School of Computing

Research Report 2006/2007

NUS National University of Singapore

Content

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School of Computing Research Report 2006 / 2007

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Dean's Foreword

Welcome to the third edition of our biennial research report. In the following pages, you will find the highlights of research done in the past two years. These are the cumulative results of the sustained emphasis on research at NUS School of Computing (SoC) since its inception in 1998. Indeed, over the years, we have worked hard and established a strong presence in our main research clusters. In Computer Science, these clusters include our traditional strongholds of Database Systems, Media, Programming Languages and Software Engineering and Embedded Systems, plus newer areas such as Bioinformatics. In Information Systems, our main research clusters are Electronic Commerce, Internet and Information Privacy, Knowledge Management, and Virtual Teams and Virtual Communities. Our strong growth in these various areas is apparent in our publication track records with the respective leading journals and top conferences. As a School, we have also embarked on research in multi-disciplinary areas such as Interactive Digital Media, Service Science and Social Networks.

Similarly, the major conferences that we have organised reflect the active involvement of our faculty staff and the School in promoting scholarly exchange in the research areas of our interest. Conferences that we have hosted in Singapore include: Asia Information Retrieval Symposium (AIRS) 2006, International Conference on Database Systems for Advanced Applications (DASFAA) 2006, IEEE International Conference on Field-Programmable Technology (FPT) 2005, ACM Multimedia 2005 and International Conference on Image and Video Retrieval (CIVR) 2005. We have also been active in chairing/co-chairing/track-chairing the programme committees of major conferences held overseas, including: Association of Computational Linguistics (ACL), International Conference on Information Systems (ICIS) and ACM International Conference on Management of Data (SIGMOD).

More excitement lies ahead in the coming few years as we seek to introduce a more prominent entrepreneurial edge in our research activities. Already, we are making plans to recruit adjunct, visiting or full-time staff with industry experience, so that we may have greater resonance with industry in our education and research activities. To that end, we will also be embarking on transformational activities. In the long term, SoC endeavours to play an active role both internationally and locally in a sustained manner. In our established areas of strength, we seek to provide leadership. In new and evolving areas, much could be achieved through synergy among partners with complementary strengths. We seek to forge closer collaboration with various research institutes and industry. We welcome discussions

on new partnership or sponsorship possibilities, and are ready to explore new avenues of working with industry towards the next technological breakthroughs for the benefit of both industry and the wider community.

The following pages showcase the research work that has been done in SoC over the past two years. I hope that you will find it informative and useful, and urge you to keep up with news on the exciting new work that we will be doing at www.comp.nus.edu.sg/research.

OOI Beng Chin
Professor and Dean
NUS School of Computing
Personal webpage: www.comp.nus.edu.sg/~ooibc

Department of

COMPUTER SCIENCE

Department Overview

The Department of Computer Science aims to excel in both education and research. Today, we have over 100 academic and research staff members. Our research activities encompass a wide spectrum of areas, ranging from topics in core computer sciences (such as artificial intelligence, databases, media, programming languages, networking and software engineering) to topics involving multiple disciplines (such as computational biology, medical informatics and embedded systems).

Our colleagues and their research activities are internationally recognised. Our colleagues serve as members of technical programme committees in many international conferences, and a number of them served as the TPC co-chair (e.g., ACL 2005, ACM Multimedia 2005 and SIGMOD 2006). Several of our colleagues also sit on the editorial boards of international journals. We publish more than 200 papers in international conferences and journals every year, with a significant number in the leading conferences and journals in the respective fields. For the period of this report (1 April 2005 – 31 March 2007), several research articles of our colleagues won Best Paper Awards in international conferences. Our staff members are also often engaged as consultants to industry as well as technical experts in overseas project evaluations funded by research councils in Hong Kong and Australia.

We strongly encourage and promote international collaboration. Our colleagues have worked with academia from the US (MIT, Purdue, Michigan, UC Irvine), Australia (University of Sydney, University of Melbourne), the UK (Oxford University, Cambridge University), Europe (EPFL, L3S, CNRS) and China (Fudan University, Tsinghua University) as well as industrial research labs (IBM T J Watson, HP Palo Alto Lab, Microsoft Asia). We continue to engage overseas academics and researchers to visit us and serve in various capacities. Our International Review Committee comprises Professor (Emeritus) Jeffrey Ullman (Stanford University), Professor H.T. Kung (Harvard University), Professor Edward A. Lee (University of California at Berkeley) and Professor T. Kanade (Carnegie Mellon University). Professor Franco Preparata (Brown University) visits us regularly as Kwan Imm Thong Chair Professor and advises the department on our computational biology programme. Professor Lee Chin Hui (Georgia Institute of Technology) and Professor Ramesh Jain (University of California at Irvine) are both regular visitors and have research collaborations with our media group.

Our graduate students contribute significantly to our research. During the last two years, we have graduated 143 MComp students, 61 MSc students and 67 PhD students. In particular,

our PhD graduates are well placed in their first job – some became Postdoctoral/Research Fellows in the US (Purdue University, Stanford University, University of Georgia, Harvard University), Europe (EPFL, Aalborg University), Australia (CSIRO, University of Queensland, University of Melbourne) and China (Zhejiang University, Microsoft Asia, IBM Beijing Lab, Beijing University); others joined local research institutes (Genome Institute of Singapore, Institute for Infocomm Research) and local industries.

We are also seeing more activities that benefit the local scene. In medical image analysis, our colleagues have collaborated with medical doctors on a wide range of applications including detection of bone fractures in x-ray images (with Singapore General Hospital); segmentation of liver in abdominal CT images for liver transplant (with National University Hospital); detection, classification and quantification of acnes and pigmentation in face images (with National Skin Centre); early detection of infarcts in brain CT (with Singapore General Hospital); simulation of cardiac surgery for surgical planning (with National Taiwan University Hospital), and derivation of quantitative measures for the description of retinal vessels' characteristics from vascular structure information (with Department of Ophthalmology and the Singapore Eye Research Institute). In the document analysis project, a novel language/script identification technique developed has found its way into a document processing system for a government organisation that deals with a large amount of incoming multilingual documents. In human motion analysis, a sophisticated system for analysing the motion of a sports novice captured in a single video with the 3D reference motion of an expert has been developed, and applied to Taichi and golf swing coaching. A prototyping effort, in collaboration with an IT entrepreneur and supported by the Economics Development Board (EDB), is currently underway to build a prototype system for remote golf swing coaching. In addition, several projects are also being incubated for potential spin-off as part of our drive to encourage technopreneurship and the transfer of technologies to industries.

We are also very pleased that several of our colleagues have received prestigious awards locally. Limsoon Wong was conferred the Singapore Youth Award Medal of Commendation in July 2006 for his sustained contributions to science and technology. Ken Sung Wing Kin and his collaborators at the Genome Institute of Singapore were conferred the National Science Award in October 2006 for their innovative work in developing the Paired End diTag sequencing technology for comprehensive characterisation of the human genome and transcriptome. Terence Sim Mong Cheng won the Temasek Young Investigators Award 2005, which comes with a $700K grant over three years.

We hope this report will give you a good overview of our research activities. You are strongly encouraged to contact our colleagues or look up their web pages for more details on their research projects.

Sanjay Jain (Dr)
Professor and Head
Department of Computer Science

Artificial Intelligence

Artificial Intelligence (AI) may be considered one of the newest disciplines in the history of science. The name Artificial Intelligence was coined in 1956, soon after World War II. Today, AI encompasses a wide range of sub-disciplines, from general topics such as learning and perception to specific areas such as game playing, theorem proving, medical diagnosis, robotic control, as well as image and text processing. In a sense, AI aims to emulate human intelligence in various problem solving endeavours involving knowledge processing, such as learning new knowledge, dealing with uncertainty in knowledge, and finding knowledge presented in different formats including texts and images. The above examples of knowledge processing represent the five areas of AI interests in the School of Computing:

- Machine Learning
- Image Mining
- Digital Libraries
- Uncertainty Management
- Document Analysis

Machine Learning

Learning is one of the fundamental capabilities of intelligent systems that have been studied since the dawn of AI. Alan Turing proposed machine learning as a possible way to construct machines that may be able to pass the Turing Test in his landmark 1950 paper "Computing Machinery and Intelligence". One of the earliest success stories in AI, Samuel's checkers player, was constructed with the help of machine learning.

Machine learning methods currently give the best performance in many practical problems in areas such as computer vision, speech, and natural language processing and robot control. Along with impressive practical successes, much has been achieved in our understanding of the fundamental issues involved in machines that learn. Learning theory characterises the conditions under which learning can be successful in two main ways: probabilistically, along the lines of Valiant's Probably Approximately Correct (PAC) framework, and in the limit using recursion theoretic methods (inductive inference), as initiated by Gold in 1967[1].

Our work spans both the theoretical and applied fronts of machine learning. On the theory side, we have been working on non U-shaped learning, which is currently a much investigated topic in inductive inference. We have also been investigating new approaches such as the inversion of operators in a learning-theoretic context and the modes of data presentation for function learning. Towards the applied side, we have been looking at the use of unlabeled data in learning, including semi-supervised and unsupervised learning methods. In addition, we have been investigating the use of machine learning for applications such as activity recognition and natural language processing. In natural language processing, our entry in the evaluation conference, SemEval 2007, has been ranked first in the word sense disambiguation lexical sample task.

Representative Publications

- Lorenzo, C., Case J., Jain S. and Stephan F. Memory-limited U-shaped learning. Conference on Computational Learning Theory, Pittsburgh, USA, June 2006.
- Jain S. and E.B. Kinber. Iterative Learning from Positive Data and Negative Counterexamples. Algorithmic Learning Theory, Barcelona, October 2006.
- Jain S., Nessel J. and Stephan F. Invertible Classes. Theory and Applications of Models of Computation, Beijing, May 2006.
- D. Zhang and W.S. Lee. Extracting Key-substring-group Features for Text Classification. International Conference on Knowledge Discovery and Data Mining, Philadelphia, USA, August 2006.
- Zhang, X. and W.S. Lee. Hyperparameter Learning for Graph based Semi-supervised Learning Algorithms. Conference on Neural Information Processing Systems, Vancouver, Canada, December 2006.

Uncertainty Management

Computational technologies for uncertainty management facilitate the identification of relevant information, the acquisition of useful insights, and the implementation of timely actions in complex decision problems. Many recent global events of significant and sometimes catastrophic impact, e.g., business globalisation, disease outbreaks, terrorism attacks, earthquakes and tsunamis, etc., have highlighted the need for decision support systems that can efficiently and systematically help manage uncertainties and minimise surprises. Current technologies cannot adequately address the major challenges brought by substantial contextual, informational and temporal changes in such decision situations. These are the main challenges being addressed at the Medical Computing Laboratory in SoC, with an emphasis in the biomedical domains. Our research group is part of the multidisciplinary Biomedical Decision Engineering (BIDE) team in the University, comprising faculty members, researchers and students from NUS, and various local and overseas institutions and healthcare organisations.

Our long-term research agenda focuses on developing advanced computational technologies to support complex decision making in dynamic environments. Our current research focuses on developing a comprehensive decision making framework that: 1) supports adaptive reasoning in changing, uncertain environments; 2) integrates and learns from distributed information sources; and 3) provides timely decision recommendations with limited resources.

This framework includes: 1) languages for effective specification of decision factors and objectives in a context-sensitive manner, 2) methodologies for reasoning with and learning of decision information from human experts and online databases, and 3) techniques for adapting responses and managing surprises under resource constraints.

Our on-going research projects focus on techniques and systems that provide support for complex medical decisions where relevant information from distributed multimodal sources is integrated to provide recommendations in a timely manner. Our recent foci are:

Decision Modelling with Multimodal Information

Projects in this area aim to combine multimodal information, such as text-based, structured, and/or image data, in support of biomedical decision making. The objective of an initial project is to develop an intelligent human organ segmentation system using 3D medical magnetic resonance images (MRIs) to support medical decision making. We have proposed hybrid image processing algorithms, and evaluated them on a set of kidney images. We continue to explore and develop other image processing algorithms and decision support system models.

Advanced Techniques in Probabilistic Graphical Models

Projects in this area explore and develop analytical techniques in the realm of probabilistic graphical models and influence diagrams. We are currently working on context-aware probabilistic reasoning, multiple-level probabilistic game representation and knowledge discovery using Bayesian learning. The results are being evaluated in selected prototype applications in biomedicine and e-commerce.

Time Critical Decision Modelling

Projects in this area investigate methodologies and build computer-based tools for managing complex decisions under limited resources. Such techniques take into account the dynamic nature of the problem, uncertainties, preferences of decision makers, as well as the time criticality of the problem. They help ensure that the decision models being built are of optimum size for timely recommendations of effective actions. Our ongoing work includes outcome and risk profile analysis, guideline implementation, and learning from imbalanced data in various critical care domains.

Highlights of research achievements and potential for commercialisation:

Project ResEasy

Funded by the Infocomm Development Authority (IDA) and The Enterprise Challenge (TEC) in Singapore, this translational research project adopts a new collaborative approach by facilitating a research team, an engineering team, and a clinical team to speed up trial implementation and productisation of our previous research results. The objective is to trial the effectiveness and feasibility of an open, adaptive workbench which implements decision support applications based on a set of generic information management toolboxes that support integration, visualisation, analysis, security and reporting of relevant information. The toolboxes can be generalised to other diseases or conditions directly, and adapted and deployed in multiple sites simultaneously. The ResEasy project initially focuses on facilitating best practices in process management, outcome analysis, and guideline execution in two areas: prospective care of asthma patients, and acute care of Acute Respiratory Distress Syndrome (ARDS) patients. Collaborators and partners include the Singapore National Asthma Program, Gleneagles Hospital, Hewlett Packard and other engineering firms.

Representative Publications

- Pang, B.C., Vellasamy K., Joshi R., H. Yin, K.K. Lee, B.T. Ang, J. Lee, T.Y. Leong and I. Ng. A Hybrid Outcome Prediction Model for Severe Trauma Brain Injury. Journal of Neuro Trauma, 24(1):136-46, 2007.
- Liu, J., T.Y. Leong, K.B. Chee, B.P. Tan, Shuter B. and S.C. Wang. Set based Cascading Approaches for Magnetic Resonance Image Segmentation (SCAMIS). American Medical Informatics Association Annual Symposium (AMIA), Washington, DC, USA.
- Joshi, R. and T.Y. Leong. Patient Specific Inference and Situation Dependent Classification using Context Sensitive Networks. American Medical Informatics Association Annual Symposium (AMIA), Washington, DC, USA.
- Jiang, C.A., T.Y. Leong and K.L. Poh. PGMC: A Framework for Probabilistic Graphic Model Combination. American Medical Informatics Association Annual Symposium (AMIA), Washington, DC, USA.

Image Mining

Advances in image acquisition and storage have given rise to huge image databases. Retrieving salient information from these images is a daunting task. Image mining aims to address this problem. Image mining research at the School of Computing stems from our group's original interests in data mining. Although it is usually used in relation to the analysis of data, data mining, like artificial intelligence, is an umbrella term and is used with varied meaning in a wide range of contexts. Thus, in the context of images, image mining deals with the extraction of knowledge, image data relationship, or other patterns not explicitly stored in the images. It is an interdisciplinary effort that draws on expertise in image processing, information retrieval, data mining, machine learning, database and artificial intelligence.

The image mining research that is being carried out in the School of Computing focuses on medical images, particularly retina images and brain CT scan images. The main objective is to allow the machine to capture salient features in such images with the view to mine useful information pertaining to medical anomalies.

Retina images provide a window into what is happening inside the human body. Subtle changes in the eye's retinal vessels can serve as warnings as to whether the patient may be heading towards a stroke. Computers can help trace and track these vessels accurately and quantify the changes in them over time. The RETINA image mining group in the School has been working on retina images over the years and has developed a computer aided screening system for use in polyclinics.

A new image mining application involving brain CT scan images has recently been studied. The current research aims to investigate techniques for fast retrieval of brain CT scan images based on the image content of medical anomalies as well as other textual information associated with the medical conditions. Machine learning paradigms are explored to enable automatic classification of medical images based on image contents and textual data. In addition, text and image mining techniques are also investigated for the training of the machine to do automatic interpretation of image contents.

In the Retina image mining project, we have developed increasingly accurate and robust algorithms to grade the vascular or blood-vessel structure in retinal images automatically. Our approach incorporates techniques from wavelet analysis, texture analysis, and curvature ridge/trench analysis to attain the desired clinical sensitivity. In collaboration with the Department of Ophthalmology and the Singapore Eye Research Institute (SERI), we have developed a user-friendly system called SIVA (Singapore "I" Vessel Assessment) to extract vascular structure information and derive quantitative measures for the description of retinal vessels' characteristics (Figure 1). The robust system is also flexible and intuitive in gathering feedback for enhancing the accuracy of vessel measurement. We are currently validating the system on approximately 6,000 retinal images from the Singapore Prospective Cohort Study, conducted by the Department of Ophthalmology at NUS, SERI and the Singapore General Hospital.

In addition, we have also designed new data mining techniques for the discovery of interesting changes over time. These include: a dense periodic pattern miner, a scalable graph miner, and a progressive confident rule miner. In particular, the progressive rule miner is able to look for rules that capture the state changes of objects leading to a certain end state with increasing confidence. An initial application of this algorithm on the retinal dataset shows that the algorithm is able to increase the predictive accuracy of occurrences of maculapathy in diabetic patients.

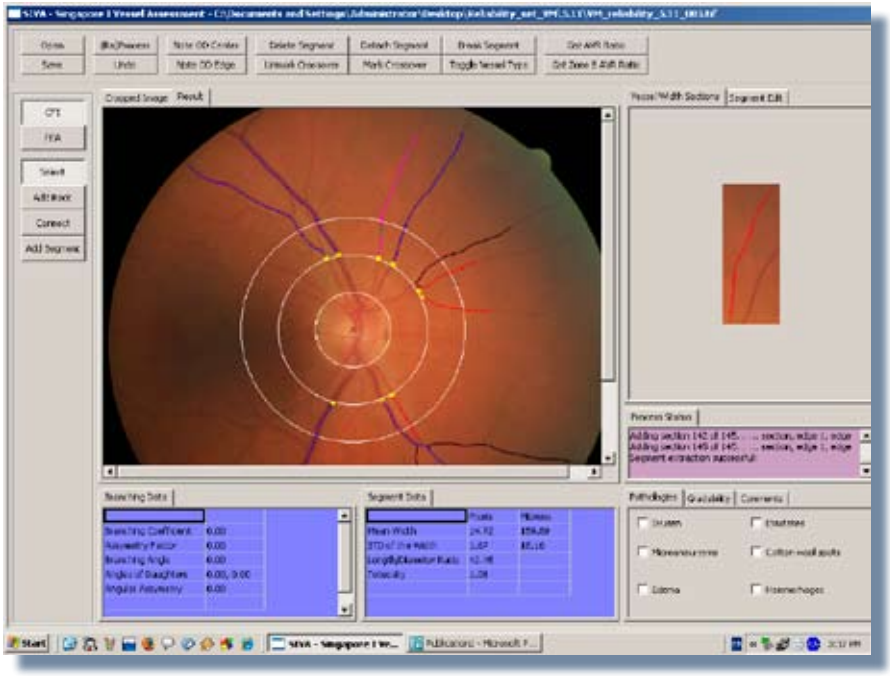


Figure 1: The SIVA (Singapore "I" Vessel Assessment) System

Representative Publications

- Sheng, C., W. Hsu and M.L. Lee. Mining Dense Periodic Patterns in Time Series Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, April 2006.
- Wang, J., W. Hsu and M.L. Lee. A Partition-based Approach to Graph Mining. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, April 2006.
- Guo, X., W. Hsu, M.L. Lee and T.Y. Wong. A Tree Matching Approach for the Temporal Registration of Retinal Images. IEEE International Conference on Tools with Artificial Intelligence, Washington, USA, November 2006.
- Zhang, M., W. Hsu and M.L. Lee. Mining Progressive Confident Rules. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (SIGKDD), Philadelphia, USA, August 2006.
- Li, H., W. Hsu, M.L. Lee and T.Y. Wong. Automatic Grading of Retina Vessel Caliber. IEEE Transactions on Biomedical Engineering, 52(7), 2005.

Document Analysis

Document analysis is the task of examining document content in order to acquire an understanding of its intended meaning. The document content can be in the form of texts, tables, charts, graphics and photographs. Documents may be in electronic texts or digitised images. Electronic texts are pervasive in the information world today and they can be easily processed by the machine, but digitised images are also becoming very popular following recent advances in digital publishing technology. While historically, works in text processing and document image analysis were done quite independently of each other, in recent years, there have been common interests between the two communities: The field of information retrieval which has traditionally dealt with text has since also been looking into information in document images. On the other hand, we begin to see works on web and text documents reported in conferences that traditionally dealt with document images.

The document analysis group in the School of Computing has interest in both electronic texts and images, with the objectives of retrieving relevant documents and extracting textual contents from the documents. We have developed techniques in processing documents across different formats, including pure texts, charts, texts converted from optical character recognition (OCR) with errors, text images with noise and distortion, and multilingual documents.

Text representation is the task of transforming the content of a textual document into a compact representation of its content so that the document may be recognised and classified by a computer. In this research, we have developed a new term weighting scheme based on a Relevance Frequency measure for text classification.

In the area of document image analysis, we have developed techniques to correct distorted images caused by perspective distortion or warped document surfaces. Two main approaches have been investigated. One is based on the textual content of the document. Here, a curving grid is superimposed over the document in alignment with the distorted text line. The grid is then regularised, and the textual content straightened in the process. The other approach works by shading information in the document page to model the 3D surface of the document. The 3D model is then subject to a transformation process to achieve a flattened rendition of the document page (Figure 2). The distortion correction improves text recognition and hence provides for more accurate document information retrieval and extraction.

Another stream of research in document image analysis focuses on identifying the language and script of document content. The identification is based on some statistical measures of the image features of characters and scripts. The language/script identification is useful in optical character recognition (OCR) involving multilingual documents. The automated language/script identification allows documents to be directed to the respective OCR engines for correct text conversion.

In addition to document text processing, recognition of charts is also being examined in our group. The techniques developed allow us to extract textual information as well as graphical components in charts so that we may derive meaningful interpretation of the charts. A question and answering system is being developed that allows chart information to be incorporated into document textual information to answer questions that involve data implicitly represented in charts.

Highlights of research achievements and potential for commercialisation:

Our technique for text classification based on Relevance Frequency has attracted industry interest. A start-up company is keen to use the technique to perform machine classification of biomedical literature from the PubMed document database.

Our language/script identification technique has been used by a company to develop a document processing system for a government organisation that deals with a large amount of incoming multilingual documents.

Another company is currently exploring the use of our document image analysis techniques to process scanned images of U.S. patent documents. The processing tasks include correction of document skews and distortion, detection and recognition of graphical components, and retrieval of relevant patent documents.

Our text classification method based on Relevance Frequency has achieved the best performance in BioCreative II evaluation (Critical Assessment for Information Extraction in Biology, http://biocreative.sourceforge.net/biocreative_2.html) in the protein-protein Interaction Article Selection sub-task, in terms of F Score. The evaluation was held in conjunction with a workshop known as “Second BioCreAtIvE Challenge Workshop” (website: http://biocreative.sourceforge.net/bc2ws/index.html).

Our group has clinched a prestigious grant – the HP Digital Publishing for University Teaching and Learning grant worth more than US$58,000. The grant is targeted at research activities in developing advanced techniques for document text recognition, storage and

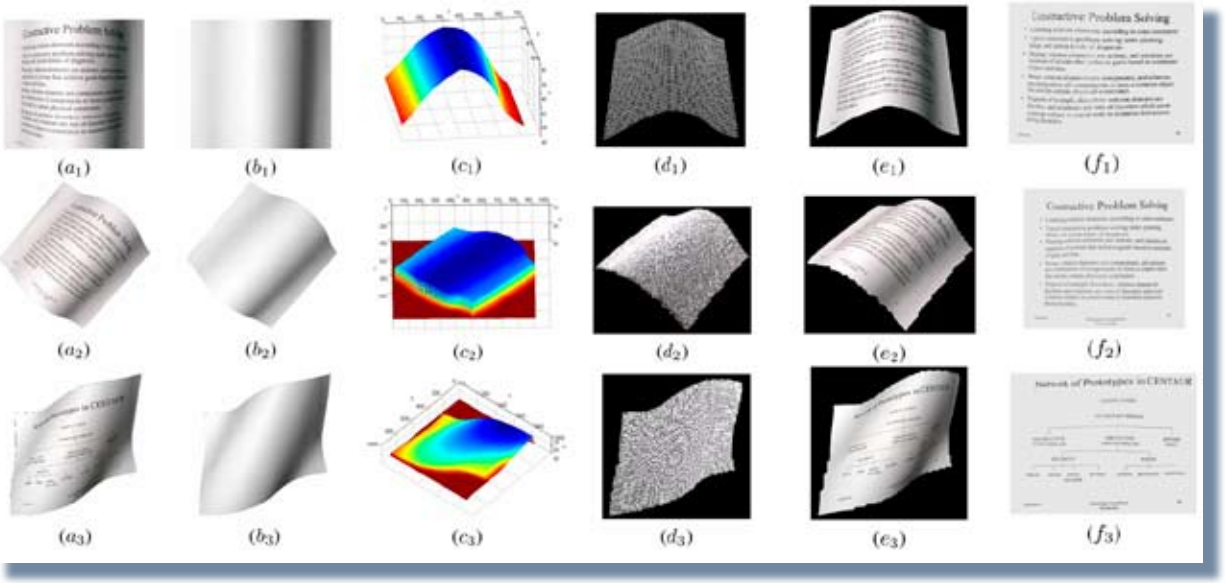


Figure 2. (a) Original distorted images; (b) Real shading; (c) Reconstructed shape; (d) Uniform sampled mesh; (e) Textured mesh; (f) Restored image

retrieval. Only 14 institutions from around the world were selected in 2006 to receive the grant.

Representative Publications

- Zhang, L., A.M. Yip and C.L. Tan. Photometric and Geometric Restoration of Document Images using Inpainting and shape-from-shading. Conference on Artificial Intelligence (AAAI), Vancouver, Canada, July 2007.
- Zhang, L., A.M. Yip and C.L. Tan. Shape from Shading based on Lax-friedrichs Fast Sweeping and Regularization Techniques with Applications to Document Image Restoration. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Minneapolis, USA, June 2007.
- Lu, S and C.L. Tan. Automatic Document Orientation Detection and Categorization through Document Vectorization. ACM Multimedia, Santa Barbara, USA, October 2006.
- Lan, M., C.L. Tan and H.B. Low. Proposing A New Term Weighting Scheme for Text Categorization. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.
- Zhang, L. and C.L. Tan. Warped Image Restoration with Applications to Digital Libraries. International Conference on Document Analysis and Recognition (ICDAR), Seoul, Korea, August 2005.

Digital Libraries

Digital libraries aim to transform the way knowledge is created, transmitted and stored. It is a diverse area with contributors from library sciences, databases, natural language processing, multimedia and information retrieval. Previous efforts in the area have examined the problems of storage and access of vast quantities of human knowledge. While scalability of the storage and retrieval of large data remains a problem, recent efforts are centred on how today's knowledge workers use and most efficiently access information. Properly integrating information from the World Wide Web into peer-reviewed, manually-selected and authoritative sources available in the digital library is a continued focus.

Our current research applies techniques in machine learning and natural language processing to solve problems in digital libraries and applied information retrieval. While digital library research is very diverse, our focus is in building tools and platforms for the automated, large-scale digital library. We examine the problem of name authority and attribution (e.g., Which of the 11 known Wei Wang's is the author of this work?) and large scale scholarly digital library implementation and fielding. Query analysis is another continuing area of interest, where we bring statistical and syntactic analyses to bear on user queries in the context of library catalogues as well as the Web. Our research on user interface design in the context of analysis of search and browsing interfaces also helps us develop and understand next-generation methods of information presentation (e.g., using Web 2.0 technologies).

Highlights of research achievements and potential for commercialisation:

Our holistic view of digital library research leads directly to implementation of toolkits and fielded digital library technology. Our research on automated backend implementation in record linkage and terminology handling helps us to conduct more meaningful analysis of scholarly data. Our research on query analysis and user interface design allows us to build real-world, simple and workable interfaces for key application areas in digital libraries such as public access catalogues (Figure 3).

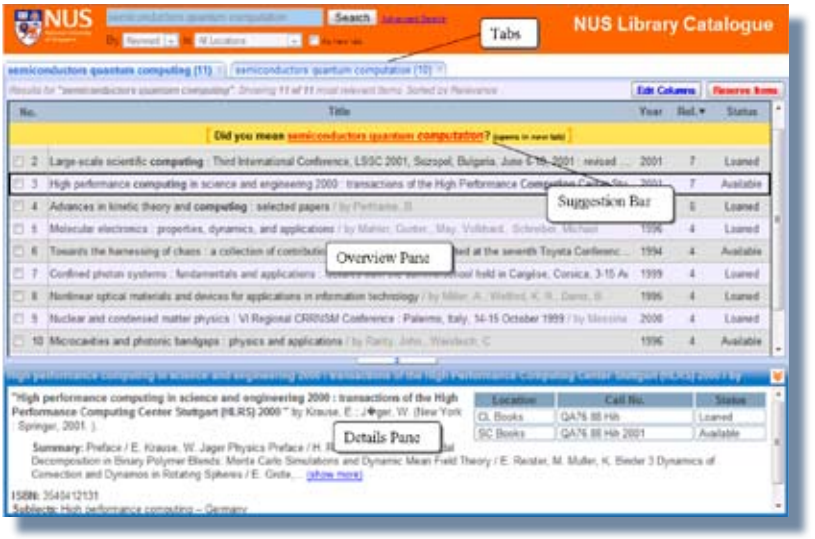


Figure 3: Re-designed prototype library catalogue featuring tabs and overview+detail user interface design

Our current implementation efforts aim to build scholarly libraries for mathematics research, where problems with terminology and equation retrieval arise, and for scholarly presentations, in which alignment and synthetic visual images play a significant role.

Our research has led to two invention disclosures that have attracted industry attention. Our research on synthetic image classification has led to licensing talks with international document processing companies.

While our digital library group is young, we have already established our specialty of cross-disciplinary research. Our publications feature automated analysis of digital data in various modes: web data, image, and query and metadata analysis. We have also established and headed a working group of investigators from several international universities examining issues in scholarly digital anthologies.

Representative Publications

- Lu, W. and M.Y. Kan. Supervised Categorization of Javascript using Program Analysis Features. Information Processing and Management, 43(2):431-444, 2006.
- Wang, F. and M.Y. Kan. NPIC: Hierarchical Synthetic Image Classification using Image Search and Generic Features. Conference on Image and Video Retrieval (CIVR), Tempe, Arizona, USA, July 2006.
- Tan, Y.F., M.Y. Kan and D.W. Lee. Search Engine Driven Author Disambiguation. ACM/IEEE Joint Conference on Digital Libraries (JCDL), North Carolina, USA, June 2006.
- Li, L.L. and C.L. Tan. Improving OCR Text Categorization Accuracy with Electronic Abstracts. International Workshop on Document Image Analysis for Libraries (DIAL), April 2006.
- Kan, M.Y. and D.C.C. Poo. Detecting and Supporting Known Item Queries in Online Public Access Catalogs. ACM/IEEE Joint Conference on Digital Libraries (JCDL). Denver, USA, June 2005.

The faculty members involved in artificial intelligence research are:

- HSU Wynne
- JAIN Sanjay
- KAN Min Yen
- LEE Mong Li
- LEE Wee Sun
- LEONG Tze Yun
- STEPHAN Frank
- TAN Chew Lim

Collaboration

Faculty Member	Name of Organisation
HSU Wynne	Institute for Infocomm Research, Singapore National Health Care Group Polyclinics, Singapore Singapore Eye Research Institute, Singapore Singapore General Hospital University of Melbourne, Australia University of Sydney, Australia
JAIN Sanjay	Sacred Heart University, USA University of Delaware, USA University of New South Wales, Australia
KAN Min Yen	Pennsylvania State University, USA Arizona State University , USA Cambridge University, UK
LEE Wee Sun	Birbeck College, University of London, UK Massachusetts Institute of Technology, USA University College, University of London, UK
LEONG Tze Yun	Gleneagles Hospital, Singapore Massachusetts Institute of Technology, USA National Neuroscience Institute, Singapore National University Hospital, Singapore National Asthma Programme, Singapore
STEPHAN Frank	University of New South Wales, Australia University of Delaware, USA University of Heidelberg, Germany
TAN Chew Lim	Tsinghua University, China Purdue University, USA Institute for Infocomm Research, Singapore National Neuroscience Institute, Singapore Tan Tock Seng Hospital, Singapore HotCard Technology Pte Ltd, Singapore Hewlett Packard, Singapore Thothe Technologies Pte Ltd, Singapore Retriva Solutions Pte Ltd, Singapore ClearlyUnderstood Inc., USA

Journal Editorial

Faculty Member	Name of Journal	Position
HSU Wynne	Journal of Database Management	Editorial Board Member
LEONG Tze Yun	Journal of Artificial Intelligence in Medicine Journal of Biomedical Informatics Methods of Information in Medicine	Associate Editor Editorial Board Member Associate Editor
TAN Chew Lim	Pattern Recognition	Associate Editor

Reference:

[1] E.M. Gold. Language Identification in the Limit. Information and Control, 10(5):447-474, 1967.

Computational Biology

The frontier of medical science has rarely been as exciting and full of opportunities as it is today. From basic science to clinical research to health services research, the opportunities made available through impressive recent advances in the biomedical, physical, and computational sciences have brought us to a place of unprecedented opportunities. It is also now widely appreciated that present-day biomedical researchers are confronted by vast amounts of data from genome sequencing, microscopy, high-throughput analytical techniques for DNA, RNA and proteins, and a host of other new experimental technologies. Coupled with enormous advances in computing power, this flow of information should enable scientists to model and understand biological systems in novel ways.

Over the last decade, however, the community has come to the realisation that, to make effective use of the explosion of data, new challenges must be faced especially in the development and application of computational analysis and knowledge discovery technologies and methodologies. The SoC Computational Biology Lab was thus established. The research of our lab will benefit biological and clinical researchers by enabling extraction and inference of new knowledge and value-added information from diverse biomedical data. Our research projects and activities are described below.

Protein Structure Comparison and Database Search

Analysis of three-dimensional (3D) protein structures plays an important role in bioinformatics. Since the functions of a protein is more closely related to its 3D structure than its amino acid sequence, the study of proteins from the structural perspective can give us more valuable information about their functions.

Here, we have two main objectives: (a) develop efficient and effective methods to compare a pair of 3D protein structures, and (b) develop efficient and effective methods to search a database of 3D protein structures. The “efficiency” aspect deals with the speed of retrieval. The “effectiveness” aspect deals with the accuracy of the methods.

We have designed a fine-grained protein structure alignment method named MatAlign. It is a two-step algorithm. First, we represent 3D protein structures as 2D distance matrices, and align these matrices by means of dynamic programming in order to find the initially aligned residue pairs. Second, we refine the initial alignment iteratively into the optimal one according to an objective scoring function. We have implemented MatAlign and evaluated it against two widely used structural comparison tools, DALI and CE. On the benchmark set of 68 protein structure pairs by Fischer et al., MatAlign provides better alignment scores, according to four different criteria, than both DALI and CE in a majority of cases. MatAlign is about four times faster than DALI, and has about the same speed as CE. The current implementation runs on Win32, and the executables can be downloaded from http://www1.i2r.a-star.edu.sg/~azeyar/genesis/MatAlign/MatAlign_v11_Windows.zip.

We have also proposed a rapid protein structure database retrieval system named ProtDex2, in which we adopt the techniques used in information retrieval (IR) systems in order to perform rapid database search without having to access every structure in the database. The retrieval process is based on the inverted index constructed on the feature vectors of the relationships between the secondary structure elements (SSEs) of all the protein structures in the database. Experimental results show that ProtDex2 is very much faster than two commonly used detailed structural comparison methods, DALI and CE, yet does not sacrifice too much accuracy of comparison. When comparing with a fast database scan method, Topscan, ProtDex2 is much faster and also slightly more accurate. The software is available at http://www1.i2r.a-star.edu.sg/~azeyar/genesis/ProtDex2.

Relevant Publications

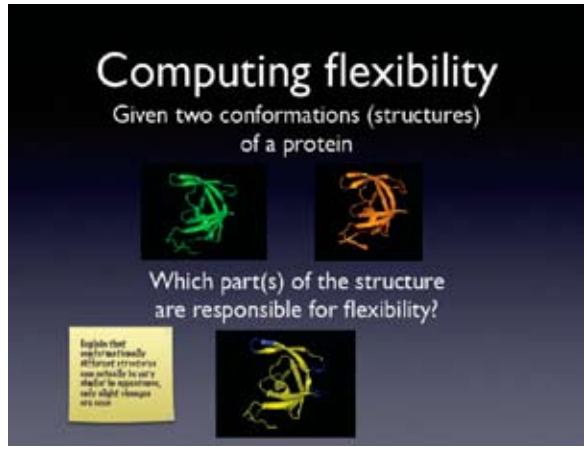
- Aung, Z. and K.L. Tan. MatAlign: Precise Protein Structure Comparison by Matrix Alignment. Journal of Bioinformatics and Computational Biology, 4(6):1197-1216, 2006.
- Aung, Z. and K.L. Tan. Automatic 3D Protein Structure Classification Without Structural Alignment. Journal of Computational Biology, 12(9):1221-1241, 2005.
- Chionh, C.H., Z. Huang, K.L. Tan and Z. Yao. Towards Scaleable Protein Structure Comparison and Database Search. International Journal on Artificial Intelligence Tools, 14(5):827-848, 2005.

Protein Structure and Protein Motion

Protein conformational flexibility plays a critical role in vital biological functions, such as immune protection and enzymatic catalysis. An example is the "flap" motion of HIV protease, a major inhibitory drug target for AIDS therapy. The flaps, located near the reactive site of HIV protease, must open to allow a ligand to bind and then close to form direct contacts with the ligand. Such motion is an essential means for proteins to perform their functions, and therefore provides an important link between structure and function, a central relationship in molecular biology.

We envision that future protein databases will contain not only static structures of proteins, as the Protein Data Bank (PDB) does currently, but also the motion of proteins. Users can submit queries on protein motions to study the relationship between structure and function, just as they submit queries on sequences and static structures today. Such information will greatly enhance our ability to understand and predict ligand-protein and protein-protein interactions during processes such as for pharmaceutical drug design. Towards this goal, we are developing geometric computation tools to explore, analyse and model protein conformational flexibility.

We have developed a new method called Stochastic Roadmap Simulation (SRS) for studying protein folding kinetics and have used it to computationally predict experimental quantities in protein folding. Interesting properties of molecular motion are best characterised statistically by considering an ensemble of motion pathways rather than an individual one. Classic simulation techniques, such as the Monte Carlo method and molecular dynamics, generate individual pathways one at a time and are easily "trapped" in the local minima of the energy landscape. They are computationally inefficient if applied in a brute-force



fashion to deal with many pathways. SRS uses a randomised technique for sampling molecular motion and exploring the kinetics of such motion by examining multiple pathways simultaneously.

We have developed an algorithm and the related software called pFlexAna for detection of protein conformational changes from experimental data obtained through, for example, X-ray crystallography. Due to noise in the data, determining salient conformational changes accurately and efficiently is a challenging problem. A key element of pFlexAna is a statistical test that determines the similarity of two protein structures in the presence of noise. Using data from the Protein Data Bank and the Macromolecular Movements Database, we tested the algorithm on proteins that exhibit a range of different conformational changes. Results show that our algorithm can reliably detect salient conformational changes, including well-known examples such as hinge and shear.

With collaborators from Yong Loo Lin School of Medicine in NUS, we are studying the protein-protein interaction between Bcl-2 and Rac1.

Relevant Publications

- Nigham, A. and D. Hsu. Protein Conformational Flexibility Analysis with Noisy Data. International Conference on Research in Computational Molecular Biology (RECOMB), San Francisco, California, April 2007.
- Chiang, T.H., M. S. Apaydin, D. L. Brutlag, D. Hsu, and J.C. Latombe. Predicting Experimental Quantities in Protein Folding Kinetics using Stochastic Roadmap Simulation. International Conference on Research in Computational Molecular Biology (RECOMB), Venice, Italy, April 2006.

Increasing Reliability of Protein Interactomes

Progress in high-throughput experimental techniques in the past decade has resulted in the rapid accumulation of protein-protein interaction (PPI) data. However, recent surveys reveal that interaction data obtained by popular high-throughput assays such as yeast-two-hybrid experiments may contain as much as

Are We There Yet?

	Coverage	Data quality
DNA genome sequence	99% of genome sequence	99.9% correct
mRNA profiling	80-90% of transcripts represented	90% of spots are good data
Protein interaction data	10-30% of interactions catalogued	50-70% of interactions are spurious

50% false positives and false negatives. As a result, further carefully focused small-scale experiments are often needed to complement the large-scale methods to validate the detected interactions. However, the vast interactomes require much more scalable and inexpensive approaches.

Here, we have three main objectives: (a) identify properties that characterise true-positive and false-positive PPIs, (b) develop efficient and effective methods for assessing the reliability of PPIs reported in high-throughput assays, and (c) develop efficient and effective methods for identifying false-negative PPIs and new protein complexes from high-throughput assays.

We have developed several methods for assessing the reliability of a PPI, given a graph derived from high-throughput protein interaction experiments. The pairs of "interacting" proteins that are ranked highly by these methods are shown more likely to be true-positive interacting pairs. The most interesting feature of these methods is that they are able to rank the reliability of an interaction between a pair of proteins using only the topology of the interactions between that pair of proteins and their neighbours within a short radius.

Our methods can be roughly divided into two groups. The first group is represented by the functional similarity weighting (FS-Weight) and CD Distance indices. This group of indices attempt to provide abstract mathematical characterisations of networks of reliable protein-protein interactions. They are based on the hypothesis that true-positive interactions are likely to be characterised by dense cross connections in the derived interaction graph. The second group is represented by the meso-scale motifs (NeMoFinder) indices. This group of indices attempt to provide explicit motifs of network connections that are associated with reliable protein interactions.

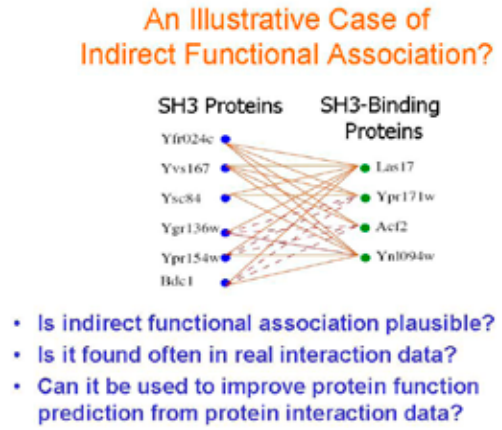
The NeMoFinder, CD Distance, and FS-Weight are far superior (30-50% better correlated with function homologeneity, localisation coherence, and gene expression correlation) than previous methods (e.g., interaction generality index) for detecting false positives in protein interaction experiments. CD Distance and FS-Weight are also very fast to compute. Furthermore, with small modifications such as incorporation of interacting motif pairs, these indices can also be used for false negative detection with high confidence.

Relevant Publications

- Chen, J., W. Hsu, M.L. Lee and S.K. Ng. Increasing Confidence of Protein Interactomes Using Network Topological Metrics. Bioinformatics, 22:1998-2004, 2006.
- Chen, J., W. Hsu, M.L. Lee and S.K. Ng. NeMoFinder: Dissecting Genome-Wide Protein-Protein Interactions with Repeated and Unique Network Motifs. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), Philadelphia, Pennsylvania, August 2006.
- Chen, J., H.N. Chua, W. Hsu, M.L. Lee, S.K. Ng, R. Saito, W.K. Sung and L. Wong. Increasing Confidence of Protein-Protein Inteactomes. International Conference on Genome Informatics (GIW), Yokohama, Japan, December 2006.
- Chen, J., W. Hsu, M.L. Lee and S.K. Ng. Discovering Reliable Protein Interactions from High-Throughput Experimental Data Using Network Topology. Artificial Intelligence in Medicine, 35:37-47, 2005.

Protein Function Prediction

Although sequence similarity search has proven useful for protein function prediction in many cases, it has fundamental limitations. First, only a fraction of newly discovered sequences have identifiable homologous genes in the current databases. Second, the most



prominent vertebrate organisms in GenBank have only a fraction of their genomes present in finished sequences. New bioinformatics methods should allow inference of protein function using "associative analysis" of functional properties to complement traditional sequence homology-based methods. Associative properties that have been used to infer function not evident from sequence homology include: cooccurrence of proteins in operons or the genome context, proteins sharing common domains in fusion proteins, proteins in the same pathway, proteins with correlated gene expression patterns, etc.

In this project, we investigate and develop methods for inferring protein functions without sequence homology. In particular, (a) we find out how significant functional association between level-2 neighbours is, (b) we investigate how they can be exploited for protein function prediction in a graph-based framework, and (c) we investigate how to integrate protein interaction information with other types of information to improve the sensitivity and specificity of protein function prediction in a graphbased framework. At the end of the project, we expect to have developed a robust and powerful system to predict protein functions, even in the absence of sequence homology.

We have developed FS-Weight, a method for assigning functions to a protein based on the functions of direct and indirect interaction partners of that protein. The FS-Weight method predicts the functions of a protein in two steps: (1) It assigns a weight (the FW-Weight) to each of its level-1 and level-2 neighbours by estimating its functional similarity with the protein using the local topology of the interaction network as well as the reliability of experimental sources. (2) It scores each function based on its weighted frequency in these neighbours. FS-Weight makes predictions with better precision and recall compared to other protein interaction based methods (e.g., Neighbour Counting and Chi-Square) for seven model genomes we have tested. FS-Weight is also robust in the presence of noise in the protein interaction data, maintaining consistent prediction performance even when a large number of interactions are randomly added to or deleted in the interaction data.

We have also proposed a method called LaMoFinder to annotate network motifs with biological information associated with the proteins in a protein-protein interaction network. Our method is specifically devised to handle a large labelling space and the sophisticated Gene Ontology scheme in which proteins have been annotated. As a result, we have captured not only the

topological shapes of the motifs, but also the biological context in which they occur in the labelled network motifs. We have also demonstrated how the network motifs labelled by LaMoFinder can be used to predict the functions of unknown proteins in the PPI network. The superior performance of our method against other current prediction methods confirms that network motifs are indeed adequately enriched by LaMoFinder for more sophisticated biological applications such as protein function prediction.

We have also developed a technique for identifying potential annotation errors in protein sequence databases. These databases are crucial to protein function prediction that uses the principle of "guilt by association" in sequence similarity. However, these databases are known to contain many annotation errors. We have derived a statistical method to filter and assess the reliability of data from these databases. Our experiments show that we can effectively detect mis-annotated sequence data.

Relevant Publications

- Chen, J., W. Hsu, M.L. Lee and S.K. Ng. Labeling Network Motifs in Protein Interactomes for Protein Function Prediction. International Conference on Data Engineering (ICDE), Istanbul, Turkey, April 2007.
- Chua, H.N., W.K. Sung and L. Wong. Exploiting Indirect Neighbours and Topological Weight to Predict Protein Function from Protein-Protein Interactions. Bioinformatics, 22:1623-1630, 2006.
- Tan, S.H., W. Hugo, W.K. Sung and S.K. Ng. A Correlated Motif Approach for Finding Short Linear Motifs from Protein Interaction Networks. BMC Bioinformatics, 7:502, 2006.
- Ning, K. and H.N. Chua. Automated Identification of Protein Classification and Detection of Annotation Errors in Protein Databases Using Statistical Approaches. LNBI 3886: PAKDD 2006 Workshop on Knowledge Discovery in Life Science Literature (KDLL2006), Singapore, April 2006.

Identifying Functional Elements in Human and Other Genomes

Interactions between macromolecules play many essential roles, e.g., metabolic reactions and signal transduction. The interactions can also occur in many combinations, such as protein-protein, protein-DNA and protein-RNA. Protein interactions with DNA and RNA are the primary mechanisms for controlling gene expression. What is needed is a recognition code that maps from the protein sequence to a pattern that describes the family of DNA binding sites – the functional elements. Identification of functional elements in the human genome is fundamental to our understanding of cell functions including how these codes orchestrate the complex network of gene transcription, the transcriptome, and interactions in distinct locations.

We have two objectives here: (a) develop methods for accurate identification of transcription factor binding sites and other regulatory sites, and (b) develop methods for inferring the interactions of transcription factors and other functional elements.

We have developed an algorithm called LocalMotif to detect localised motifs in long regulatory sequences. A novel score function predicts the region of localisation of the motif. This score is combined with other scoring measures including Z-score and relative entropy to detect the motif. The algorithm is optimised for fast processing of long regulatory sequences. Tests on simulated and real datasets confirm that LocalMotif accurately determines the region of localisation of motifs and automatically discovers the biologically relevant motifs, which can be detected by other motif-finding algorithms only when the search is restricted to the relevant interval.

Relevant Publications

- Narang, V., W.K. Sung and A. Mittal. LocalMotif---An In Silico Tool for Detecting Localized Motifs in Regulatory Sequences. IEEE International Conference on Tools with Artificial Intelligence (ICTAI 2006), Washington D.C., November 2006.

- Narang, V., W.K. Sung and A. Computational Annotation of Transcription Factor Binding Sites in D. Melanogaster Developmental Genes. International Conference on Genome Informatics (GIW 2006), Yokohama, Japan, December 2006.
- Chan, H.L., T.W. Lam, W.K. Sung, P.W.H. Wong, S.M. Yiu and X. Fan. The Mutated Subsequence Problem and Locating Conserved Genes. Bioinformatics, 21(10):2271-2278, 2005

Management and Analysis of Gene Expression Data

The development of microarray technology has made possible the simultaneous monitoring of the expression of thousands of genes. This development offers great opportunities in advancing the diagnosis of diseases, the treatment of diseases, and the understanding of gene functions.

Our main goals are: (a) develop techniques to derive gene regulatory networks from gene expression data, (b) develop technologies for the design of microarrays, and (c) develop tools for the optimisation of disease treatment based on gene expression profiles.

We have developed a new conditional dependence learning algorithm to learn a gene regulatory network from gene expression data. Besides the pairwise correlation of the gene expression profiles of a pair of genes, our algorithm considers three additional factors: (a) collaboration among regulators, (b) formation of regulatory complex, and (c) variable time delay to learn the gene network. Experiments on both artificial and real-life gene expression datasets validate the effectiveness of the algorithm.

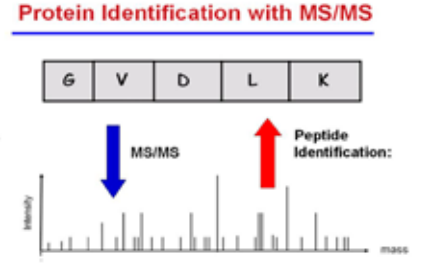
We have also proposed an efficient algorithm to identify time-lagged co-regulated gene clusters. The algorithm facilitates localised comparison and processes several genes simultaneously to generate detailed and complete timelagged information for genes/gene clusters. Our results show that the algorithm is not only efficient, but also delivers more reliable and detailed information on time-lagged co-regulation between genes/gene clusters, compared to existing methods such as the event method and the edge detection method.

Relevant Publications

- Liu, T.F., W.K. Sung and A. Mittal. Model Gene Network by Semi-fixed Bayesian Network. Expert Systems with Applications, 30(1):42-49, 2006.
- Liu, T.F., W.K. Sung and A. Mittal. Learning Gene Network Using Time-delayed Bayesian Network. International Journal on Artificial Intelligence Tools, 15(3):353-370, 2006.
- Zeller, K.I., X.D. Zhao, C.W.H. Lee, K.P. Chiu, F.Yao, J.T. Yustein, H.S. Ooi, Y.L. Orlov, A. Shahab, H.C. Yong, Y.T. Fu, Z. Weng, V.A. Kuznetsov, W.K. Sung, Y. Ruan, C.V. Dang, and C.L. Wei. Global Mapping of c-Myc Binding Sites and Target Gene Networks in Human B cells. PNAS, 103:17834-17839, 2006
- Ji, Li. And K.L. Tan. Identifying Time-lagged Gene Clusters using Gene Expression Data. Bioinformatics, 21(4):509-516, 2005.

Analysing Mass Spectra for Identifying Proteins

Proteomics is useful for understanding the expression of proteins in cells at different levels, at different time points, and in different forms. Such an understanding is critical to drug discovery and medical advances. Mass spectrometers are the predominant tool to accomplish some of the primary goals of proteomics.



For example, identification of proteins, determination of expression level of proteins, and determination of post-translational modifications, sites and types. Due to limitations in mass spectrometers and the associated software tools, most of the MS/MS data generated by mass spectrometers are rejected because they are not interpretable by currently available software. Furthermore, the remaining data usually contain many false positives. In addition, the sensitivity and precision of mass spectrometers vary greatly.

Our objective here is two-fold: (a) develop efficient, accurate and robust algorithms for protein identification from tandem mass spectra, and (b) develop efficient, accurate and robust algorithms for alignment of noisy mass spectra.

Most peptide sequencing algorithms currently handle spectra of charge 1 or 2, and have not been designed to handle higher-charge spectra. We have recently given a characterisation of multi-charge spectra by generalising existing models and analysed spectra with charges up to 5. Our analysis shows that higher charge peaks are present and they contribute significantly to prediction of a complete peptide. They also help explain why existing algorithms do not perform well on multi-charge spectra.

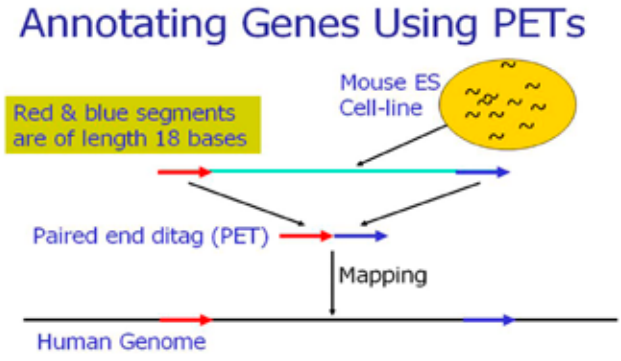
We have further proposed an algorithm, GST-SPC, for de novo sequencing of multi-charge mass spectra. It computes a peptide sequence that is optimal with respect to shared peaks count from among all sequences that are derived from multi-charge strong tags. GST-SPC uses a larger set of multi-charge strong tags than existing methods, which improves the theoretical upper bound on performance. Experimental results confirm the improvement.

Relevant Publications

- Ning, K., K.F. Chong and H.W. Leong. De Novo Sequencing for Mass Spectra based on Multi-Charge Strong Tags. Asia-Pacific Bioinformatics Conference (APBC), Hong Kong, January 2007.
- Chong, K.F., K. Ning, H.W. Leong and P.A. Pevzner. Modeling and Characterization of Multi-Charge Mass Spectra for Peptide Sequencing. Journal of Bioinformatics and Computational Biology, 4(6):1329-1352, December 2006.
- Chong, K.F., K. Ning, H.W. Leong and P.A. Pevzner. Characterization of Multi-Charge Mass Spectra for Peptide Sequencing. Asia-Pacific Bioinformatics Conference (APBC), Taipei, Taiwan, February 2006.
- Ning, K., K.F. Chong and H.W. Leong. A Database Search Algorithm for Identification of Peptide with Multiple Charges Using Tandem Mass Spectrometry. PAKDD 2006 Workshop on Data Mining for Biomedical Applications (BioDM 2006), Singapore, April 2006
- Ning, K., H.K. Ng, H.W. Leong. PepSOM: An Algorithm for Peptide Identification by Tandem Mass Spectrometry Based on SOM. International Conference on Genome Informatics (GIW 2006), Yokohama, Japan, December 2006.

Annotating the Genome Using Paired-End-diTag

Annotating the whole genome is an expensive and time-consuming task. Recently, a new technology called Paired-End-diTag (PET) has been developed. This technology allows us to find the 20 bps of the two ends of genes/transcripts in a high-throughput and cost-effective way. When used with chromatin immunoprecipitation (ChIP), it can also precisely extract PETs surrounding all transcription factor binding sites in the whole genome. Since PETs are short and the



genome is big, the bioinformatics challenge is to have a method that can align the PETs onto the genome accurately and efficiently.

Our main aim is to develop a tool to help biologists process PET data. The tool should be accurate and efficient. In addition, cancer cell-lines may generate some abnormal genes known as fusion genes due to genome rearrangement in cancer cells. Our second aim is to discover these genes.

We have developed a mapping algorithm that can efficiently and accurately align PETs onto the genome. This allows us to discover numerous novel genes and novel transcription factor binding sites in the human genome and the mouse genome. In addition, we have discovered a number of fusion genes in cancer cells. To help biologists, our algorithm is implemented as a pipeline PET-Tool that allows biologists to manage and process PET sequence data.

Relevant Publications

- Chiu, K.P., C.H. Wong, Q. Chen, P. Ariyaratne, H.S. Ooi, C.L. Wei, W.K. Sung and Y. Ruan. PET-Tool: A Software Suite for Comprehensive Processing and Managing of Paired-End diTag (PET) Sequence Data. BMC Bioinformatics, 7:390, 2006.
- Ng, P., J. Tan, H.S. Ooi, Y.L. Lee, K.P. Chiu, M. Fullwood, K. Srinivasan, C. Perbost, L. Du, W.K. Sung, C.L. Wei and Y. Ruan. Multiplex Sequencing of Paired-End Ditags (MS-PET): A Strategy for the Ultra-High- Throughput Analysis of Transcriptomes and Genomes. Nucleic Acids Research, 34(12):e84, 2006.
- Ng, P., C.L. Wei, W.K. Sung, K.P. Chiu, L. Lipovich, C.C. Ang, S. Gupta, A. Shahab, A. Ridwan, C.H. Wong, E.T. Liu and Y. Ruan. Gene Identification Signature (GIS) Analysis for Transcriptome Characterization and Genome Annotation. Nature Methods, 2:105-111, 2005.

RNA Secondary Structure Prediction

Due to advances in sequencing technologies, many RNA sequences have been discovered. Moreover, only a few of their structures have been deduced. On the other hand, the chemical and biological properties of many RNAs (such as tRNAs) are determined primarily by their secondary structures. Therefore, determining the secondary structures of RNAs is becoming one of the most important topics in bioinformatics.

We consider two problems related to RNA: (a) inferring the RNA secondary structure of an RNA sequence by comparing it with another RNA sequence whose secondary structure is known, and (b) extracting local sub-structures shared by two RNA secondary structures, including where the sub-structure may be the functional part of the two RNAs.

We expect two RNAs having a similar function to generally have a similar structure. We have devised a polynomial time dynamic programming algorithm to infer the secondary structure for an RNA sequence based on the known secondary structure of another functionally similar RNA.

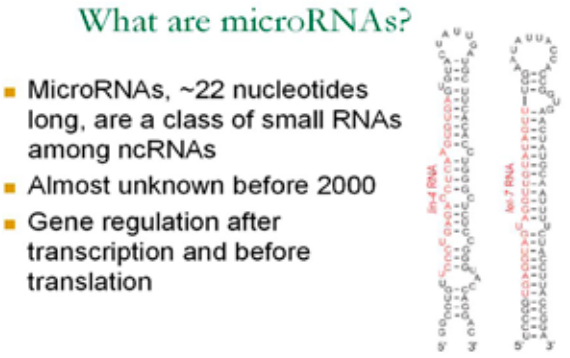
For the local sub-structure problem, we propose modelling the local structural motif as a local gapped subforest. Our model is general enough to describe a structural motif such as the SECIS-motif. We have further proposed a polynomial time algorithm to compute the local gapped subforest of two RNA secondary structures.

Relevant Publications

- Jansson, J., N.T. Hieu, W.K. Sung. Local Gapped Subforest Alignment and Its Application in Finding RNA Structural Motifs . Journal of Computational Biology, 13(3):702-718, April 2006.
- Jansson, J., S.K. Ng, W.K. Sung and H. Willy. A Faster and More Space-Efficient Algorithm for Inferring Arc-Annotations of RNA Sequences through Alignment. Algorithmica, 46(2):223-245, 2006.

Recognition of MicroRNA Precursors and their Targets

MicroRNAs (miRNAs) are small non-coding RNAs of about 22 nucleotides long. They play important regulatory functions in eukaryotic gene expression through mRNA degradation or translation inhibition. The regulatory functions of miRNAs range from cell proliferation, fat metabolism, neuronal patterning in nematodes, neurological diseases, modulation of hematopoietic lineage differentiation in mammals, development, cell death, cancer and control of leaf and flower development in plants.



Our objectives are as follows. (a) Experimental miRNA identification is technically challenging and incomplete. This calls for the development of computational approaches to complement experimental approaches to miRNA gene identification. We propose in this project to investigate de novo miRNA precursor prediction methods. (b) Analysing the binding of miRNAs to their mRNA target sites reveals that many different factors determine what constitutes a good fit. We intend to investigate these factors in detail and to construct decision models for predicting miRNA targets. (c) Finally, we would like to understand the role of miRNAs in a number of human diseases.

We follow the "feature generation, feature selection, and feature integration" paradigm of constructing recognition models for genomics sequences. We have generated and identified features based on information in both primary sequence and secondary structure, and used these features to construct accurate decision models for the recognition of miRNA precursors.

Relevant Publications

- Yang, L.H., W. Hsu, M.L. Lee and L. Wong. SVM-based Identification of microRNA Precursors. Proceedings of 4th Asia-Pacific Bioinformatics Conference (APBC), Taipei, Taiwan, February 2006.
- Zheng, Y., W. Hsu, M.L. Lee and L. Wong. Exploring Essential Attributes for Detecting MicroRNA Precursors from Background Sequences. VLDB 2006 Workshop on Data Mining in Bioinformatics, Seoul, Korea, September 2006.
- Zheng, Y. and C.K. Kwoh. Informative MicroRNA Expression Patterns for Cancer Classification. PAKDD 2006 Workshop on Data Mining for Biomedical Applications (BioDM 2006), Singapore, April 2006.

Sequence Indexing and Database Search

One of the important daily tasks of biologists is performing homology search. Currently, heuristic methods such as BLAST are used for this task. Their running time is linear to the size of the database (for instance, the human genome is of size 3 billion bases). As typical sequence databases rapidly increase in size, the performance of the existing tools is set to deteriorate. Thus, it is important to have solutions to improve the performance of database search.

Our aim is to improve the performance of database search by utilising sequence indexing techniques. We consider two directions. The first direction is to create a compressed index. The second direction is to rely on disk-based indexing. For compressed indexing, we have devoted our effort on the compressed suffix array, which is a compressed index of biological sequences. We have developed a number of approximate string matching algorithms utilising the compressed suffix array to speed up database search. Our solution has shown advantages in specialised homology search in the biology domain. For disk-based indexing, we have developed the CPS-tree, which is a compact partitioned suffix tree on disk. For exact pattern search,

the performance of the CPS-tree is very good and the pattern search time is independent of the genome length.

Relevant Publications

- Wong, S.S., W.K. Sung, L. Wong. CPS-tree: A Compact Partitioned Suffix Tree for Disk-Based Indexing on Large Genome Sequences. IEEE International Conference on Data Engineering, pages 1350-1354, Istanbul, Turkey, April 2007.
- Huynh, T.N.D., W.K. Hon, T.W. Lam and W.K. Sung. Approximate String Matching using Compressed Suffix Arrays. Theoretical Computer Science, 352(1-3):240-249, 2006.
- Chan, H.L., T.W. Lam, W.K. Sung, S.L. Tam and S.S. Wong. Compressed Indexes for Approximate String Matching. European Symposium on Algorithms (ESA 2006), Zurich, Switzerland, September 2006.
- Chan, H.L., T.W. Lam, W.K. Sung, S.L. Tam and S.S. Wong. A Linear Size Index for Approximate Pattern Matching. Symposium on Combinatorial Pattern Matching (CPM 2006), Barcelona, Spain, July 2006.

Tag SNP Selection and Association Study

An SNP (Single Nucleotide Polymorphism) is a specific location in our genome where different people have different DNA bases. Millions of SNPs in human beings account for the major differences among different individuals. Studying SNPs is helpful to understanding genetic diseases.

There are a number of bioinformatics problems related to SNPs. We target two particular problems: (a) the tag SNP selection problem, and (b) association study. Since there are millions of SNPs, it is difficult to investigate all of them. The tag SNP selection problem is the selection of a subset of informative SNPs to represent the major variations among individuals. Given a set of SNPs for a set of individuals, an association study is the finding of a combination of SNPs which has the potential to cause a genetic disease.

We have developed a method for tag SNP selection. Our method efficiently selects a minimum set of tag SNPs that maximises the independence among the selected SNPs. We have also developed a method for association study. Unlike most of the previous methods which perform single SNP association, our method considers the association of variable-size haplotypes. Through regularised regression analysis, we tackle the problem of multiple degrees of freedom in haplotype test. Our method can handle a large number of haplotypes in association analyses more efficiently and effectively than currently available approaches can.

Relevant Publications

- Li, Y., W.K. Sung and J.J. Liu. Association Mapping via Regularized Regression Analysis of Single- Nucleotide–Polymorphism Haplotypes in Variable-Sized Sliding Windows. American Journal of Human Genetics, 80(4):705-715, April 2007.
- Liu, T.F., W.K. Sung, Y. Li, J.J. Liu, A. Mittal and P.L. Mao. Effective Algorithms for Tag SNP Selection. Journal of Bioinformatics and Computational Biology, 3(5):1089-1106, 2005.

Phylogenetic Tree and Network Reconstruction

A phylogenetic tree, also known as a cladogram or a dendrogram, is a tree describing several life forms and their relations. A phylogenetic network is a generalisation of a phylogenetic tree. In addition to the ancestral-descendent mutational relationship, phylogenetic networks capture evolutionary events such as horizontal gene transfer and hybridisation. Constructing a phylogenetic tree/network is helpful to the understanding of the history of life and the analysis of rapidly mutating viruses such as HIV. The phylogenetic tree is also an important tool in comparative genomics, where the comparison of

multiple species can help predict protein structure, gene expression pattern, etc. It is also relevant as a tool for reconstructing phylogeny.

Our aim is to develop methods for constructing phylogenetic trees and networks. In particular, we are interested in approaches based on combining trees.

We have developed accurate and efficient methods for constructing phylogenetic trees and networks. For phylogenetic networks, we provide the first polynomial time algorithm for combining a dense set of triplets into a galled phylogenetic network. Also, we have generalised the method to reconstruct a network by combining a set of phylogenetic trees. For phylogenetic trees, we study the supertree problem. We have a fixed-parameter polynomial time algorithm to construct a maximum agreement supertree of a set of phylogenetic trees.

Relevant Publications

- He, Y.J., T.N.D. Huynh, J. Jansson and W.K. Sung. Inferring Phylogenetic Relationships Avoiding Forbidden Rooted Triplets. Journal of Bioinformatics and Computational Biology, 4(1):59-74, 2006.
- Jansson, J., N.B. Nguyen and W.K. Sung. Algorithms for Combining Rooted Triplets into a Galled Phylogenetic Network. SIAM Journal of Computing, 35(5):1098-1121, 2006.
- Jansson, J. and W.K. Sung. Inferring a Level-1 Phylogenetic Network from a Dense Set of Rooted Triplets. Theoretical Computing Science, 363(1):60-68, 2006.
- Jansson, J., J.H.K. Ng, K. Sadakane and W.K. Sung. Rooted Maximum Agreement Supertrees. Algorithmica, 43(4):293-307, 2005.
- Huynh, T.N.D., J. Jansson, N.B. Nguyen and W.K. Sung. Constructing a Smallest Refining Galled Phylogenetic Network. International Conference on Research in Computational Molecular Biology (RECOMB), Cambridge, Massachusetts, May 2005.

Developing Bio-Dynamical Systems and Analysing the Regulatory Behaviour of Biological Pathways

Mathematical modelling has been increasingly recognised as a useful tool in the biomedical sciences. Biological models provide a coherent framework for interpreting data. They can uncover new phenomena to explore, identify key factors of a system, link different levels of details, enable the formalisation of intuitive understanding, screen unpromising hypotheses, predict variable inaccessible to measurement, and expand the range of questions that can meaningfully be asked.

We focus on the study of bio-dynamical systems, which are mathematical models of the dynamic behaviours of biological systems. Specifically, we intend to develop efficient computational representations, analysis techniques, and algorithms for modelling and reasoning about bio-dynamical systems. Our goal is to provide computational tools that enable biologists to design experiments more effectively and thus accelerate the process of biological discovery.

We have developed a decompositional approach to parameter estimation for bio-dynamical systems based on the hybrid functional Petri net. It exploits the structure of a large pathway model and breaks it into smaller components, whose parameters can then be estimated independently. This leads to significant improvements in computational efficiency. We have tested our approach on a detailed model of the Akt and MAPK pathways with two known and one hypothesised crosstalk mechanisms. Our simulation results exhibit good correlation with experimental data, and they have yielded positive evidence in support of the hypothesised crosstalk between the two pathways.

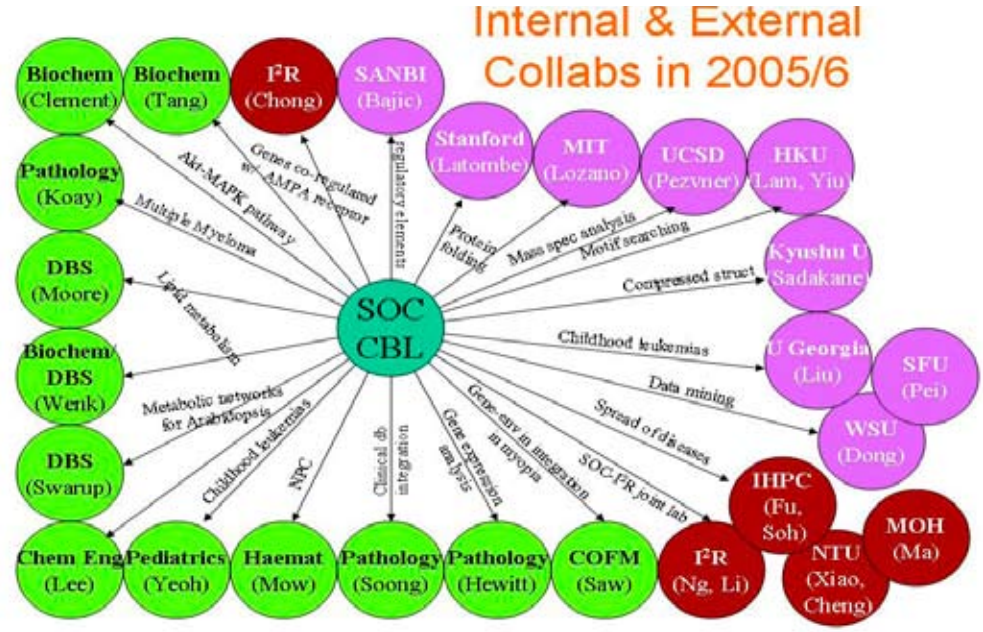
Relevant Publications

• Koh, G., H.F.C. Teong, M.V. Clement, D. Hsu and P.S. Thiagarajan. A Decompositional Approach to Parameter Estimation in Pathway Modeling: A Case Study of the Akt and MAPK Pathways and their Crosstalk. Bioinformatics, 22:e271--e280, 2006.

The faculty members involved in computational biology research are:

- HSU David
- HSU Wynne
- LEE Mong Li
- LEONG Hon Wai
- OOI Beng Chin
- SUNG Wing Kin, Ken
- TAN Kian Lee
- THIAGARAJAN P. S.
- TUNG Kum Hoe, Anthony
- WONG Limsoon

Collaboration



Award

Wong Limsoon was conferred the Singapore Youth Award Medal of Commendation in July 2006 for his sustained contributions to science and technology.

Sung Wing Kin, Ken and his collaborators at the Genome Institute of Singapore were conferred the National Science Award in October 2006 for their innovative work in developing the Paired End diTag sequencing technology for comprehensive characterisation of the human genome and transcriptome.

Activity Organised

(1) 5th Korea-Singapore Workshop on Bioinformatics and NLP, Feb 2006.
(2) IMS Workshop on BioAlgorithmics, July 2006.
(3) 3rd RECOMB Satellite Workshop on Regulatory Genomics, July 2006.

Database Management Systems

The Database Management Systems (DBMS) Research Lab in the School of Computing has a strong group of faculty members and students working on many diverse data management issues, ranging from core database research such as storage structure, query processing and optimisation, and indexing, to advanced database applications such as XML, data mining, data warehousing and peer-to-peer computing.

Our research interests in database management systems are:

- Database security
- Distributed systems for standing subscriptions
- Information integration
- Privacy and anonymity in databases
- Semi-structured data repository and query processing
- Skyline query processing
- XML query evaluation and estimation
- Mobile databases
- Peer-to-peer database management
- Peer-to-peer technologies for distributed applications
- Query processing in peer-to-peer (P2P) systems
- Schema integration and schematic discrepancy
- Sensor network
- Spatio-temporal data mining

Database Security

We started working in Database Security in 2001. Security is critical to any computing system. We aim to focus on designing techniques to protect data/databases. We have focused on several aspects over the years, ranging from storage design (steganographic file systems) to securing data streams. In the past two years, we have studied data authentication in outsourced databases. Here, we have focused on the completeness issue which has not been previously addressed in the literature. Essentially, we have designed a scheme that enables users to verify that results obtained from third party publishers are complete without violating user access control. We are also the first to look into verifying multi-dimensional data.

Representative Publications

- Cheng, W., H. Pang and K.L. Tan. Authenticating Multi-dimensional Query Results in Data Publishing. Annual IFIP WG 11.3 Working Conference on Data and Applications Security (DBSec), Sophia Antipolis, France, July/August 2006.
- Pang, H.H., A. Jain, K. Ramamritham and K.L. Tan. Verifying Completeness of Relational Query Results in Data Publishing. International Conference on Management of Data (SIGMOD), Baltimore, Maryland, USA, June 2005.

Distributed Systems for Standing Subscriptions

This project started in January 2006, and is funded by the University Research Committee (URC). The goal of this project is to study efficient techniques to disseminate data in a distributed publish/subscribe environment.

To date, we have achieved the following:

a) We have designed a publish/subscribe system to facilitate dissemination of streaming data where the subscription has a coherency constraint. Our proposed method is also adaptive to runtime changes in the environment, and can adapt the dissemination tree dynamically at runtime to optimise performance.

b) We have also developed a novel architecture for scaleable distributed stream processing. Our system provides services to evaluate a large number of continuous queries for a large number of clients. The query layer is built over a distributed publish/subscribe architecture. We have also proposed a solution to distribute queries in the query layer.

c) We have developed an efficient approach for filtering and disseminating fragmented XML documents in a publish/subscribe environment. The approach consists of novel query scheduling and optimisation algorithms that exploit the semantics of fragmented data to minimise unnecessary and redundant processing overhead.

d) We have developed a new optimisation technique that enables downstream routers to leverage the processing done by upstream routers to reduce response time. This is achieved by dynamically piggybacking useful processing hints along with the XML data.

Representative Publications

- Zhou, Y., K.L. Tan and F. Yu. Leveraging Distributed Publish/Subscribe Systems for Scalable Stream Query Processing. Workshop on Business Intelligence for the Real-Time Enterprise (VLDB), Seoul, Korea, 2006.
- Zhou, Y., B.C. Ooi, K.L. Tan and F. Yu. Adaptive Reorganization of Coherency-preserving Dissemination Tree for Streaming Data. International Conference on Data Engineering (ICDE), Atlanta, USA, 2006.
- Chan, C.Y. and Y. Ni. Content-based Dissemination of Fragmented XML Data. International Conference on Distributed Computing Systems, Lisboa, Portugal, July 2006.
- Chan, C.Y. and Y. Ni. Piggyback Optimization of XML Data Dissemination. International Conference on Data Engineering, Istanbul, Turkey, April 2007.

Information Integration

The objective of this research is the design of strategies, techniques and tools for the integration and management of multi-modal and multimedia information from distributed, heterogeneous and autonomous sources. The approach is primarily grounded in database research. As such, it emphasises various ideas such as declarative query languages, conceptual data models, adaptive processing and optimisation of programs and queries, and the consideration of large numbers of users and large collections of data. Currently, the research focuses on the following themes: XML data management and processing, progressive processing of disparate information (stream processing), business process definitions management and integration, and algorithms for web information (clustering).

The research findings concern the semantic integration of disparate information sources, in particular, the integration and management of XML data. The integration and management of multi-modal information also concern textual and geographical information indexing, retrieval and extraction, as well as business processes management.

Our research achievements include:
- The first geographical search engine Global Atlas
- The X007 benchmark
- The iMinMax indexing technique for multidimensional data

Representative Publications

- Bressan S., B. Catania B, Z. Lacroix Z. Y.G. Li and A. Maddalena. Accelerating Queries by Pruning XML Documents. Data and Knowledge Engineering, 54(2):211-240, 2005.
- Jayasena S., S. Bressan and S. Madnick. A Case Study of Electronic Bill Presentment and Payment (EBPP) Integration using the COIN Mediation Technology. Journal of Internet Banking and Commerce 10(2), 2005.
- Wijaya D.T and S. Bressan. Clustering Web Documents using Co-citation, Coupling, Incoming and Outgoing Hyperlinks: A Comparative Performance Analysis of Algorithms. International Journal of Web Information Systems 2(2), 2006.
- Dung, X.L., S. Bressan, D. Taniar and W. Rahayu. Semantic XPath Query Transformation: Opportunities and Performance. International Conference on Database Systems for Advanced Applications (DASFAA), 2007.
- Tok, W.H., S. Bressan and M.L. Lee. RRPJ: Result-rate based Progressive Relational Join. International Conference on Database Systems for Advanced Applications (DASFAA), Bangkok, Thailand, April 2007.

Privacy and Anonymity in Databases

Organisations, such as government agencies, insurance companies and hospitals, need to release detailed data (e.g., medical records, financial data, etc.) for research and other public benefit purposes. However, sensitive personal information (e.g., disease of a specific person) may be revealed in this process, despite the hiding of identifying attributes, such as name or social security number. This is due to the existence of quasi-identifiers (QI), which are sets of attributes (e.g., ZIP, DateOfBirth, Sex) that can be used in conjunction with information obtained from a variety of sources (e.g., public voting registration data) to reveal the identity of individuals whose data is residing on the records. Indeed, a well-known study has found that 87% of the US population can be uniquely identified by the combination of ZIP, DateOfBirth, Sex. As more data is made available online, greater concern over privacy may be expected. Recent research has proposed k-Anonymity and ℓ-Diversity to solve this problem. Both approaches involve generalisation (e.g., showing the area code instead of the exact phone number) or suppression (completely hiding some data), which inadvertently causes information loss.

Our research focuses on:
a) Developing a framework for efficient data transformations (i.e., k-Anonymity and ℓ-Diversity), which minimises information loss (for the given k or ℓ). Most existing research employs many-to-one mappings to compute anonymised versions of original multi-dimensional data. We focus on more flexible many-to-many multi-dimensional mappings. Although it has been acknowledged that this method may achieve lower information loss, it has not received much attention because it is computationally expensive. To reduce computation cost, we use dimensionality reduction techniques and study efficient approximation algorithms in one-dimensional space.

b) Studying the dual problem: Given the maximum acceptable information loss, we seek to find a transformation that maximises privacy (i.e., k or ℓ). Although this problem is significant in practice, it has not been studied before.

c) Extending our framework (i.e., anonymisation via dimensionality reduction) to related applications. Examples include location-based services (e.g., online maps), where the location of the querying user (rather than the data) must be anonymised, or stream data (e.g., data from sensors, stock market, etc.).

Representative Publications

- Ghinita G., P. Kalnis and S. Skiadopoulos. PRIVE: Anonymous Location-base Queries in Distributed Mobile Systems. World Wide Web Conference (WWW), Banff, Canada, 2007.
- Ghinita G., P. Kalnis and S. Skiadopoulos. MobiHide: A Mobile Peer-to-peer System for Anonymous Location-based Queries. International Symposium on Spatial and Temporal Databases (SSTD), Boston, USA, July 2007.
- Kalnis P., G. Ghinita, K. Mouratidis and D. Papadias. Preserving Anonymity in Location Based Services, 2006.

Semi-structured Data Repository and Query Processing

There has been increased interest in semi-structured data recently with the introduction of XML and related languages and technologies. Semi-structured data is claimed to be self-describing, making it important to define a schema for the data. The data models that have been proposed specifically for semi-structured data, (e.g. DOM, Dataguides, etc.), capture limited semantics in the data, and do not model the semantics expressed in the schema.

Although XML documents could have rather complex internal structures, they can generally be modelled as ordered trees. In most XML query languages, the structures of XML documents are expressed by twig patterns while the values of XML elements are used as part of selection predicates. Efficiently matching all twig patterns in an XML database is a major concern of XML query processing. Among them, the holistic twig join approach has been taken as an efficient way to match twig patterns through reducing intermediate results.

The project has so far achieved the following:

a) We have defined a data model called ORA-SS that captures richer semantics. Using this semantically rich data model, we have investigated and experimented with more efficient storage mechanisms, identified valid views of the base data, defined efficient view maintenance algorithms, and proposed methods for efficiently querying a semistructured data repository.

b) We have extended the existing Dewey node labelling technique and used it to improve twig pattern query processing.

c) We have developed new node labelling techniques to label dynamic XML data without re-labelling any node labels when the XML data is updated. Prior node labelling techniques used in twig pattern processing are designed for static XML data.

Representative Publications

- Lu, J.H. T.W. Ling, C.Y. Chan and T. Chen. From Region Encoding to Extended Dewey. On Efficient Processing of XML Twig Pattern Matching. International Conference on Very Large Data Bases, Trondheim, Norway, August/September 2005.
- Chen, T., J.H. Lu and T.W. Ling. On Boosting Holism in XML Twig Pattern Matching using Structural Indexing Techniques. ACM SIGMOD Conference, Baltimore, Maryland, USA, June 2005.
- Li, C.Q. and T.W. Ling. QED: A Novel Quaternary Encoding to Completely Avoid Re-labeling in XML Updates. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, October/November 2005.
- Li, C.Q., T.W. Ling, J.H. Lu and T. Yu. On Reducing Redundancy and Improving Efficiency of XML Labeling Schemes. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, October/November 2005.
- Li, C.Q., T.W. Ling and M. Hu. Efficient Processing of Updates in Dynamic XML Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, April 2006.

Skyline Query Processing

This project started in January 2005, and is funded by the Faculty Research Committee (FRC). The goal of this project is to investigate efficient techniques to process an important class of qualitative preference queries called skyline queries. A skyline query returns a set of records such that each returned record is not dominated by other records with respect to a user-specified set of attributes.

The project has so far achieved the following:

a) We have developed a novel framework and several scalable algorithms to efficiently process a generalised class of skyline queries that support data attributes with partially ordered domains.

b) We have introduced two novel notions of interesting skyline points (frequent skylines and k-dominant skylines), and developed efficient algorithms to compute them. These concepts are particularly important for high-dimensional data points in enabling a meaningful ranking of large sets of skyline query results.

Representative Publications

- Chan, C.Y., P.K. Eng and K.L. Tan. Stratified Computation of Skyline Queries with Partially-ordered Domains. ACM SIGMOD Conference, Baltimore, Maryland, USA, June 2005.
- Chan, C.Y., H.V. Jagadish, K.L. Tan, A.K.H. Tung and Z. Zhang. On High-dimensional Skylines. EDBT Conference, Munich, Germany, March 2006.
- Chan, C.Y., H.V. Jagadish, K.L. Tan, A.K.H. Tung and Z. Zhang. Finding k-dominant Skylines in High Dimensional Space. ACM SIGMOD Conference, Chicago, Illinois, June 2006.
- Li, C., B.C. Ooi, A.K.H. Tung and S. Wang. DADA: A Data Cube for Dominant Relationship Analysis, ACM SIGMOD Conference, Chicago, Illinois, June 2006

XML Query Evaluation and Estimation

With the fast-growing use of XML data on the Web, optimising XML queries has become one of the most active and exciting research areas. Developments in query processing and selectivity estimations of XML data are among the major issues since they determine data access methods and the best possible execution plans for complex XML queries.

Our research in this area aims to develop efficient approaches for query evaluation and selectivity estimations of XML queries. We examine how path information in XML data can be utilised to speed up structural join, which is the core operation in XML query processing. The proposed solution comprises a path-based node labelling scheme and a path join algorithm. The path-based approach is also efficient for an important class of XML queries involving structural join with not-predicates.

We have also designed several methods for XML selectivity estimations. These include a compact statistical method, a histogram-based method for skewed XML data, and a path-based method for estimating the selectivity of XML queries with or without order-based axes.

Representative Publications

- Li, H., M.L. Lee, W. Hsu and L. Li. A Path-based Approach for Efficient Structural Join with Not-predicates. International Conference on Database Systems for Advanced Applications, Bangkok, Thailand, April 2007.
- Li, L., M.L. Lee and W. Hsu. Rewriting Queries for XML Integration Systems. International Conference on Database and Expert Systems Applications (DEXA), Krakow, Poland, September 2006.
- Li, H., M.L. Lee, W. Hsu and C. Gao. An Estimation System for XPath Expressions. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, April 2006.

- Li, H., M.L. Lee and W. Hsu. A Path-based Labeling Scheme for Efficient Structural Join. International XML Database Symposium (XSym/VLDB), Trondheim, Norway, August 2005.
- Li, H., M.L. Lee and W. Hsu. A Histogram-based Selectivity Estimator for Skewed XML Data. International Conference on Database and Expert Systems Applications (DEXA), Copenhagen, Denmark, August 2005.

THE FACULTY MEMBERS INVOLVED IN DATABASE MANAGEMENT SYSTEMS ARE:

- BRESSAN Stephane
- CHAN Chee Yong
- HSU Wynne
- KALNIS Panagiotis
- LEE Mong Li
- LING Tok Wang
- OOI Beng Chin
- TAN Kian Lee
- TUNG Kum Hoe, Anthony

Collaboration

Faculty Member	Name of Organisation
BRESSAN Stephane	University of Cork, Ireland Latrobe University, Australia Massachusetts Institute of Technology, USA Monash University, Australia University of Indonesia, Indonesia University of Linz, Austria University Sains Malaysia, Malaysia CNRS and University of Marseilles, France Simtech, Singapore IBM, UK
CHAN Chee Yong	University of Michigan, USA
KALNIS Panagiotis	Hong Kong University of Science and Technology, China University of Peloponnese, Greece University of Hong Kong, China
LING Tok Wang	University of Auckland, New Zealand
OOI Beng Chin	University of Michigan, USA
TAN Kian Lee	Singapore Management University University of Michigan, USA
TUNG Kum Hoe, Anthony	University of Michigan, USA

Journal Editorial

Faculty Member	Name of Journal	Position
BRESSAN Stephane	Journal of Digital Information Management Columbian Review of Computer Science Radiomatics - Journal on Communication Engineering	Associate Editor Associate Editor Editorial Board Member
HSU Wynne	Journal of Database Management	Editorial Board Member
LING Tok Wang	Data and Knowledge Engineering International Journal of Cooperative Information Systems Journal of Data Semantics Journal of Database Management World Wide Web: Internet and Web Information Systems	Editorial Board Member Editorial Board Member Editorial Board Member Editorial Board Member Editorial Board Member
OOI Beng Chin	Geoinformatica IEEE Transactions on Knowledge and Data Engineering	Editorial Board Member Editorial Board Member
TAN Kian Lee	International Journal on Mobile Information Systems International Journal on Web Engineering and Technology Journal of Database Management Journal of Computer Science and Engineering The VLDB Journal	Editorial Board Member Editorial Board Member Editorial Board Member Editorial Board Member Editorial Board Member

Patent

Faculty Member	Description
YU Cui, Stephane BRESSAN, OOI Beng Chin, and TAN Kian Lee	iMinMax Apparatus and Method for Performing Transformation-based Indexing of Highdimensional Data. US Patent No. 7,117,217 B2 issued on 3 October 2006

Media

With increasing integration of computing, broadcasting, networking and the Web, multimedia information has become pervasive, permeating almost every aspect of our life. Increasingly, we find information coming in different media forms, multiple external sources and encoded in various knowledge representations. Typical generic media types include text, image, video and audio. Major parallel sources of information may come from the media contents in different forms, the Web, and social network sites such as Wikipedia. Also, we can normally find good coded knowledge sources such as ontologies and user usage patterns. To process such information effectively and efficiently, the ability to analyse and fuse the myriads of related sources of information has become critically important in any information processing tasks. To leverage such synergy, the media group is organised to include researchers in the related fields of multimedia, computer vision, computer graphics, natural language processing, multimedia systems, and machine learning. Overall, the group conducts research related to the generation, processing, understanding, display, interaction, transmission and storage of multimedia information. The group is active in both basic and systems research, including works of industrial impact. Members are active in international professional activities, including chairing major international conferences, sitting on editorial boards and serving in technical programme committees. Locally, various group members participate in various national level technical committees, with one chairing a national level research funding board.

Multimedia Information Processing

Analysis of multimedia contents has in the past been carried out on the basis of a single medium. Only recently have we begun to use multimodal features routinely to analyse multimedia contents. The use of only intra-content features, however, is still inadequate. To progress further, we need to utilise the available external information sources, such as the abundance of Web, ontology, and human language resources (dictionaries, encyclopaedia), and various encoded knowledge, to supplement media content analysis. Along this theme, we have carried out research on concept extraction, retrieval and question answering in video, working on both news and informational videos. The longterm goal is to develop automated techniques to index an input video stream to facilitate the retrieval, summarisation and personalisation of video. In concept annotation, which involves assigning one or more pre-defined concepts to input video clips, we are focusing on employing hierarchical concept structures and developing visual vocabulary to perform multimodal concept annotation. The use of a visual dictionary along with text vocabulary has been found to be effective on public image corpuses.

a) News video question answering system

b) Browser for interactive news video retrieval that incorporates active learning

Figure 1: Prototypes in news video question answering

In retrieval, our system exploits domain models for news, together with speech (in terms of Automatic Speech Recognition or ASR output) and various audio-visual (AV) features inherent in news video streams. Our modelling incorporates query analysis, topic-dependent information fusion model, and integration of text and visual concepts to identify precise answers. In addition, we explore the modelling and detection of events of human interests through their relations to people, time and space, and leveraging on vast

external information sources such as news and blogger sites. We have participated in large scale public news video retrieval evaluations organised by TRECVID (see http://www-nlpir.nist.gov/projects/trecvid/), and achieved top positions in auto-news video retrieval tasks in 2005-06. We are developing an interactive system that incorporates active learning and facilitates fast user feedback.

We apply the similar multimodal, multi-source and multiresolution framework to personal media and painting domains. In personal media, we focus on auto annotation of "who" and "exact where" by exploiting visual and social contexts. We explore the annotation of paintings with high level artistic concepts using arts ontologies and Web resources. The key research issues explored in these projects are: (a) ontology-based learning; and (b) transductive learning as training data is scarce.

Representative Publications

- Xu, H. and T.S. Chua. Fusion of AV Features and External Information Sources for Event Detection in Team Sports Video. ACM Transactions on Multimedia Computing, Communications and Applications, 2 (1):44-67, 2006.
- Shi, R. T.S. Chua, C.H. Lee and S. Gao. Bayesian Learning of Hierarchical Multinomial Mixture Models of Concepts for Automatic Image Annotation. Conference on Image and Video Retrieval, Tempe, Arizona, July 2006.
- Zhao, M., Y.W. Teo, S. Liu, T.S. Chua and R. Jain. Automatic Person Annotation of Family Photo Album Conference on Image and Video Retrieval, Tempe, Arizona, July 2006.
- Marchenko, Y., T.S. Chua and R. Jain. Semi-supervised Annotation of Brushwork in Paintings Domain using Serial Combinations of Multiple Experts. Proceedings of ACM Multimedia 2006, Santa Barbara, California, October 2006.
- Neo, S.Y., Y. Zheng, T.S. Chua and Q. Tian. News Video Search with Fuzzy Event Clustering using High-level Features. Proceedings of ACM Multimedia 2006, Santa Barbara, California, October 2006.Conference on Image and Video Retrieval, Tempe, Arizona, July 2006.

Multimedia Analysis and Synthesis

Analysis: A diversity of media types such as text, audio, video and novel sensory forms is proliferating in a variety of applications. This is true of traditional media sources such as television, new media sources such as the Internet, consumer applications such as personal media management, and emerging niche areas such as surveillance. This calls for media analysis, which is the precursor of other forms of processing such as archiving, querying, retrieval and transcoding. For example, the ability to analyse and fuse information from different sources and in multiple media types in order to parse the semantic events occurring has become critically important in many media management tasks. Handling live data (be it symbolic text feed or signal sensor feed) is particularly challenging in this environment. We have developed an experiential sampling technique as well as information assimilation techniques for this purpose. Most of the analysis work has been done in the multimedia surveillance context. There are two basic thrusts:

Active Multimedia Sensing: This thrust aims to develop the theoretical foundation, algorithms, architectures and prototypes for active sensing for a wide variety of applications such as surveillance, monitoring and the Web. The idea here is to harness the power of diverse sensors in an orchestrated manner to optimally perform the given tasks. For example, we have developed a 'coopetitive' interaction approach, which combines the salient features of cooperation and competition with an aim to optimise the cooperation among sensors to achieve best results at the system level rather than redundantly implementing cooperation at each stage. For this, we employ a forward state estimation method which is based on Model Predictive Control to counteract various delays in multi-sensor environments. Our results from two different visual surveillance adaptations with different number of cameras and different surveillance goals provide clear evidence of improvements achieved with the coopetitive strategy.

Multimedia Event Detection and Capture through Sensors and Context: Here, we operate on the recognition that humans tend to organise their lives around events. Our work centres on developing event detection techniques with the use of all appropriate sensors. So far, we have considered specific event detection using multimodal information with human assistance as may be suitable in specific contexts. Most of the work has been done in the context of building personal media collections in the form of family e-chronicles.

Figure 2: Multimedia surveillance system

Synthesis: A well-produced video makes a strong impression on the viewer. However, amateur home video makers are unaware of the principles of cinema grammar. The videos they shoot are meant to convey some specific intent, although often, their inexperience and lack of editing skills, or the limitations of the means of video capture they have at their disposal belie their intentions. Intent delivery techniques, which rely on principles of cinema grammar, aesthetics and video analysis, may remedy the situation by conveying a range of evident intents. We have developed a general approach for video intent delivery by means of a brief catalogue of the intentions of the cinematographer and the editor. It allows for the delivery of four basic types of intents: cheer, serenity, gloom and excitement. Essentially, we have used the theoretical support from video grammar and cinematic rules in order to model computable features for repurposing home videos. We have also developed a transcoding technique called *multimedia simplification* which is based on experiential sampling. Multimedia simplification helps optimise the synthesis of Multimedia Messaging Service (MMS) messages for mobile phones. Transcoding is useful in overcoming the limitations of compact devices. The proposed approach aims at reducing the redundancy in multimedia data captured by multiple types of media sensors. The simplified data is first stored into a gallery for further usage. Once a request for MMS is received, the MMS server makes use of the simplified media from the gallery. The multimedia data is aligned to the time-line for MMS message synthesis. Our technique is targeted at users who are interested in obtaining salient multimedia information via mobile devices.

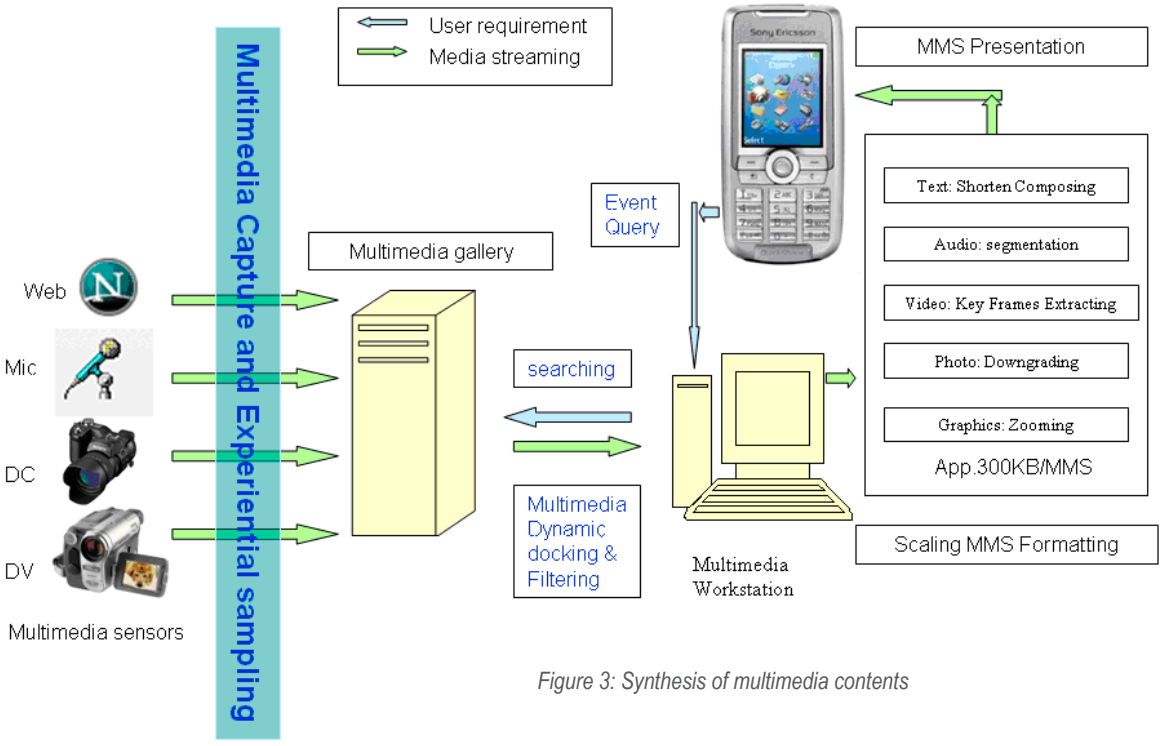


Figure 3: Synthesis of multimedia contents

Representative Publications

- Achanta, R., W.Q. Yan and M.S. Kankanhalli. Modeling Intents for Home Video Repurposing, IEEE Multimedia, 13(1):46-55, 2006.
- Kankanhalli, M.S., J. Wang and R. Jain. Experiential Sampling in Multimedia Systems, IEEE Transactions on Multimedia, 8(5):937-946, 2006.
- Kankanhalli, M.S., J. Wang and R. Jain. Experiential Sampling on Multiple Data Streams, IEEE Transactions on Multimedia 8(5):947-955, 2006.
- Madhwacharyula, C., M. Davis, P. Mulhem and M.S. Kankanhalli. Metadata Handling: A Video Perspective, ACM Transactions on Multimedia Computing, Communications and Applications, 2(4):358-388, 2006.
- Atrey, P.K., M.S. Kankanhalli and R. Jain. Information Assimilation Framework for Event Detection in Multimedia Surveillance Systems, ACM Multimedia Systems Journal, 12(3):239-253, 2006.
- Atrey, P.K., M.S. Kankanhalli and J. B. Oommen. Goal-oriented Optimal Subset Selection of Correlated Multimedia Streams, ACM Transactions on Multimedia Computing, Communications and Applications, 3(1), 2007.
- Yan, W.Q. and M.S. Kankanhalli. Multimedia Simplification for Optimized MMS Synthesis, ACM Transactions on Multimedia Computing, Communications and Applications, 3(1), 2007.
- Singh, V.K., P.K. Atrey and M.S. Kankanhalli. Coopetitive Multi-camera Surveillance using Model Predictive Control, Machine Vision and Applications Journal, 2007.

Computer Vision

Our research in computer vision spans many areas, including: biometrics and face recognition, human motion analysis, medical image analysis, and digital photography. In biometrics, we have developed techniques to make face recognition more robust against changes in lighting and head orientation. These are the two most prevalent variations in face images that make recognition difficult. We can also deal with images of low quality, such as blur, low contrast, and partial occlusion. We have recently demonstrated the usefulness of combining multiple modalities, e.g., face, fingerprint, and keystroke dynamics, to create a system that continuously authenticates a user after initial login. Such a system is useful for high security environments.

Figure 4: A high-security PC that continuously authenticates the user via multiple biometrics: face, fingerprint, and keystroke dynamics. The system can detect an impostor within three seconds, and suspends all user processes, thereby preventing further damage.

In digital photography, we are developing the next generation of 'picture perfect' cameras that will eliminate common problems such as red eye, blurring, uneven exposure, and insufficient ambient light. The goal is to create a consumer camera that produces sharp, detailed and pleasing photographs directly from hardware, without the need to touch up the images. To do this, we are exploiting near infrared light which is already captured by normal CCD sensors, as well as by detecting the presence of faces and known objects in the scene. In human motion analysis, we have developed a sophisticated offline system for analysing the motion of a sports novice captured in a single video with the 3D reference motion of an expert. The system performs temporal alignment of novice motion in the video and the 3D reference motion, and then computes the difference between the novice posture and the corresponding 3D reference posture. The posture differences are visualised and fed back to the novice to allow him to correct his motion as though a human coach is present. We have applied this system to Taichi and golf swing coaching. At present, we are collaborating with an IT entrepreneur to build a prototype system for remote golf swing coaching. This prototyping effort is supported by the Economics Development Board (EDB) in Singapore and is showcased in EDB's publicity brochure. We are in the process of filing patents for this technology.

Figure 5: Reference 3D posture is projected onto a 2D image plane and overlapped onto the input posture. The colour codes indicate the estimated amount of error of the input posture: red – big error, green – moderate error, and transparent – negligible error.

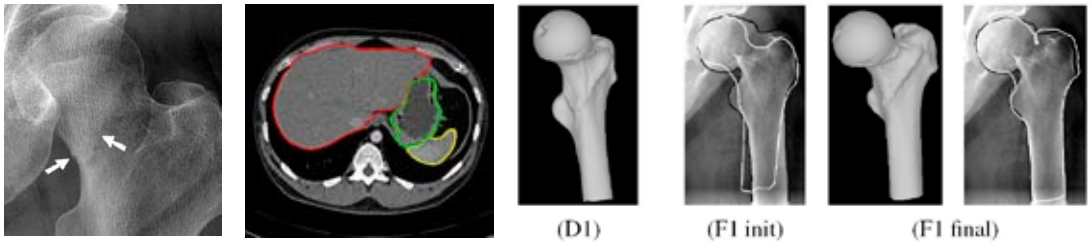


Figure 6: (a) Detected subtle fracture (arrows) of femur in x-ray images. (b) Segmentation of liver, stomach and spleen in abdominal CT mage using atlas-based method. (c) Estimation of 3D pose of bone from single x-ray image. (D1) Default pose. (F1 init) Initial pose after automatic rough alignment. (F1 final) Final pose after refinement.

In medical image analysis, we have collaborated with medical doctors on a wide range of applications including detection of bone fractures in x-ray images (with Singapore General Hospital); segmentation of liver in abdominal CT images for liver transplant (with National University Hospital); detection, classification and quantification of acnes and pigmentation in face images (with National Skin Centre); early detection of infarcts in brain CT (with Singapore General Hospital); simulation of cardiac surgery for surgical planning (with National Taiwan University Hospital), etc. An international patent for fracture detection system has been published under PCT and a U.S. patent has been filed. We are in the process of filing patents for the skin acne analysis system. Most of the above research work is still in progress.

Representative Publications

- Sim, T., S. Zhang, R. Janakiraman and S. Kumar. Continuous Verification Using Multimodal Biometrics. International Conference on Biometrics, Hong Kong, January 2006.
- Zhang, S. and T. Sim. When Fisher Meets Fukunaga-Koontz: a New Look at Linear Discriminants. International Conference on Computer Vision and Pattern Recognition, New York, USA, June 2006.
- He, J.C., W.K. Leow, and T.S. Howe. Hierarchical Classifiers for Detection of Fractures in X-Ray Images, International Conference on Analysis of Images and Patterns, Vienna, Austria, August 2007.
- Bhunre, P.K., W.K. Leow and T.S. Howe. Recovery of 3D Pose of Bones in Single 2D X-ray Images. IEEE Workshop on Applications of Computer Vision, Austin Texas, February 2007.
- Ding, F., W.K. Leow and S.C. Wang. Segmentation of 3D CT Volume Images Using a Single 2D Atlas. International Workshop on Computer Vision for Biomedical Image Applications, Beijing, China, October 2005.
- Wang, R. and W.K. Leow. Human Body Posture Refinement by Nonparametric Belief Propagation. International Conference on Image Processing, Genova, Italy, September 2005.

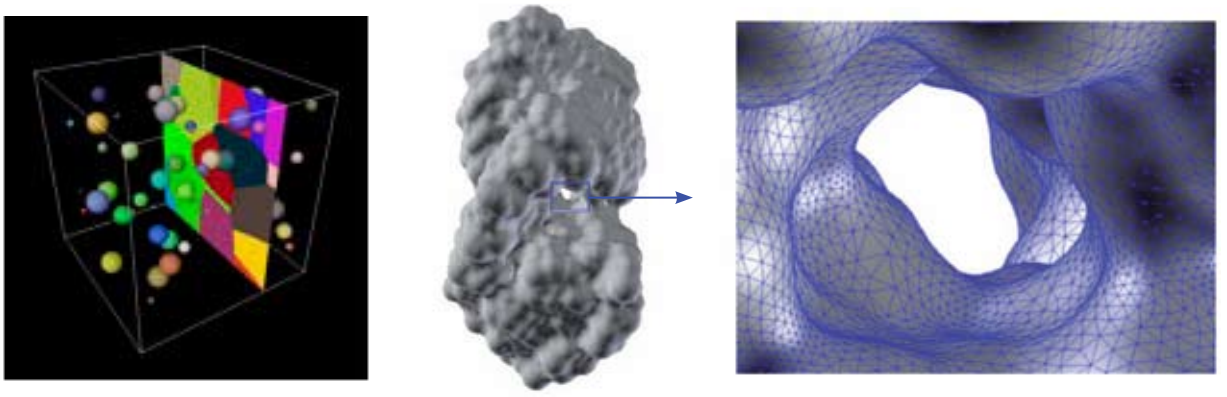
Interactive 3D Computer Graphics and Computational Geometry

The group pursues research mainly in the areas of interactive 3D graphics and computational geometry. Research in the first area includes: interactive control in graphics applications such as morphing; real-time modelling and rendering; large scale data management to support visual simulation & animation; GPU computation; and adaptive gaming agents with personality modelling.

Research in the area of computational geometry includes: a) quality and homeomorphic meshes for smooth surface used in molecular science, engineering simulation and general deformation in computer graphics; (b) parametric deforming mesh scheduling for automatic deformation with arbitrary topology changes; and (c) deformation and meshing of R^3 surfaces, shape alignments, approximation of convex

shapes, and relationships between toric surfaces and Dixon sparse resultants.

The works are relevant to building design, architectural visualisation, visual simulation and gaming. The group is in collaboration with building professionals to research into computational problems in building design. Its work on realtime generation of shadows, Trapezoidal Shadow Maps (TSM), has been licensed to game companies (such as Big Huge Games Inc., USA). The algorithm has also been bundled in nVidia (the market giant on video display chips) SDK, and used in a plant rendering software (USA). Its work on real-time Voronoi diagram has been used in software developed in Harvard-MIT, Division of Health Sciences and Technology.



(a) Screenshot of the program computing 3D Voronoi diagram using 50 spheres as sites

(b) The molecular model of a helix structure. The left shows the molecular skin model and the right shows the magnified mesh details in the box of the figure on the left

Figure 7: Research in interactive 3D graphics and computational geometry

Representative Publications

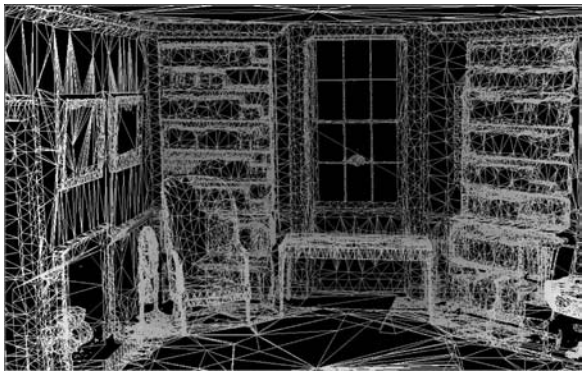
- Rong, G.D. and T.S. Tan. Jump Flooding in GPU with Applications to Voronoi Diagram and Distance Transform. ACM Symposium on Interactive 3D Graphics and Games, Redwood City, California, March 2006.
- Rong, G.D. and T.S. Tan. Utilizing Jump Flooding in Image-based Soft Shadows. ACM Symposium on Virtual Reality Software and Technology, Limassol, Cyprus, November 2006.
- Lim, C.W. and T.S. Tan. Surface Reconstruction by Layer Peeling. The Visual Computer, 22(9-11):593-603, 2006.
- Chen, C. and H.L. Cheng. Superimposing Voronoi Complexes for Shape Deformation. International Journal of Computing. Geometry Applications, 16(2-3):159-174, 2006.
- Cheng, H.L. and X.W. Shi. Quality Mesh Generation for Molecular Skin Surfaces using Restricted Union of Balls. IEEE Visualization, 51, 2005.
- Yu, H., E.C. Chang, Z. Huang and Z. Zheng. Fast Rendering of Foveated Volumes in Wavelet-based Representation. The Visual Computer, 21(8-10):735-744, 2005.
- Chang, E.C., S.W. Chio, D.Y. Kwon, H. Park and C.K. Yap. Shortest Path amidst Disc Obstacles is Computable. ACM Symposium on Computational Geometry, Pisa, Italy, June 2005.

3D Digital Reconstruction of Real-world Objects & Environments

Using active range sensing to reconstruct high-quality 3D digital models of real-world objects and environments has many practical applications in areas ranging from manufacturing to the cultural. Yet even now, acquisition and reconstruction processes are very tedious and laborious, let alone the huge amount of data that needs to be processed. The ultimate goal of many research projects in this area is to automate the whole 3D reconstruct process, or to reduce human involvement. To create visually realistic models, colour information is acquired using digital still cameras and video cameras.

Our current research focuses on: (a) View planning – to determine a sequence of positions to place acquisition devices to optimise acquisition and obtain a more complete reconstructed model. (b) View-dependent colour acquisition and automatic registration – to create a visually realistic 3D digital model with colour information. (c) Real-time hand-held range scanning – to register, reconstruct and displayrange data in real-time to provide effective visual feedback to the human operator.

(a) A realistic computer rendering of a 3D digital model of a real-world environment



(b) A wireframe rendering of the 3D digital model

Figure 8: 3D model reconstruction - from colour information captured by a digital still camera and range images acquired by a 3D laser scanner. Image courtesy of UNC-Chapel Hill.

Representative Publications

- Low, K.L. and A. Lastra. Predetermination of ICP Registration Errors and its Application to View Planning. IEEE International Conference on 3-D Digital Imaging and Modeling, Montreal, Canada, August 2007.
- Low, K.L. and A. Lastra. An Adaptive Hierarchical Next-best-view Algorithm for 3D Reconstruction of Indoor Scenes. Pacific Conference on Computer Graphics and Applications, Taipei, Taiwan, October 2006.
- Low, K.L. and A. Lastra. Efficient Constraint Evaluation Algorithms for Hierarchical Next-best-view Planning. Symposium on 3D Data Processing. Visualization and Transmission, Chapel Hill, North Carolina, USA, June 2006.

Digital Audio Processing and Media Integration

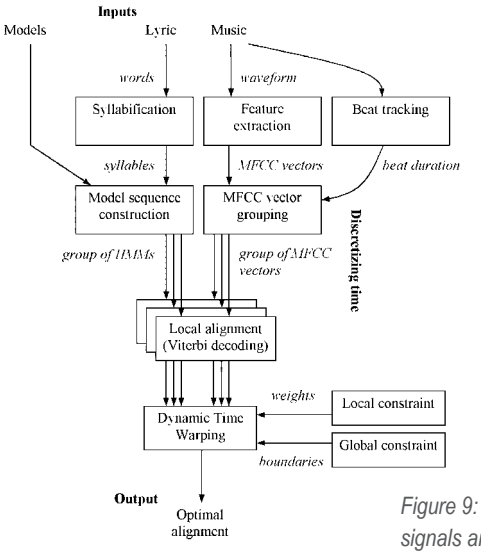


Figure 9: Syllabic level automatic synchronisation of music signals and text lyrics

We focus on applied audio research in the context of real life applications. We have produced the Interactive Digital Violin Tutor (iDVT), which mainly focuses on music transcription. Exploiting synergy between individuals in the School and collaborating with colleagues at local research institutes, we are developing practical multimedia applications which integrate audio into other media types such as text, video and animation. We have developed LyricAlly, which is designed as a useful tool for mobile entertainment in the form of portable karaoke.

Representative Publications

- Wang, Y. and J. Zhu. Complexity Scalable Beat Detection with Compressed Audio Formats. Computer Music Journal.
- Loscos, A., Y. Wang and J. Boo. Low Level Descriptors for Automatic Violin Transcription. International Conference on Music Information Retrieval, Victoria, Canada, October 2006.
- Iskandar, D., Y. Wang, M. Kan and H. Li. Syllabic Level Automatic Synchronization of Music Signals and Text Lyrics. ACM Multimedia Conference, Santa Barbara, USA, October 2006.
- Wang, Y. and J. Zhu. Interactive Digital Violin Tutor (iDVT): An Edutainment System for Violin Learners. ACM International Conference on Advances in Computer Entertainment Technology, Salzburg, Austria, June 2007.

Multimedia Systems

Our research aims to improve resource efficiency and playback quality in a multimedia system. As these are often conflicting goals, one general theme of our research is to develop new techniques that operate at the right trade-off point between resource and quality. In this direction, we are currently investigating the trade-off between bandwidth and correctness of a distributed video surveillance system, and between power consumption and frame-rate rendering in a first-person shooting game. Another general research theme deals with the Internet's lack of service guarantee during media streaming. Our interest covers fundamental issues, such as error control and congestion control, as well as new approaches to streaming, such as multi-source streaming and peer-to-peer streaming. We are also investigating the streaming of 3D objects, a new media type that is becoming popular. Our team is collaborating with IRIT-ENSEEIHT, France, on this topic.

Figure 10. The mathematical model to quantify the effect of network characteristics on transmitted 3D objects represented as progressive meshes, leading to a new packetisation scheme. (Left: Results of naïve packetisation scheme. Right: Result from our packetisation scheme.)

Representative Publications

- Ma, L. and W.T. Ooi. Congestion Control in Distributed Media Streaming. IEEE Conference on Computer Communications, Anchorage, Alaska, USA, May 2007.
- Gu, Y., S. Chakraborty and W.T. Ooi. Games are Up for DVFS. Design Automation Conference, San Francisco, USA, July 2006.
- Korshunov, P. and W.T. Ooi. Critical Video Quality for Distributed Automated Video Surveillance. ACM International Multimedia Conference, Singapore, November 2005.
- Gu, Y. and W.T. Ooi. Packetization of 3D Progressive Meshes for Streaming over Lossy Networks. International Conference on Computer Communications and Networks, San Diego, USA, October 2005.
- Ma, L. and W.T. Ooi. Retransmission in Distributed Media Streaming. International Workshop on Network and Operating System Support for Digital Audio and Video, Stevenson, WA, June 2005.

Media Streaming

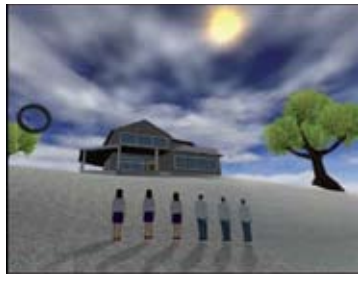
Low-latency, Interactive Peer-to-peer Streaming

Peer-to-peer (P2P) streaming is emerging as a viable communications paradigm. Research in this field has traditionally aimed at building efficient and optimal overlay multicast trees at the application level. However, much of the existing work focuses on store-and-forward or one-way stream delivery. In these scenarios, end-to-end latency is not very critical. In our work, we focus on peer-to-peer streaming support for live, interactive applications. While some applications exist in this space (e.g., Skype), most are targeted at relatively small groups of participants per session (say two to eight).

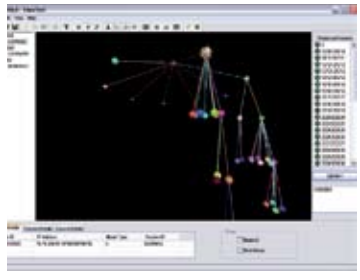
The aim of our Adaptive Cluster Technology for Interactive Virtual Environments (ACTIVE) protocol is to enable interactive communications for large participant groups as can be found in a number of applications such as e-learning and Massively Multiplayer Online Games (MMOG). Some of the novel concepts introduced by ACTIVE are the distinction between active and passive participants and a dynamically adaptive clustering mechanism based on this classification. In virtual environments, latency optimisation is performed based on the location proximity of avatars within the virtual space. By leveraging the location information, the ACTIVE platform can also be used to deliver positional audio to create a more realistic aural landscape.

ACTIVE has been the foundation of a number of experimental prototype systems such as AudioPeer, a voice chat application for large participant groups (see Figure 11(a)). More recently, ACTIVE has been used to add peer-topeer voice services to the Torque game engine and a sample game called PartyPeer has been created (Figure 11(b)).

(a) AudioPeer system test



(b) PartyPeer prototype



(c) Tree topology visualisation

Figure 11: Application prototypes based on the ACTIVE peer-to-peer streaming platform. The web-based AudioPeer interface is shown in (a) while PartyPeer is based on the Torque game engine. The administration control interface with the tree topology visualisation is shown in (c).

Representative Publications

- Liu, L.S., R. Zimmermann, B. Xiao and J. Christen. PartyPeer: A P2P based Massively Multiplayer Online Game. ACM Multimedia, Santa Barbara, California, October 2006.
- Liu, L.S. and R. Zimmermann. Adaptive Low-latency Peer-to-peer Streaming and its Application. Multimedia Systems Journal, 2006.
- Liu, L.S. and R. Zimmermann. Immersive Peer-to-peer Audio Platform for Massive Online Games. IEEE International Workshop on Networking Issues in Multimedia Entertainment, Las Vegas, Nevada, January 2006.
- Seo, B. and R. Zimmermann. Edge Indexing in a Grid for Highly Dynamic Virtual Environments. ACM Multimedia, Santa Barbara, California, October 2006.
- Liu, L.S. and R. Zimmermann. ACTIVE: A Low Latency P2P Live Streaming Architecture. SPIE Multimedia Computing and Networking Conference, San Jose, January 2005.

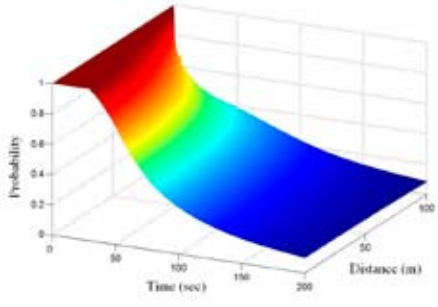
Wireless Ad Hoc Media Streaming

With the widespread availability of handheld devices that are both media-capable and wirelessly networked, streaming audio or video content between such units is feasible. Many recent mobile devices can operate via wireless 802.11 networks, which provide broadband-level bandwidth (usually free of charge) and a communication range of hundreds of meters. This allows a user to move freely when she is streaming multimedia content from others within her communication radius (see figure 12(a)). One challenge in streaming multimedia content among mobile ad hoc peers is to deliver the content, usually large in size, over a wireless link whose quality is constantly changing. For example, the wireless bandwidth may drop or the link may even break as the distance between two mobile ad hoc peers increases. Our research in this area focuses on link availability prediction to improve the quality of peer streaming.

Predicting future link availability under different movement patterns of the devices is a challenging task (Figure 12(b)). Our work mathematically models the link status given certain mobility models (e.g., random walk and random waypoint models), location and speed information (e.g., obtained via GPS), and realistic network bandwidth as determined by the Auto-Rate Fallback (ARF) scheme of 802.11-based wireless equipment. Additionally, our technique takes advantage of the multi-layer structure of Scalable Video Coding (SVC) or Multiple Description Coding (MDC) to increase the success of media delivery under varying conditions.

Some of our techniques have been implemented in a prototype called MStream (Figure 12(c)), which was demonstrated as a US Finalist project of the ImagineCup 2006 competition at Microsoft in Redmond, Washington.

(a) hybrid architecture (peer streaming with server)



(b) probability of two users staying connected given an initial distance

(c) MStream prototype on a PDA with GPS interface

Figure 12: MStream application designed to allow ad hoc media streaming between wirelessly connected mobile devices

Representative Publications

- Qin, M. and R. Zimmermann. Supporting Guaranteed Continuous Media Streaming in Mobile Ad-hoc Networks with Link Availability Prediction. ACM Multimedia, Santa Barbara, California, October 2006.
- Qin, M., R. Zimmermann and L.S. Liu. Supporting Multimedia Streaming between Mobile Peers with Link Availability Prediction. ACM Multimedia, Singapore, November 2005.
- Qin, M. and R. Zimmermann. Studying Upper Bounds on Sensor Network Lifetime by Genetic Clustering. IEEE International Conference on Distributed Computing in Sensor Systems, California, June 2005.
- Qin, M. and R. Zimmermann. VCA: An Energy-efficient Voting-based Clustering Algorithm for Sensor Networks. Journal for Universal Computer Science, 2007.

Natural Language Processing

Research on natural language processing includes the areas of semantic processing, discourse processing, and Chinese language processing. In semantic processing, we exploit parallel texts and semi-supervised learning to scale up word sense disambiguation, which is the task of determining the correct meaning or sense of a word in context. We also employ automated techniques to estimate sense priors for adapting a word sense disambiguation program to different domains. We have also built state-ofthe-art semantic role labelling programs for PropBank and NomBank, which identify the semantic role of each constituent in a sentence.

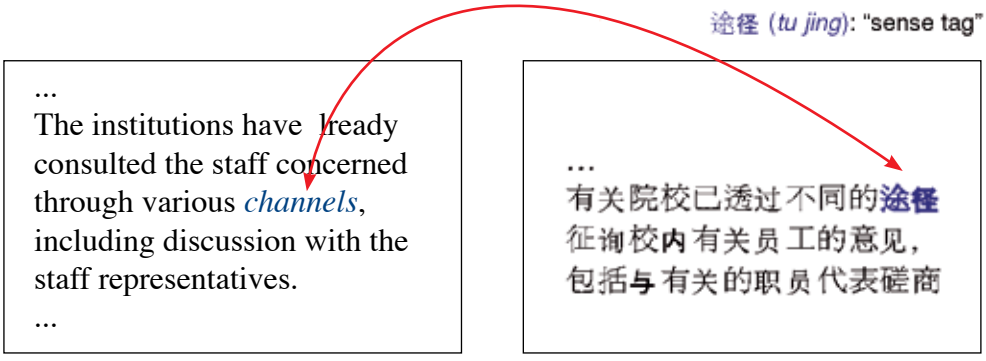


Figure 13: Application of word sense disambiguation techniques in machine translation

In discourse processing, we work on the task of English one-anaphora resolution, using a machine learning approach. In Chinese language processing, we have built a state-of-the-art Chinese word segmenter. In 2005, we participated in the open track of the Second International Chinese Word Segmentation Bakeoff, an international evaluation exercise that compares competing Chinese word segmenters. Our Chinese word segmenter achieved the highest accuracy on three of the four test corpora, and the second highest accuracy on the fourth test corpus. A total of 18 teams participated in the event.

In addition to these areas, we have done peripheral work in other key areas of natural language processing, including machine translation, information extraction and verb analysis. Our work in machine translation has improved the quality of word ordering in translated Chinese to English text. We have developed methods for building better textual similarity for application in NLP processes such as in information extraction, summarisation and question answering. Finally, in lexical analysis, we have continued to examine and find automated methods to treat compound verb phrases, in particular, light verb phrases (e.g., make a call) where the verbs play only a licensing role for its arguments.

Currently, we employ our multi-resolution relation-based framework for information extraction. We are also exploring the use of web knowledge and onto logies to perform interactive QA.

Representative Publications

- Chan, Y.S. and H.T. Ng. Scaling Up Word Sense Disambiguation via Parallel Texts. National Conference on Artificial Intelligence, Pittsburgh, Pennsylvania, USA, June 2005.
- Chan, Y.S. and H.T. Ng. Estimating Class Priors in Domain Adaptation for Word Sense Disambiguation. International Conference on Computational Linguistics and Annual Meeting of the Association for Computational Linguistics, Sydney, Australia, July 2006.
- Jiang, Z.P. and H.T. Ng. Semantic Role Labeling of NomBank: A Maximum Entropy Approach. Empirical Methods in Natural Language Processing, Sydney, Australia, July 2006.
- Low, J.K., H.T. Ng and W. Guo. A Maximum Entropy Approach to Chinese Word Segmentation. SIGHAN Workshop on Chinese Language Processing, Jeju Island, Korea, October 2005.
- Ng, H.T., Y. Zhou, R. Dale and M. Gardiner. A Machine Learning Approach to Identification and Resolution of One-anaphora. International Joint Conference on Artificial Intelligence, Edinburgh, Scotland, UK, July-August 2005.
- Tan, Y.F., M.Y. Kan and H. Cui. Extending Corpus-based Identification of Light Verb Constructions using a Supervised Learning Framework. EACL Workshop on Multi-word-expressions in a Multilingual Context, Trento, Italy, April 2006.
- Kan, M.Y. Using Multi-document Summarization to Assist in Semi-structured Literature Retrieval: A Case Study in Consumer Healthcare. Design and Usability of Digital Libraries: Case Studies in the Asia Pacific.
- Qiu, L., M.Y. Kan and T.S. Chua. Paraphrase Recognition via Dissimilarity Significance Classification. Empirical Methods for Natural Language Processing, Sydney, Australia, July 2006.
- Setiawan, H., H. Li and M. Zhang. Learning Phrase Translation using Level of Detail Approach. Machine Translation Summit X, Phuket, Thailand, September 2005.

Precise Information Retrieval and Question Answering

Question answering (QA) aims to find exact answers to users' natural language queries, instead of ranked lists of documents as is done in current search engines. It is a major step towards information retrieval instead of document retrieval.

Our QA system employs a pipeline structure that consists of several modules to get short and precise answers to users' questions. It searches for answers at increasingly finergrained units of: (1) locating the relevant documents, (2) retrieving passages that may contain the answer, and (3) pinpointing the exact answer from candidate passages. The research focus of our work is three-fold. First, we search the Web for relevant context information to supplement the often inexact query. In particular, we perform semantic clustering of information retrieved from the Web to identify different sub-events and induce different facets of queries in supporting event-based QA. Second, in addition to densitybased word matching, we employ discourse, semantic and dependency relations to perform passage retrieval at sentence level. This gives rise to a multi-resolution framework for relation-based precise information retrieval. Third, we develop a document concept lattice model together with definitional patterns and a human interest model to perform task-oriented summarisation. Our studies on the large-scale TREC-QA corpus demonstrate that our approaches are effective in performing factoid, list and definitional QA. Our system has been ranked consistently at second position over three years (2003-2005) in the public TREC-QA evaluations organised by NIST, USA. Our summarisation system also achieved top position in the DUC forum in 2005. Our technology has been licensed by industry to perform precise legal search. Currently, we employ our multi-resolution relation-based framework for information extraction. We are also exploring the use of web knowledge and onto logies to perform interactive QA.

Representative Publications

- Ye, S. and T.S. Chua. Automatically Integrating Heterogeneous Ontologies from Structured Web Pages. International Journal on Semantic Web and Information Systems, 3(2):96-111, 2007.
- Maslennikov, M. and T.S. Chua. A Multi-resolution Framework for Information Extraction from Free Text. Association of Computational Linguistic, Prague, Czech Republic, June 2007.
- Kor, D. and T.S. Chua. Interesting Nuggets and their Impact on Definitional Question Answering. ACM SIGIR 2007, Amsterdam, Netherlands, July 2007.
- Cui, H., M.Y. Kan and T.S. Chua. Soft Pattern Matching Models for Definitional Question Answering. ACM Transactions on Information Systems, 2007.
- Ye, S., T.S. Chua, M.Y. Kan and L. Qiu. Document Concept Lattice for Text Understanding and Summarization. Information Processing and Management, 2007.
- Gao, S., W. Wu, C.H. Lee and T.S. Chua. A Maximal Figure-of-merit (MFoM) Learning Approach to Robust Classifier Design for Text Categorization. ACM Transaction on Information Systems, 24(2):190-218, 2006.
- Sun, R., C.H. Ong and T.S. Chua. Mining Dependency Relations for Query Expansion in Passage Retrieval. ACM SIGIR Conference, Seattle, Washington, August 2006.

Machine Learning for Media Applications

Our research applies machine learning to the areas of text processing, natural language processing, and signal and video processing for activity recognition. For activity recognition, we have been working with physiological signals from wearable sensors as well as video from fixed cameras. In text classification, our focus has been on developing kernels and features that would perform well. In natural language processing, we have been working on word sense disambiguation, utilising unlabeled data in unsupervised and semi-supervised learning. We focus on both developing machine learning techniques to address the issues important in these applications as well as doing well on the applications themselves. We participated in the SemEval 2007 evaluation for the word sense disambiguation tasks, and our system ranked first in the lexical sample task and third in the coarse-grained all-words task.

Figure 14: Video data for activity recognition captured in our lab

Representative Publications

- Cai, J., W.S. Lee and Y.W. Teh. Improving Word Sense Disambiguation using Topic Features. Empirical Methods in Natural Language Processing, 2007.
- Zhang, D. and W.S. Lee. Extracting Key-substring-group Features for Text Classification. International Conference on Knowledge Discovery and Data Mining, Philadelphia, USA, August 2006.
- Hai, L.C., W.S. Lee and L. Kaelbling. Activity Recognition from Physiological Data using Conditional Random Fields, Singapore- MIT Alliance Symposium, 2006.

• Thanh, P.P., H.T. Ng and W.S. Lee. Word Sense Disambiguation with Semi-supervised Learning. National Conference on Artificial Intelligence, Pittsburgh, Pennsylvania, USA, June 2005.
• Zhang, D., X. Chen and W.S. Lee. Text Classification with Kernels on the Multinomial Manifold. ACM SIGIR Conference, Salvador, Brazil, August 2005.

THE FACULTY MEMBERS INVOLVED IN MEDIA RESEARCH ARE:

- CHANG Ee Chien
- CHENG Holun
- CHUA Tat Seng
- CHIONH Eng Wee
- FANG Chee Hung, Anthony
- GOLAM Ashraf
- KAN Min Yen
- KANKANHALLI Mohan
- LEE Wee Sun
- LEOW Wee Kheng
- LOW Kok Lim
- NG Hwee Tou
- OOI Wei Tsang
- SIM Mong Cheng, Terence
- TAN Tiow Seng
- WANG Ye

Collaboration

Faculty Member	Name of Organisation
CHUA Tat Seng	Georgia Institute of Technology, USA Institute for Infocomm Research, Singapore University of California at Irvine, USA Clearly Understood Pte Ltd, USA
KAN Min Yen	Pennsylvania State University, USA Arizona State University, USA Cambridge University, UK Institute for Infocomm Research, Singapore
KANKANHALLI Mohan	University of California at Irvine, USA Institute for Infocomm Research, Singapore Indian Institute of Science, Bangalore
NG Hwee Tou	Information Sciences Institute, University of Southern California, USA Macquarie University, Australia Institute for Infocomm Research, Singapore Microsoft Research Asia, China
SIM Mong Cheng, Terence	Defence Science and Technology Agency, Singapore
LEE Wee Sun	Birbeck College, University of London, UK Massachusetts Institute of Technology, USA University College, University of London, UK
LEOW Wee Kheng	CNRS, France Institute for Infocomm Research, Singapore Singapore General Hospital, Singapore National University Hospital, Singapore National Skin Centre, Singapore
ZIMMERMANN Roger	University of Southern California, USA Korean Air, Korea Inha University, Korea Pratt & Whitney, USA University of Denver, USA HP Labs Palo Alto, USA IBM T.J. Watson Research Center, USA University of Kuwait, Kuwait

Conference Committee

Faculty Member	Name of Conference	Position
CHUA Tat Seng	Conference on Image and Video Retrieval 2005 ACM Multimedia 2005	Conference Co-Chair Conference Co-Chair
KANKANHALLI Mohan	ACM Multimedia 2005 International Conference on Distributed Multimedia Systems 2006	Technical Programme Co-Chair Technical Programme Co-Chair
NG Hwee Tou	Association of Computational Linguistics 2005 Asia Information Retrieval Symposium 2006	Technical Programme Co-Chair Technical Programme Chair

Journal Editorial

Faculty Member	Name of Journal	Position
CHUA Tat Seng	Multimedia Tools and Applications The Visual Computer	Associate Editor Associate Editor
KANKANHALLI Mohan	IEEE Transactions on Information Forensics and Security LNCS Transactions on Data Hiding and Multimedia Security International Journal of Security and Networks International Journal of Virtual Technology and Multimedia ACM Multimedia Systems Journal IEEE Transactions on Multimedia ETRI Journal Pattern Recognition ACM Transactions on Multimedia Computing, Communications and Applications	Associate Editor Associate Editor Editorial Board Member Editorial Board Member Editorial Board Member Associate Editor Editorial Board Member Associate Editor Associate Editor
NG Hwee Tou	Computational Linguistics Natural Language Engineering	Editorial Board Member Editorial Board Member
ZIMMERMANN Roger	ACM Computers in Entertainment Multimedia Tools and Applications	Editorial Board Member Editorial Board Member

Award

Faculty Member	Name of Award
SIM Mong Cheng, Terence	Temasek Young Investigators Award 2005. This award is given by DSTA, and comes with a $700K grant over 3 years.
MARCHENKO Liza (supervised by CHUA Tat Seng)	MMM 2007 Best Paper Award for paper “Ontology-based Annotation of Paintings using Transductive Inference Framework” presented at Multimedia Modeling (MMM 2007), Singapore, January 2007.

Patent

Faculty Member	Description
LOW Kok Lim (with Gregory F. Welch and Ramesh Raskar)	System and Method for Animating Real Objects with Projected Images. United States Patent No. 7,068,274 issued on 27 June 2006.
TAN Tiow Seng (with Zhao Yong Hong, Ong Hong Yang and Xiao Yongguan)	Method and Apparatus for Flexible User Control in Generating Morphing Sequence. United States Patent Application No. 10/548763, Singapore Patent Application No. 200505818-5, 2005.
TAN Tiow Seng (with Tobias Martin)	Trapezoidal Shadow Maps. PCT WO/2005/010827, China Patent Application No. 200480026486.0, 2006.

Systems and Networking

Our research on systems and networking is guided by the vision that these two areas influence each other strongly. Faculty members constituting this group have wide spanning research interests that cover the conceptual as well as experimental aspects of computer systems and networking. The group attracts a substantial amount of research funding and has a strong presence internationally through publications, invited tutorials and memberships in the technical programme committees of leading conferences. The major themes and research areas are:

Systems

The major areas currently being investigated by the Systems group are:

Grid Computing

In recent years, we have seen an increasing number of Internet-scale applications that focus on resource sharing. The technologies that these applications leverage include peer-to-peer, grid and web services. In this stream of work, we focus on various aspects of resource sharing. In computational resource sharing, we have developed a Javabased grid middleware called ALiCE (Adaptive and scalable internet-based Computing Engine). On infrastructure for resource sharing, we are making notable contributions in three main areas: (1) a read-only DHT (Distributed Hash Table)-based resource discovery and indexing technique, (2) a game theoretic market-based resource pricing and allocation technique, and (3) a service provisioning method for large distributed simulation on the grid. In the area of software component sharing, we are developing a framework consisting of semantic composability theory and validation techniques for large-scale sharing of simulation model and components.

Representative Publications

- March, V., Y.M. Teo and X. Wang. DGRID: A DHT-Based Resource Indexing and Discovery Scheme for Computational Grids, Australasian Symposium on Grid Computing and e-Research, Ballarat, Australia, January 2007.
- Szabo, C. and Y.M. Teo. On Syntactic Composability and Model Reuse. International Conference on Modeling and Simulation, Phuket, Thailand, March 2007.
- March, V. and Y.M. Teo. Multi-Attribute Range Queries on Read-only DHT. International Conference on Computer Communications and Networks, Arlington, Virginia, USA, October 2006.
- Ghinita, G. and Y.M. Teo. An Adaptive Stabilization Framework for Distributed Hash Tables. International Parallel and Distributed Processing Symposium, Rhodes Island, Greece, April 2006.
- March, V., Y.M. Teo, H.B. Lim, P. Eriksson and R. Ayani. Collision Detection and Resolution in Hierarchical Peer-to-Peer Systems. IEEE Conference on Local Computer Networks, Sydney, Australia, November 2005.

Embedded Computing Systems

Embedded computing systems are increasingly playing a dominant role. In particular, they are beginning to deliver more powerful services in application domains such as aviation, military, telecommunications and process control. Due to the falling price of hardware and the trend towards ubiquitous networking, embedded computing is also becoming a key component of many common place applications and household products. In these domains, lay consumers typically demand a level of reliability and predictability not normally expected from traditional computer software. This calls for a design process that is effective and reliable but yet has a short turn-around time. Such a design process should encompass multiple levels of system

descriptions and the means for going from one level of description to a neighbouring one while preserving behaviour and integrity of design.

Our research activities in this area include: model driven design methods with a focus on UML-based notations and SystemC-based simulations, timing and schedulability analysis of embedded software, performance and power analysis of real-time audio, video and 3D game applications, performance modelling of automotive software and protocols and, finally, tools and techniques for reconfigurable computing. Our research is presented at the leading Electronic Design Automation (EDA) conferences around the world.

Representative Publications

- Suhendra, V., T. Mitra, A. Roychoudhury and T. Chen. Efficient Detection and Exploitation of Infeasible Paths for Software Timing Analysis, ACM Design Automation Conference, San Francisco, California, USA, July 2006.
- Ankit, G., S. Meng, A. Roychoudhury and P.S. Thiagarajan. Interacting Process Classes, International Conference on Software Engineering, Shanghai, China, May 2006.
- Huynh, P. H and T. Mitra. Instruction-Set Customization for Real-Time Systems, The 10th Design Automation and Test in Europe, Nice, France, April 2007.
- Li, X., A. Roychoudhury and T. Mitra. Modeling Out-of-order Processors for WCET Analysis. Real-time Systems. International Journal of Time-critical Computing Systems, 34(3):195-227, 2006.

The faculty members involved in systems research are:

- CHAKRABORTY Samarjit
- MITRA Tulika
- PUNG Hung Keng
- ROYCHOUDHURY Abhik
- TAN Soon Huat, Gary
- TEO Yong Meng
- THIAGARAJAN P.S.
- WONG Weng Fai

Collaboration

Faculty Member	Name of Organisation
CHAKRABORTY Samarjit	Carnegie Mellon University, USA University of North Carolina, Chapel Hill, USA General Motors R&D, India Science Laboratory India Texas Instruments, India nVIDIA Corporation, USA
MITRA Tulika	Princeton University, USA Freescale Semiconductor, USA
ROYCHOUDHURY Abhik	University of Florida, Gainswille, USA IBM Research, USA
TEO Yong Meng	Royal Institute of Technology, Sweden Sun Microsystems, USA
THIAGARAJAN P.S.	IIT Kanpur, India IIT Bombay, India New York University, USA VERIMAG, Grenoble, France IRISA, Rennes, France
WONG Weng Fai	Massachusetts Institute of Technology, USA IBM Research, USA

Conference Committee

Faculty Member	Name of Conference	Position
TEO Yong Meng	Workshop on Principles of Advanced and Distributed Simulation 2006	Technical Programme Co-Chair
THIAGARAJAN P.S.	International Conference on Application and Theory of Petri Nets and other Models of Concurrency 2006	Technical Programme Co-Chair Technical Programme Chair

Journal Editorial

Faculty Member	Name of Journal	Position
THIAGARAJAN P.S.	Transactions on Petri Nets and other Models of Concurrency	Editorial Board Member

Networking

The Communication and Internet Research Lab (CIRL) (http://www.cir.nus.edu.sg/) and the Network Systems and Services Lab (NSS) (http://lucan.ddns.comp.nus.edu.sg/) constitute the hub of our research activities in networking. The group is presently involved in the following research activities:

Quality of Service Management

To address Quality of Service (QoS) issues arising from the heterogeneity of end-hosts and networks, we envisage a holistic approach to QoS control and management in grids which integrates QoS mechanisms in the applications, middleware and networks. In our approach, the QoS of network, host's middleware, grid middleware and application's are modelled as configurable QoS components (meta models). The way the meta-data are represented and stored is QoS Meta-Information Based (QMIB). This encompass two major categories of information, namely the application QoS information and the grid service QoS information. The potential contributions of our work are a more expressive extensible semantic QoS Specification schema (SQS) for describing QoS requirements of applications and services, an intelligent algorithm for the mapping of QoS concepts and requirements to QoS specifications at the resource level (stored as QMIB), and the QoS runtime for supporting end-to-end QoS over existing grid middleware and network infrastructures.

Representative Publications

- An, L., H.K. Pung and Zhou L. Design and Implementation of a Dynamic Protocol Framework. Computer Communications, 29(9):1309-1315, 2006.
- Zhou, L., H.K. Pung, L.H. Ngoh and T. Gu. Ontology Modeling of a Dynamic Protocol Stack. IEEE International Conference on Local Computer Networks, Tampa, Florida, USA, November 2006.
- Zhou, L., H.K. Pung and L.H. Ngoh. Toward Semantic Modeling For QoS Specification. IEEE International Conference on Local Computer Networks, Tampa, Florida, USA, November 2006.
- Fei, L. and H.K. Pung. Grid Workflow Scheduling with Temporal Decomposition. International Conference on Enterprise Information Systems 2007, Funchal, Madeira, Portugal, June 2007.

TCP Performance

In this area of research, we study the dynamics of the TCP protocol and its adaptation to the emerging wireless networks which are known for high loss and long round-trip time. We have just initiated a project called "Reactive Transport Service" in which we intend to do basic research to understand the dynamics of transport layer protocols in the context of the mobile wireless environment of an All-IP converged network and the characteristics of access networks and mobility pattern of Internet enabled devices. We aim to develop heuristics that could be applied to the design of algorithms capable of learning and reacting to the heterogeneous and dynamic nature of the network.

Representative Publications

- Wu, X, M.C. Chan and A.L. Ananda. TCP HandOff: A Practical TCP Enhancement for Heterogeneous Mobile Environments. International Conference on Communications, Glasgow, UK, June 2007.
- Wu, X, M.C. Chan and A.L. Ananda. PMC: An Energy Efficient Event Transport Service for Wireless Sensor Network. IEEE International Conference on Communications, Istanbul, Turkey, June 2006.
- Venkatesh, S.O, J. Lillykutty and A.L. Ananda. Secure Performance Enhancing Proxy: To Ensure End-to-End Security and Enhance TCP Performance over IPv6 Wireless Networks. Computer Networks, 50(13): 2225-2238, 2006.

• Wu X., B. Indradeep, M.C. Chan and A.L. Ananda. Utilizing Characteristics of Last Link to Improve TCP Performance. IEEE International Performance Computing and Communications Conference, Phoenix, Arizona, USA, April 2005.

Sensor Networks

With the capability to construct low power and low cost devices that support sensing, computation and communication capabilities, it is possible to create new and exciting types of applications in a wide range of areas including transportation, manufacturing, health care, environmental oversight, and safety and security.

Due to the constraints of sensor nodes, many networking issues such as MAC, network and transport protocols have to be revisited. In particular, protocols for sensor networks have to be very energy efficient. One way to reduce energy consumption is to apply the idea of cross-layer design. Here, the physical, MAC, network and transport protocols are designed in an integrated way so that better energy efficiency can be obtained. We are also interested in building a novel and practical sensor network system to guide and verify the design.

Representative Publications

- Tao, S., A.L. Ananda and M.C. Chan. Greedy Face Routing with Face ID Support. IEEE International Conference on Computer Communications and Networks, Honolulu, Hawaii, USA, August 2007.
- Zhang, M., M.C. Chan and A.L. Ananda. Coverage Protocol for Wireless Sensor Networks Using Distance Estimates. IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks, San Diego, California, USA, June 2007.
- Chai, E. M.C. Chan and A.L. Ananda. Coverage Aware Buffer Management and Scheduling for Wireless Sensor Network. IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks, Reston, Virginia, USA, September 2006.

Heterogeneous Wireless Networks

Development in new radio technologies and increase in user demand are driving the deployment of a wide array of wireless networks, ranging from 802.11 networks in the local area, to third generation data-only wireless networks in the wide area. Such a diverse set of wireless networks poses a number of interesting issues. We are mainly interested in resource management related to heterogeneous wireless networks. We consider the case where multiple wireless networks, including 802.11, 802.16 and 3G data-only networks are being deployed, and a single wireless provider owns and operates these wireless networks. We are interested in how a network manager can efficiently manage the common pool of radio resources, and how the quality of service of real-time applications (such as voice) and completion time of short data transfer can be improved through redundant transmission.

Representative Publications

- M.C. Chan and R. Ramjee. Improving TCP/IP Performance over Third Generation Wireless Networks. accepted for publications in IEEE Transactions of Mobile Computing.
- Bu, T., M.C. Chan and R. Ramjee. Connectivity, Performance, and Resiliency of IP-Based CDMA Radio Access Networks. IEEE Transactions on Mobile Computing, 5(8):1103-1118, 2006.
- Chen, B. and M.C. Chan. Proportional Fairness for Overlapping Cells in Wireless Networks. IEEE Vehicular Technology Conference, Montreal, Canada, September 2006.
- Chen, B. and M.C. Chan. Resource Management in Heterogeneous Wireless Networks with Overlapping Coverage. International Conference on Communication System Software and Middleware, Delhi, India, January 2006.

Data Availability of Higher-level User Tasks

Data replication is a key technique for ensuring data availability in the presence of machine failures. Most previous work on data availability focuses on the availability of a single data object (e.g., a single file). A higher-level user operation, however, often needs to access multiple data objects to perform a certain task. Our research reveals that the relative placement or assignment of replicas of different objects can result in subtle correlation among objects and dramatic effects on system availability.

Using strong probabilistic tools such as Janson's inequality from random graph theory, we are able to find the optimal assignment under different settings. We have also proposed practical decentralised designs to approximate these optimal assignments in practice, and implement the design in a prototype wide-area storage system called MOAT. PlanetLab deployment and simulation results show that using the appropriate assignment often decreases the failure probability of operations by multiple orders of magnitude.

Representative Publications

- Yu, H. and P.B. Gibbons. Optimal Inter-Object Correlation When Replicating for Availability. ACM Symposium on Principles of Distributed Computing, Portland, Oregon, USA, August 2007.
- Pang, J., P.B. Gibbons, M. Kaminsky, S. Seshan and Yu, H. Defragmenting DHT-based Distributed File Systems. International Conference on Distributed Computing Systems, Toronto, Canada, June 2007.
- Yu, H., P.B. Gibbons and S. Nath. Availability of Multi-Object Operations. Symposium on Networked Systems Design and Implementation, San Jose, California, USA, May 2006.

Defending against Sybil Attacks in Decentralised Distributed Systems

Peer-to-peer and other decentralised distributed systems are known to be particularly vulnerable to sybil attacks. In a sybil attack, a malicious user obtains multiple fake identities and pretends to be multiple distinct nodes in the system. By controlling a large fraction of the nodes in the system, the malicious user is able to "out vote" honest users in collaborative tasks such as Byzantine failure defences. We have proposed SybilGuard, a novel protocol for limiting the corruptive influences of sybil attacks. SybilGuard uses as its basis the social network among user identities, where an edge between two identities indicates a human established trust relationship. Malicious users can create many identities but few trust relationships. Thus, there is a disproportionately-small cut in the graph between the sybil nodes and the honest nodes. SybilGuard exploits this property to bound the number of identities a malicious user can create.

Representative Publications

- Yu, H. M. Kaminsky, P.B. Gibbons and A. Flaxman. SybilGuard: Defending Against Sybil Attacks via Social Networks. ACM Special Interest Group on Data Communication Conference, Pisa, Italy, September 2006.

THE FACULTY MEMBERS INVOLVED IN NETWORKING RESEARCH ARE:

- ANANDA Akkihebbal L.
- CHAN Mun Choon
- LEONG Wing Lup
- PUNG Hung Keng
- YU Haifeng

Collaboration

Faculty Member	Name of Organisation
CHAN Mun Choon	Bells Lab, Lucent Technologies, USA
PUNG Hung Keng	Nanyang Technological University, Singapore Tsinghua University, China Institute for Infocomm Research, Singapore
YU Haifeng	Carnegie Mellon University, USA University College, London, UK Intel Research, USA

Conference Committee

Faculty Member	Name of Conference	Position
CHAN Mun Choon	International Symposium on Wireless Pervasive Computing 2006	Technical Programme Co-Chair

Patent

Faculty Member	Description
ANANDA Akkihebbal L.	Component-Based Embedded System and Method Therefor. Patent No. 200204447-7 granted in July 2005.

Programming Languages

Programming Languages and Systems Programming is a central and fundamental topic in computer science which concerns all aspects related to programming. The research in the Programming Language Group at NUS School of Computing includes research into particular programming languages, fundamental research such as type systems, program analysis and verification of software, paradigms of programming, and aspects arising from concurrent, parallel and distributed programming. There is also overlap with software engineering work in formal methods as described in the software engineering portion of this report.

Our research can be classified along the following dimensions:

- Theoretical Foundations: models of concurrency, semantics and logics of programming languages, etc.
- Functional Programming: extension of type systems, enhancing functional programming languages, etc.
- Constraint Programming: constraint logic programming (CLP), algorithms for Constraint Satisfaction Problems (CSP), scheduling and timetabling algorithms, constraint solving frameworks and systems, etc.
- Program Analysis and Transformations: abstract interpretation, reasoning about programs and partial evaluation.
- Formal Methods: verification, model checking and theorem proving
- Dependable Software: detection of software vulnerabilities, systematic construction of dependable software, specification mining
- Programming Paradigms: principles and practice of aspect oriented programming
- Applications of Programming Paradigms: applications of constraint programming to real-life combinatorial problems such as sports scheduling, rostering, resource allocation, etc.
- Programming for Web 2.0

Research Findings and their Applications

- Scalable precision in analysing large software
- Must/may analysis to distinguish real software bugs from false alarms
- Achieving accurate heap analysis with separation logic
- Type systems for rich languages, user-definable overloading and XML
- Type error reporting
- Dynamic program slicing
- Visualisation for white-box tuning for local search algorithms
- Enhancing constraint propagation for optimisation problems
- Modelling and solving using ad-hoc constraints

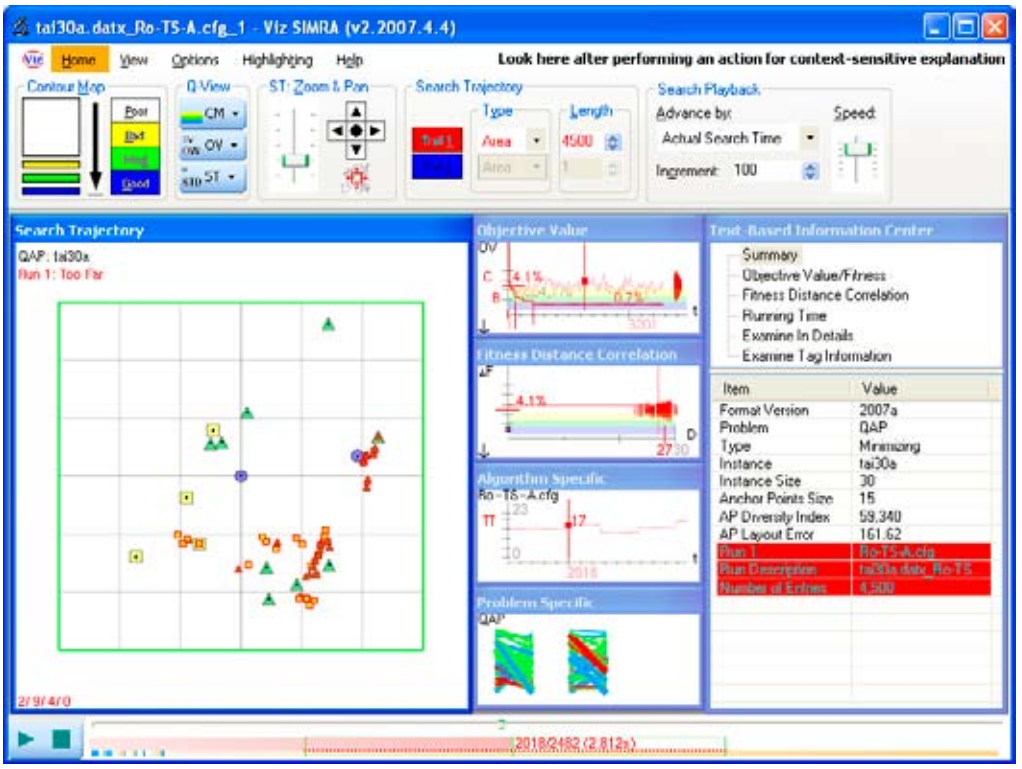


Figure 1: Vis: a local search visualizer. Stochastic Local Search is often used for solving complex decision problems, e.g., in a resource allocation problem, we might need to decide in a production line when a particular component should be produced; in a vehicle routing problem, we might need to determine what a good schedule is for a group of vehicles to do pickup and delivery to minimise total time required. Although stochastic local search methods are often effective, they need to be tuned to get good results. The screenshot shows a prototype system which visualises the behaviour of a local search for a problem and this is used to improve the search.

Commercialisation

Constraint and Optimisation Technology

Martin Henz, in collaboration with FriarTuck Pte Ltd, has secured innovative projects in the reporting period. The most notably projects among these projects are a workforce management project with the Maritime Port Authority of Singapore (MPA) and an operating theatre scheduling project with the National University Hospital (NUH). The latter project is a joint venture with NUH, funded by the Infocomm Development Authority of Singapore (IDA), and includes Fujitsu and SAP as partners.

Research Highlights

JSlice (A. Roychoudhury) is the first dynamic slicing tool for debugging and the understanding of Java programs. JSlice is currently distributed on SourceForge and is deployed in 15 different countries for research and development. Places of use include universities (such as Carnegie Mellon Purdue and McGill), research labs (such as IBM TJ Watson) and companies (such as Agitar Software). The tool has also been adopted as a teaching aid in graduate courses (in universities such as North Carolina State University and University of Delaware).

Selected Publications

Verification and Program Analysis

- Chin, W.N., H.H. Nguyen, S. Qin and M. Rinard. Memory Usage Verification for OO Programs. International Static Analysis Symposium (SAS), London, UK, September 2005.
- Chin, W.N., S.C. Khoo, S. Qin, C. Popeea and H.H. Nguyen. Verifying Safety Policies with Size Properties and Alias Controls. International Conference on Software Engineering (ICSE), St. Louis, Missouri, USA, May 2005.
- Jaffar, J., A.E. Santosa and R. Voicu. A CLP Method for Compositional and Intermittent Predicate Abstraction. International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI), Charleston, USA, January 2006.
- Jaffar, J., A.E. Santosa and R. Voicu. Relative Safety. International Conference on Verification. International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI), Charleston, USA, January 2006.
- Huynh, T.Q. and A. Roychoudhury. A Memory Model Sensitive Checker for C#. Formal Methods (FM), Hamilton, Ontario, Canada, August 2006.

Type Systems

- Chin, W.N., F. Craciun, S.C. Khoo and C. Popeea. A Flow-based Approach for Variant Parametric Types. ACM SIGPLAN International Conference on Object-oriented Programming, Systems, Languages and Applications (OOPSLA), Portland, Oregon, USA, October 2006.
- Sulzmann, M., G.J. Duck, S. Peyton Jones and P.J. Stuckey. Understanding Functional Dependencies via Constraint Handling Rules. Journal of Functional Programming, 17(1), 2007.
- Sulzmann, M., M.M.T. Chakravarty, S. Peyton Jones and K. Donnelly. System F with Type Equality Coercions. ACM SIGPLAN Workshop on Types in Language Design and Implementation (TLDI), Nice, France, January 2007.
- Sulzmann, M., T. Schrijvers and P.J. Stuckey. Principal Type Inference for GHC-style Multi-parameter Type Classes. ASIAN Symposium on Programming Languages and Systems (APLAS), Sydney, Australia, November 2006.
- Sulzmann, M. Extracting Programs from Type Class Proofs. ACM SIGPLAN International Symposium on Principles and Practice of Declarative Programming (PPDP), Venice, Italy, July 2006.

Constraint Programming

- Halim, S., R.H.C. Yap and H.C. Lau. Viz: A Visual Analysis Suite for Explaining Local Search Behaviour. ACM Symposium on User Interface Software and Technology (UIST), Montreux, Switzerland, October 2006.
- Brand, S. and R.H.C. Yap. Propagation = Logic + Control. International Conference on Logic Programming (ICLP), Seattle, USA, August 2006.
- Cheng, K.C.K. and R.H.C. Yap. Maintaining Generalized Arc Consistency on Ad-hoc n-ary Boolean Constraints. European Conference on Artificial Intelligence (ECAI), Riva del Garda, Italy, August 2006.
- Zhang, Y. and R.H.C. Yap. Set Intersection and Consistency in Constraint Networks. Journal of Artificial Intelligence Research, 27, 2006.
- Cheng, K.C.K. and R.H.C. Yap. Applying Ad-hoc Global Constraints with the Case Constraint to Still-life. Constraints, 11(2-3), 2006.

THE FACULTY MEMBERS INVOLVED IN PROGRAMMING LANGUAGES RESEARCH ARE:

- ANDERSON Norman Hugh
- CHIN Wei Ngan
- HENZ Martin
- JAFFAR Joxan
- KHOO Siau Cheng
- ROYCHOUDHURY Abhik
- SULZMANN Martin
- VOICU Razvan
- YAP Hock Chuan, Roland

Collaboration

Faculty Member	Name of Organisation
CHIN Wei Ngan	Massachusetts Institute of Technology, USA Durham University, UK
KHOO Siau Cheng	Massachusetts Institute of Technology, USA Durham University, UK
SULZMANN Martin	Microsoft Research, Cambridge, UK University of Melbourne, Australia
YAP Hock Chuan, Roland	Royal Institute of Technology (KTH), Sweden Texas Tech University, USA

Journal Editorial

Faculty Member	Name of Organisation	Position
JAFFAR Joxan	ACM Transactions on Programming Languages and Systems Journal of Functional and Logic Programming Theory and Practice of Logic and Computation	Associate Editor Associate Editor Associate Editor

Software Engineering

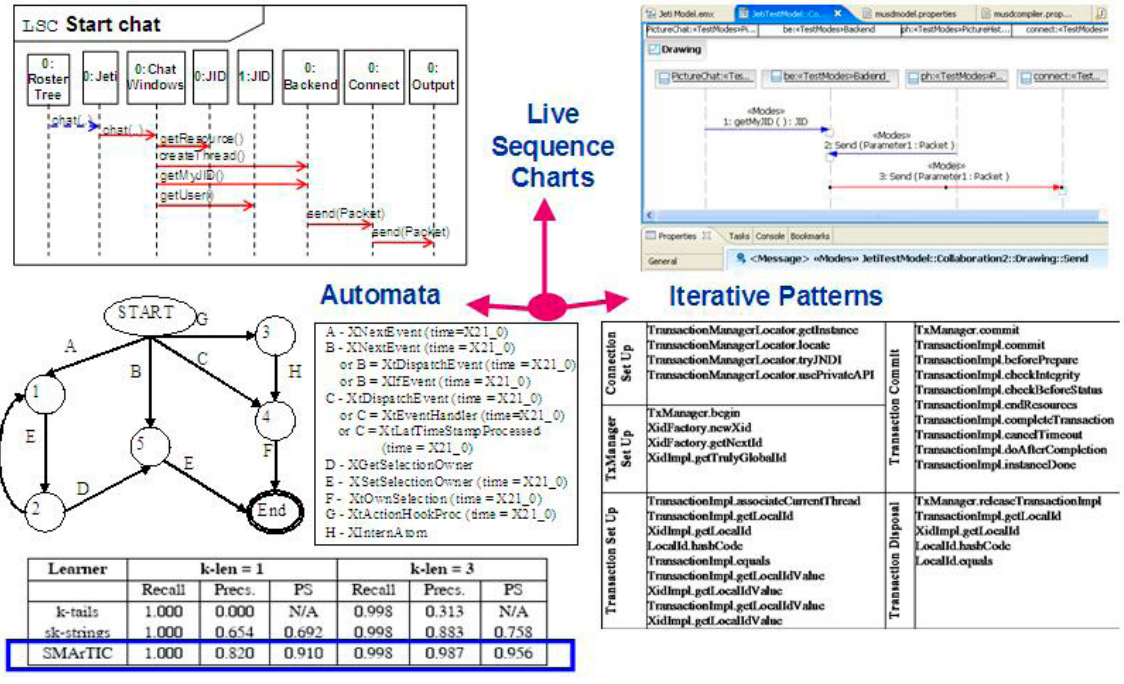
Software engineering research covers techniques for developing high quality software and the use of formal methods. Software engineering research ranges from using web-based knowledge engineering (semantic web) to software reuse techniques for designing high-variability software components, and through to debugging. In formal methods, the research looks at the problems of specification and verification of software. There is synergy with the faculty and research in the programming languages in the areas of program verification, debugging and system specification.

The research can be classified along the following dimensions:

- debugging
- integrated modelling techniques
- software specification
- program and software composition
- software engineering methodologies
- software reuse
- semantic web and ontologies

Research Highlights

- JSlice: the first dynamic slicing tool for Java (see also the Programming Languages section)
- Meta programming for software reuse with XVCL
- Reasoning for the semantic web
- Efficient specification miners



Learner	k-len = 1			k-len = 3		
	Recall	Precs.	PS	Recall	Precs.	PS
k-tails	1.000	0.000	N/A	0.998	0.313	N/A
sk-strings	1.000	0.654	0.692	0.998	0.883	0.758
SMArTIC	1.000	0.820	0.910	0.998	0.987	0.956

Figure 2: The specification of a piece of software tells you what the software is supposed to do - it can be thought of as a contract which defines the software. Unfortunately for many pieces of software, the specification may not have been written or is not available. This diagram shows a prototype system which is able to produce specifications directly from the software itself, i.e., it addresses the problem of Specification Mining.

Representative Publications

Software Reuse

- Rajapakse, D.C. and S. Jarzabek. Using Server Pages to Unify Clones in Web Applications: A Tradeoff Analysis. International Conference on Software Engineering (ICSE), Minneapolis, USA, May 2007.
- Jarzabek, S. Genericity - A Missing in Action Key to Software Simplification and Reuse. Asia-pacific Software Engineering Conference (APSEC), Nagoya, Japan, December 2007.
- Jarzabek, S. and S. Li. Unifying Clones with a Generative Programming Technique: A Case Study. Journal of Software Maintenance and Evolution: Research and Practice, 18(4), 2006.
- Basit, H.A., D.C. Rajapakse and S. Jarzabek. Beyond Templates: A Study of Clones in the STL and some General Implications. International Conference on Software Engineering (ICSE), Minneapolis, USA, May 2007.
- Basit, H.A. and S. Jarzabek. Detecting Higher-level Similarity Patterns in Programs. European Software Engineering Conference and ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC-FSE), Lisbon, Portugal, September 2005.

Formal Methods

- Sun, J. and J.S. Dong. Design Synthesis from Interaction and State-based Specifications. IEEE Transactions on Software Engineering, 32(6), 2006.
- Wang, H., J.S. Dong and J. Sun. Reasoning Support for Semantic Web Ontology Family Languages using Alloy. International Journal of Multi-agent and Grid Systems, 2(4), 2006.
- Yuan, L., J.S. Dong, J. Sun and H.A. Basit. Generic Fault Tolerant Software Architecture Reasoning and Customization, IEEE Transactions on Reliability, 55(3), 2006.
- Sun, J., J.S. Dong, S. Jarzabek and H. Wang. CAD System Family Architecture and Verification: An Integrated Formal Approach, IEEE Software, 153(3), 2006.
- J. Sun and J.S. Dong. Synthesis of Distributed Processes from Scenario-based Specifications. Formal Methods (FM), Newcastle upon Tyne, UK, July 2005.

Debugging

- Wang, T. and A. Roychoudhury. Hierarchical Dynamic Slicing. International Symposium on Software Testing and Analysis (ISSTA), London, UK, July 2007.
- Wang, T. and A. Roychoudhury. Dynamic Slicing on Java Bytecode Traces. ACM Transactions on Programming Languages and Systems.

Design Tools

- Goel, A., S. Meng, A. Roychoudhury and P.S. Thiagarajan. Interacting Process Classes. International Conference on Software Engineering (ICSE), Minneapolis, USA, May 2007.
- Lo, D. and S.C. Khoo. SMArTIC: Towards Building an Accurate, Robust and Scalable Specification Miner. ACM SIGSOFT Symposium on Foundations of Software Engineering (FSE), Portland, Oregon, USA, November 2006.

The faculty members involved in software engineering research are:

- DONG Jin Song
- JARZABEK Stanislaw
- RAJAPAKSE Damith Chatura
- WADHWA Bimlesh

Collaboration

Faculty Member	Name of Organisation
DONG Jin Song	Oxford University, UK Defence Science Organisation, Singapore
JARZABEK Stanislaw	University of Waterloo, Canada ST Electronics, Singapore

Department of

INFORMATION SYSTEMS

Department Overview

The Department of Information Systems has sustained its international leadership position in research in recent years, consistently ranking among the top 15 worldwide according to publications in top-tier journals (*Communications of the AIS*, 2005, Volume 15, pp. 555-564; Communications of the AIS, 2006, Volume 18, pp. 296-328) or top-tier conferences (*Proceedings of the International Conference on Information Systems*, 2006, pp. 569-590). Such international recognition has to be attributed to the hard work of our faculty members, who have published their research in the best journals and conferences in our discipline and won international research awards. Our faculty members are actively serving on the editorial boards of top-tier journals (e.g., *MIS Quarterly, Information Systems Research, Management Science, Journal of the AIS, Journal of Management Information Systems, and IEEE Transactions on Engineering Management*) and the program committees of top-tier conferences (e.g., *International Conference on Information Systems*). Indeed, we are one of the few information systems departments worldwide which have faculty members serving on the editorial board of every top-tier journal in the field of information systems.

To strengthen our research, we have embarked on two flagship research projects: one on knowledge management and another on information privacy. To date, both research projects have yielded many publications in top-tier journals and conferences as well as several international research awards. In these two research projects, our faculty members have worked with our industry and government partners to apply the results in industry and in governments. More details pertaining to these projects are available in the pages of this report. The Department has also started developing two new flagship research projects: one on electronic government and one on virtual communities. These two projects correspond to emerging trends in ubiquitous and social computing. We will continue to collaborate with our industry and government partners in these new projects.

The doctoral programme in the Department of Information Systems has been widely acknowledged for the quality of its graduates. The programme has been continuously refined to include comprehensive coursework and research components as well as a rigorous examination process. Graduates of the programme have received good placements in industry. In academia, our doctoral graduates have earned placements in good universities in the United States, Canada, the United Kingdom, France, Australia, New Zealand, India, China Hong Kong and Singapore. A key objective of our doctoral programme is to develop a global community of doctoral alumni.

To maintain international leadership position in research, the Department of Information Systems will continue to subject its research initiatives and education programme to rigorous review by international scholars. We owe much of our success to our Visiting Committee, comprising Professor Haim Mendelson (Stanford University) and Professor Izak Benbasat (University of British Columbia). We will continue to invite distinguished scholars in the field of information systems to visit us, critique our research and collaborate with us in our projects. In so doing, we are continuing a practice that has helped to raise our international profile in research significantly.

The Department of Information Systems aims to increase its research vibrancy by adding to the many research collaboration efforts that are already ongoing. We welcome prospective partners from academia, industry and government to work with us in our venture in knowledge creation and application.

Bernard C.Y. Tan (Dr)
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Electronic Commerce

Electronic commerce (e-commerce) is defined as using the Internet and other communication technologies for the marketing, selling and servicing of products and services. E-commerce can be categorised into two types: Business-to-Business (B2B) and Business-to-Consumer (B2C). B2B e-commerce typically relates to transactions between or among firms while B2C e-commerce generally refers to transactions between firms and consumers. Aspects of both types of e-commerce include informing a customer of a product's existence, providing in-depth product information, establishing the customer's requirements, performing purchase transactions, delivering information goods electronically, providing customer service electronically, and managing customer relationships online.

Historical Perspective

Research on B2B e-commerce has generally focused on encouraging the adoption and deployment of e-ecommerce technologies by organisations. In these studies, external factors such as institutional pressures and competitive pressures, and organisational factors such as absorptive capacity and organisational learning capacity are considered to play an important role in the adoption and deployment of e-commerce technologies by organisations.

Representative Publications

- H.H. Teo, K.K. Wei, and I. Benbasat. Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective. MIS Quarterly 27(1):1-31, 2003.
- H.H. Teo, W. Wan, X.W. Wang and K.K. Wei. Effects of Absorptive Capacity on Organizational Predisposition toward Information Systems. International Conference in Information Systems. Seattle, United States, December 2003.
- H.H. Teo, X.W. Wang, K.K. Wei, C.L. Sia, and M.K.O. Lee. Organizational Learning Capacity and Attitude Towards Complex Technological Innovations: An Empirical Study, Journal of the American Society for Information Science and Technology (JASIST), 57(2), 264-279, 2006.

Research on B2C e-commerce has identified trust and interactive features as key elements that attract consumers to visit and carry out transactions with the web storefront. Arising from these studies, some useful trust building and interactive mechanisms have been proposed to attract and convert customers from browsers to buyers.

Representative Publications

- H.H. Teo, L.B. Oh, K.K. Wei and C.H. Liu. An Empirical Study of the Effects of Interactivity on Web User Attitude. International Journal of Human-Computer Studies 58(3):281-305, 2003.
- H.W. Kim and Y. Xu. Internet Shopping: Is it a Matter of Perceived Price or Trust. International Conference on Information Systems (ICIS), Washington DC, United States, December 2004. (Nominated for Best Paper)
- H.W. Kim, Y. Xu and J. Koh. A Comparison of Online Trust Building Factors between Potential Customers and Repeat Customers. Journal of the Association for Information Systems 5(10):392-420, October 2004.
- Jiang, Z. and Benbasat, I. "Investigating the Influence of the Functional Mechanisms of Online Product Presentations," forthcoming in Information Systems Research.
- Jiang, Z. and Benbasat, I. "The Effects of Presentation Methods and Task Complexity on Online Consumers' Product Understanding," forthcoming in MIS Quarterly.

As e-commerce matures, researchers at the School of Computing have begun to focus on understanding the impact of electronic market institutions and new technologies on consumer decision-making and behaviour.

Impact of Electronic Market Institutions

Several new market institutions have emerged and become popular with consumers. They are buy-out auctions, reverse auctions, agent-assisted commerce and others. While these institutions have attracted a great deal of attention from the popular press, there are few empirical research studies examining their impact on seller and buyer behaviour. In our programme, we examine the effects of several major institutions, including agent-assisted commerce, auction and group-buying on consumer decision-making and behaviour.

Agent-assisted commerce: Through several rigorous sets of experimental studies, we show that comparisonshopping agents could help improve consumer decision accuracy without incurring additional effort in the presence of high information load (i.e., choosing products with many relevant attributes). When consumers are presented with personalised information, they are more likely to exert more effort and more able to make better decisions. At the same time, they tend to pay less attention to advertisements, but will have more clickthroughs on the advertisements that they do pay attention to. These findings provide useful inputs for agent design, implementation and usage.

Auction: The buyout option allows a bidder to acquire an auctioned product immediately at a posted price without going through the hassle of monitoring the auction process and submitting bids for it. Through two studies, we demonstrate that a bidder is more likely to be loss averse and has a higher propensity to buy out in the presence of the permanent buyout option (i.e., option is available until the end of the auction or when a bidder chooses to buy out). However, when facing temporary buyout options (i.e., options that are not available throughout an auction), a bidder would prevent other bidders from ending the auction prematurely by attempting to "remove" the buyout option. These findings allow sellers to choose the appropriate type of buy-out options to suit their needs.

Group-buying: Group-buying websites seek to aggregate the demands of buyers' with the purpose of obtaining quantity-discounts from sellers. We empirically assessed two artefacts – conditional purchase and information cue – for their effects on decisional choice. The conditional purchase artefact allows a buyer not to honour the purchase when the expected discount price is not met while the information cue artefact provides information about the procurement actions of the other buyers. Our results suggest that buyers presented with conditional purchase options are more willing to make a purchase choice, i.e., deviate from inertia. As for the provision of information cues, it appears to induce inaction generally. However, when a choice has to be made between a risky choice and one that is less risky, the presence of information cues leads to a higher propensity to opt for the riskier choice. These findings provide some useful advice on what features to include in group-buying websites.

Representative Publications

- C. H. Tan, K. Y. Goh and H. H. Teo. An Investigation of Online Group-Buying Institution and Buyer Behavior. International Conference on Human-Computer Interaction, Beijing, China, July 2007.
- C. H. Tan, K. Y. Goh, H. H. Teo and K. S. Sim. Buyout Option & Reserve Price in Online Auctions: Should I Bid or Buy Out? International Conference on Information Systems, Milwaukee, Wisconsin, USA, December 2006.
- C. H. Tan, X. Yang, H. H. Teo and G. Lin. An Empirical Investigation of the Auction Buyer's Choice to Buy Out or Bid: Cry of Regret or Laugh of Satisfaction? Proceeding of the 26th Annual International Conference on Information Systems, Las Vegas, Nevada, USA, December 2005.
- C. H. Tan. Comparison-Shopping websites: An Empirical Investigation on the Influence of Decision Aids and Information Load on Consumer Decision-Making Behavior. International Conference on Information Systems, Seattle, Washington, December 2003.

The faculty members involved in electronic commerce research are:

- CHAN Hock Chuan
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Internet Information Privacy

The proliferation of electronic commerce has facilitated the acquisition, storage and use of consumer data by Internet web sites. Such widespread use of consumer data may promote two types of activities. First, the web sites may use the data to analyse the demographics and preferences of consumers so as to devise better product offers and pricing strategies. Second, the web sites may use the data in other ways (often unanticipated by consumers), such as selling the information to third party organisations or using it for direct marketing solicitations. The extent to which consumers expect each of these activities to occur may determine whether they are willing to take part in online transactions. If consumers are sensitive about their privacy, they may decide to withdraw from online transactions, which could then impede the growth of electronic commerce. It is important to analyse the decisions of consumers and devise proper web site design and data solicitation procedures so that consumers may enjoy a comfortable transaction environment.

Past research on privacy and use of consumer information can broadly be classified into two groups. The first group, primarily contributed by economists, considers how the sharing of consumer information affects transaction and hence social efficiency, but it largely ignores the annoyance and social costs of privacy invasions. The second group of research is contributed by behavioural psychologists and policy researchers, and it focuses on individuals' concerns about various information practices of firms, and how best to address these concerns. This stream of work, however, ignores the benefits of sharing consumer information, and it fails to take into account the primary motivations of consumers to enter into online transactions.

In our research, we aim to provide a holistic view of information privacy and the decision of consumers to disclose their information to Internet web sites. Our research spans three main areas:

1. Motivations of information disclosure

At the individual level, we conceptualise the primary motivations that lead consumers to disclose their information, and investigate how Internet web sites could enhance these motivations. In particular, we consider the trade-off between benefits that consumers receive from online transactions and the costs that they pay in terms of information privacy, and empirically examine if motivators or incentives could compensate consumers for their potential loss of privacy. Through a rigorous set of experiments and consumer surveys, we show that consumers can often be motivated to enter into online transactions despite their concerns about privacy. Further, we have found that privacy is indeed tradable, and protective measures such as fair information practices or procedural justice may not be as critical as advocated by previous research.

The knowledge that we acquire through this research can help Internet web sites design optimal bundles of attributes (including proper privacy protections and relevant motivators) to meet the needs of consumers. It also complements previous behavioural research that focuses mostly on privacy concerns by illustrating, through solid empirical evidence, the equally (if not more) important role of motivators in influencing consumer decisions. This emphasis on motivators is especially useful in developing a general theory of information privacy in the future.

Representative Publications

- Hui, K.L., H.H. Teo and T.S.Y. Lee. The Value of Privacy Assurance: An Exploratory Field Experiment. MIS Quarterly, 31(1):19-33, 2007.
- Hui, K.L., B.C.Y. Tan and C.Y. Goh. Online Information Disclosure: Motivators and Measurements. ACM Transactions on Internet Technology, 6(4):415-441, 2006.
- Hann, I.H., K.L. Hui, T.S.Y. Lee and I.P.L. Png. Analyzing Online Information Privacy Concerns: An Information Processing Theory Approach. Journal of Management Information Systems, 2007, forthcoming.
- Hui, K.L. and I.P.L. Png. The Economics of Privacy. Handbooks in Information Systems, 1:471-497, 2006.

• Xu, Y., B.C.Y. Tan, K. Hui and W. Tan. Consumer Trust and Online Information Privacy. International Conference on Information Systems (ICIS), Seattle, Washington, December 2003.

2. Design and procedural aspects of data collection

Our second area of research focuses on the significance of various contextual and procedural factors, such as presentation of detailed web site information, data collection sequence, or question wording and formats, in shaping the disclosure decision of consumers. It has long been recognised in the marketing literature that consumer preferences are shaped at the point of transaction. Even though consumers may have a priori concerns on information privacy, it is often possible to enhance a transaction and raise consumers' participation rates by the use of carefully constructed web site stimuli and information collection strategies.

We focus on cost-effective procedural and presentation elements that have wide applicability across Internet businesses. Our preliminary findings are promising. In particular, we have found that question wording and use of default options affect consumers' willingness to receive future marketing promotions from Internet web sites. Further, consumers tend to provide more personal details when questions are arranged in ascending sequence, and when Internet web sites reveal more information about their own background and practices. Consumers display these tendencies, our findings show, even though they do not cognitively pay attention to design elements.

Our findings open up new avenues and offer practical insights for Internet businesses to improve their information collection practices. They also draw attention to common design elements that are often ignored by online firms (e.g., most Internet web sites ask consumers for sensitive personal data at the beginning of registration, which our findings show may not be desirable).

Representative Publications

• Lai, Y.L. and K.L. Hui. Does Opt-in and Opt-out Really Matter? Investigating the Roles of Frame, Defaults, and Privacy Concerns. ACM Computer Personnel Research Conference, Claremont, USA, April 2006.
• Lai, Y.L. and K.L. Hui. Opting-in or Opting-out on the Internet: Does It Really Matter? International Conference on Information Systems (ICIS), Washington DC, December 2004.
• Hui, K.L. Consumer Disclosure: The Effects of Information Presentation and Question Sequence.

3. Solicitation, intrusion, and public policy

This stream of research focuses specifically on the intrusion aspect of privacy (cf. secrecy as in the other two streams above). By developing a stylised economic model, we consider the costs imposed by direct marketers (telephone, television, or email advertisers) on consumers who do not want to receive solicitations, and the benefits for consumers who are interested in the products being promoted. Our results show that under a wide range of conditions, consumers would spend too much effort to avoid marketing, which may actually raise the effectiveness of direct marketers' promotional efforts, and hence lead to even more solicitations. We have tested some of our theoretical predictions using large-scale empirical data on the do-not-call list, a practice which has been implemented in the USA since 2003. Based on the findings, we suggest practical strategies for consumers to handle unsolicited promotions. We also propose public policies that could help internalise the privacy costs imposed by direct marketers on consumers.

Because we adopt a balanced view in designing our research model, we are able to balance the interests of consumers who are neutral toward unsolicited promotions and may make purchases if they see desirable offers, and those who are sensitive to privacy. This is different from prior studies that either ignored privacy costs (as in the economics literature)

or benefits of information disclosure (as in the behavioural psychology literature). Our findings could provide useful insights for governments in devising optimal policies that take into account the interests of all consumers in electronic commerce.

Representative Publications

- Hann, I.H., K.L. Hui, Y.L. Lai, T.S.Y. Lee and I.P.L. Png. Who Gets Spammed. Communications of the ACM, 49(10):83-87, 2006.
- Hann, I.H., K.L. Hui, T.S.Y. Lee and I.P.L. Png. Direct Marketing: Privacy and Competition. American Economic Association (AEA) Annual Meeting, San Diego, California, January 2004.

The faculty members involved in internet information privacy research are:

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Knowledge Management

Knowledge has emerged as the most strategically significant resource of an organisation, and not surprisingly, knowledge management (KM) is gaining attention in the academic arena as well as in the practice community. Here, we define KM as the creation, sharing and application of knowledge in a knowledge enterprise. Competitive firms can be seen as generators and transformers of different kinds of knowledge. As firms increasingly compete with a different stock of knowledge, management of the firm's knowledge base has emerged as a major challenge in maintaining the firm's sustainable competitive advantage.

Our flagship knowledge management project, which has been in progress since 2002, delves into complex organisational as well as information technological issues related to KM and KM systems (KMS). Our Knowledge Management Laboratory (http://kmlab.comp.nus.edu.sg) is equipped with the latest computing facilities and serves as a focal point for faculty members and graduate students conducting research in KM.

We investigate various important issues in the KM and Enterprise Systems (ES) fields. These include knowledge sharing behaviour, knowledge integration strategies, knowledge management systems, communities of practice and information technologies, knowledge management performance measurement, enterprise systems research covering technologies and practices such as electronic government (e-Gov), customer relationship management (CRM) and enterprise resource planning (ERP). Our particular focus is on the following five areas.

Knowledge Reuse

Knowledge management involves the management of knowledge processes which are often categorised by whether they involve knowledge creation or knowledge reuse. Knowledge creation is typically viewed as somehow more important than knowledge reuse, more difficult to manage, and less amenable to information technology support. However, in reality, organisations are as much concerned about the reuse of knowledge since productivity benefits can be derived from leveraging existing experience and avoiding duplication of solutions. Given that knowledge reuse is a key organisational concern, it is necessary to understand the factors behind reuse success. The purpose of this research is therefore to develop a framework to explain how successful knowledge reuse can take place within an organisation. In particular, we apply the framework to investigate the reuse of knowledge in the context of information systems development. While the software engineering literature has extensively covered software code reuse, relatively little attention has been devoted to the reuse of overall software project knowledge. The framework can serve to elucidate the individual, process and technology factors behind successful reuse of information systems development knowledge.

Secure Knowledge Management

While organisations aim to facilitate knowledge sharing in order to leverage their knowledge resources, they also seek to ensure that organisational knowledge is shared and used securely. Knowledge sharing systems and the related policies and practices need to cater for these dual objectives. A key factor affecting knowledge protection effectiveness is the knowledge protection process capability of the organisation. The capability hinges on two major components of organisational security: technical controls and organisational controls. Additionally, individual motivations as well as social factors such as employee trust and identification are likely to impact the way knowledge is shared and secured. Hence, the purpose of this research

is to investigate the nature of policies, controls and processes that ensure the security of knowledge resources without hampering their sharing and leveraging. The results should enhance understanding into how security may be incorporated into knowledge management planning and implementation.

Knowledge Management and Data Mining

Methods that have been developed for data mining could be used to capture, select and refine individual knowledge into collective organisational knowledge. Traditional knowledge management methodologies have primarily focused on knowledge acquisition from individuals. The approach to building a knowledge management system is often a manual process which requires considerable efforts. It commonly involves lengthy interviews, domain ontologies readjustments and rules rewriting in consultation with domain experts. On the other hand, machine learning algorithms used in data mining search for valuable but hidden knowledge in databases. These algorithms are meant to alleviate difficulties in capturing and summarising useful knowledge from different sources. While the algorithms may be effective in analysing data in large databases and uncovering trends and patterns, they have largely been applied to structured databases governed by well-defined domain theories. Techniques such as the decision tree and the neural network method can be used to build knowledge management systems faster and more effectively. The knowledge captured by such systems can be formalised and documented in knowledge repositories, and eventually, shared by all.

Cross Cultural Study on Behavioural Intention Formation in Knowledge Sharing

Here, we investigate why many organisations face difficulties in deploying knowledge sharing practices across countries. We examine the motivational factors of different individuals, and how these factors influence knowledge sharing intention in two different cultures: oriental (China) versus western (Sweden).

Managing Multiple Identities in Organisation-wide Knowledge Management

A common but important issue with large Information Technology (IT) organisations that implement KM strategies is end-user apathy and indifference towards the KM initiative in organisational units. End-user communities associate themselves minimally with the organisation-wide KM apparatus, rarely contributing to the initiative, or/and in a few cases, completely dissociating themselves from the KM initiative. Here, we analyse the qualitative data collected from an in-depth case study of the KM implementation at three of India's largest IT organisations through the lens of the Social Identity Theory (SIT). Evidence from the case points to the dominance of multiple social identities; the enactments of these identities in everyday organisational life in the KM context are manifest. Preliminary findings from the cases suggest that evoking organisational identities in end-user communities in the context of sharing and contributing to the KM apparatus is an important challenge facing organisational KM strategies.

Representative Publications

- Bock, G.W., B. Zmud, Y.G. Kim and J.M. Lee, J-M. Behavioral Intention Formation Knowledge Sharing: Examining Roles of Extrinsic Motivators, Social-Psychological Forces and Organizational Climate. MIS Quarterly 29(1), 2005.
- Kankanhalli, A., B.C.Y. Tan and K.K. Wei. Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation, MIS Quarterly, 29(1), 2005.
- Pan, S.L., G. Pan and Hsieh M-H. A Dual-level Analysis of Capability Development Process: A Case Study of TT&T. Journal of the American Society for Information Science and Technology. 57(13):1814-1829, November 2006.
- Kankanhalli, A., B.C.Y. Tan and K.K. Wei. Understanding Seeking from Electronic Knowledge Repositories: An Empirical Study. Journal of the American Society for Information Science and Technology, 56(11):1156-1166, 2005.

The faculty members involved in the knowledge management research are:

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Virtual Teams and Virtual Communities

Information technology is providing the infrastructure necessary for the development of new organizational forms. Virtual teams represent one such organizational form, one that is changing the workplace and providing organizations with higher levels of flexibility and responsiveness. While the technological infrastructure supporting virtual teams is largely available, there are a number of challenges arising from space/time dispersion and cultural diversity that can hamper virtual team functioning. Research on a range of issues surrounding virtual teams is required if we are to learn how to manage them effectively. Recent research has centred on virtual team inputs, socio-emotional processes, task processes, and outcomes. Much of this literature focuses on comparisons of virtual teams and traditional teams. While traditional team research offers valuable theoretical background and a starting point for virtual team research, virtual teams, with their unique managerial, technical and social challenges, call for additional, specialised research. In our work in this area, we concentrate mainly on understanding and addressing the significant task coordination challenges in global virtual teams such as for offshore software development projects.

Another related type of structure enabled by information technology that has become prevalent is virtual communities. While a few online communities such as Usenet newsgroups have existed for a quarter of a decade, more recently, the number of virtual communities has increased exponentially. As both virtual community sites and users grow in number, they have become a subject of study by both the popular press and Information Systems (IS) researchers. Thus, reasons why users join particular communities are of interest to businesses seeking to establish a web presence and for academics seeking to understand user behaviour. Understanding virtual communities is also of interest to organizations in order to be able to tap into their information and revenue generating potential. Our research on virtual communities consists of two main streams. One stream focuses on investigating the factors affecting knowledge sharing and participation in such communities while the other related stream studies how the commercial potential of these communities can be realised. The virtual team and community projects are described below.

Task Coordination in Global Virtual Teams

Global virtual teams (GVT) are defined as globally and/or organizationally dispersed workers brought together by information and communication technologies (ICT) to accomplish one or more organizational tasks. While GVT can potentially offer productivity benefits to organizations, these benefits may not be realised if organizations fail to address their task coordination challenges. For instance, the cost savings derived from outsourcing software development tasks through GVT can be wiped out by coordination inefficiencies. GVT rely largely on ICT to accomplish their tasks, including work coordination. Previous studies have found that poor coordination causes GVT to produce fewer positive outcomes than collocated teams. While interest in the study of ICT usage in GVT has increased among researchers, there is little knowledge of how ICT can facilitate GVT task coordination.

The objective of this research is therefore to investigate how ICT can support GVT task coordination. Task coordination is the act of managing interdependent work activities among team members. Task coordination mechanisms can be categorised into three modes: the impersonal mode (standards or rules, and plans or schedules), the personal mode (supervisor-subordinate communication and peer-to-peer communication), and the group mode (team meetings). The communication required for coordination has inherent complexities. We

propose that different task coordination modes possess varying communication complexities that can be optimally supported by ICT with specific characteristics. The portfolio of ICT mediated coordination modes for a particular GVT project should be determined by task interdependencies, member dispersion, and time constraints on the team. The effectiveness of the proposed ICT-mediated task coordination modes is being explored both qualitatively through case studies and quantitatively through surveys. Findings from this work should help guide future research and the practice of GVT task coordination.

Representative Publications

- Kankanhalli, A., B.C.Y. Tan and K.K. Wei. Conflict and Performance in Global Virtual Teams. Journal of Management Information Systems, 23(3):237-274, 2006.
- Sutanto, J., A. Kankanhalli and B.C.Y. Tan. Investigating Task Coordination Effectiveness in Global Virtual Teams. International Symposium of Information Systems (ISIS), Hyderabad, India, 2006.
- Sutanto, J. and A. Kankanhalli. Investigating ICT-mediated Task Coordination Modes in Global Virtual Teams. International Conference on Information Systems (ICIS), Milwaukee, 2006.
- Sutanto, J., A. Kankanhalli and B.C.Y. Tan. Assessing and Resolving Suboptimal Outcomes in Global Virtual Team Task Coordination. International Conference on Management of Globally Distributed Work (GDW), Bangalore, India, 2005.
- Sutanto, J., Kankanhalli, A. and B.C.Y. Tan. Task Coordination in Global Virtual Teams: A Study in the Context of Software Development. Organizations and Society in Information Systems (OASIS) Workshop, Las Vegas, 2005.

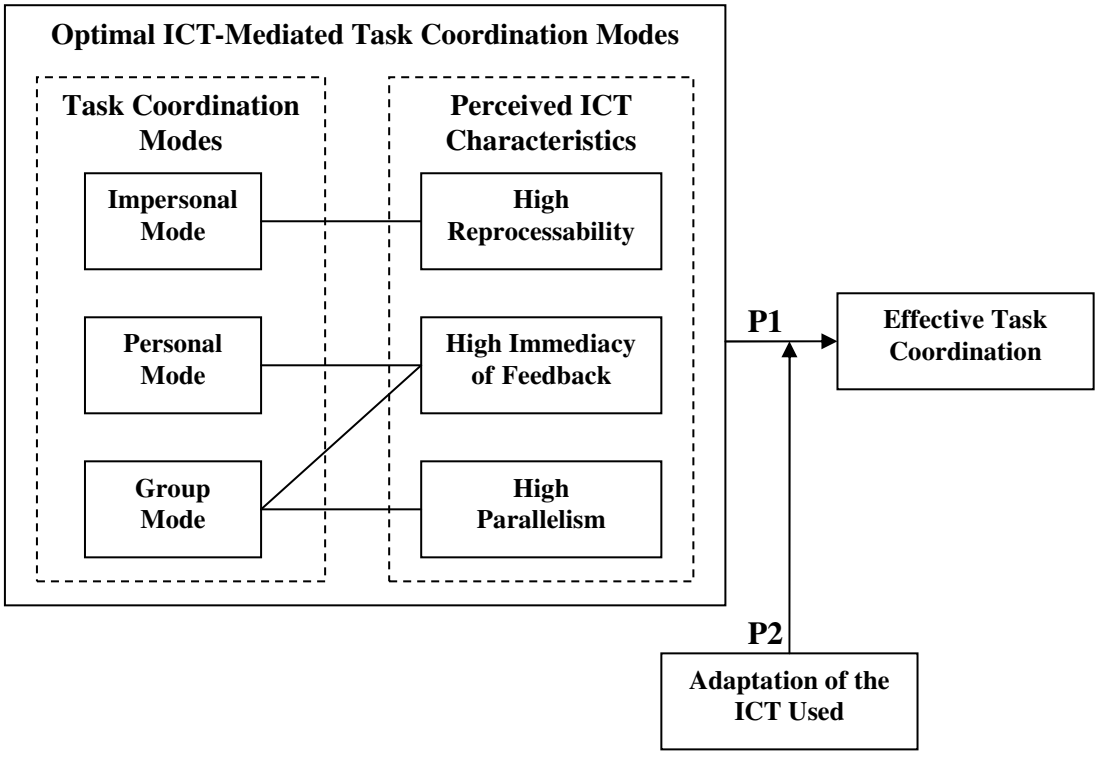

Figure 1: Global Virtual Team Task Coordination

Knowledge Contribution and Participation in Virtual Structures

The mere existence of technical infrastructure does not guarantee that individuals will be willing to join and stay in a virtual community (VC). Similar to other computer-mediated communications, a critical mass or minimum number of people must be present in a VC in order to attract new members or sustain interactions between existing members. Without lively interactions, users will either stop participating or migrate to larger groups, and the community will lose valuable benefits that can also attract new members. Participation in these communities is voluntary in nature. Individuals can choose to participate in one or multiple communities. They can also vary in their involvement in different communities, participating actively in some and occasionally in others. Previous research has suggested that a VC member's intention to stay, willingness to help, and intention to spend time and money are of great concern to VC organisers. In order to enjoy the economic and intangible benefits from VCs, VC organisers need to understand what attracts online members to stay in a community and be willing to spend time, efforts or money in the community. This project aims to contribute to this understanding by studying the impact of individual needs, trust and identification on members' participation intentions in VCs.

A unique type of virtual communities is related to Open Source Software (OSS) projects. Here, members interact virtually for the purpose of software development. The communities contain both users and developers of these systems. The fact that there are more unsuccessful than successful OSS projects has prompted researchers to investigate factors that could increase OSS projects' success rate. Trust and members' competency are among team and individual factors found to affect OSS projects' success. Our work in this area aims to add to the literature by examining community-level factors that may influence OSS success through their effect on enabling knowledge transfer in an OSS community. This project examines the relationship between OSS community network configuration and OSS success. Sampling 101 projects, this work has indicated that OSS projects' success is determined by the existence of a few central people who control the transmission of information throughout the OSS community and by the number of messages reaching each community member. OSS success is not related to the ability of OSS community members to directly obtain information from one another.

Representative Publications

- Han, J., J. Zheng and Y. Xu. The Effect of Individual Needs and Social Capital in Explaining Participation Intentions in Virtual Community. Hawaii International Conference on System Science (HICSS), Waikoloa, Big Island, Hawaii, 2007.
- Kankanhalli, A., B.C.Y. Tan and K.K. Wei. Communication Media and Knowledge Sharing in Global Virtual Teams. Global Entrepreneurship: Local Innovations and Value Creation, 2007.
- Koh, J., Y.G. Kim, B. Butler and G.W. Bock. Stimulating Conversation: Encouraging Participation in Virtual Communities. Communications of ACM, 50(2):68-73, 2007.
- Yu, J., Z. Jiang and H.C. Chan. Knowledge Contribution in Problem Solving Virtual Communities: The Mediating Role of Individual Motivations. SIGMIS Computer Personnel Doctoral Consortium and Research Conference, St. Louis, Missouri, USA, 2007.

Category	Type of Challenge	Description	Relevant Theorist
Social perspective	Communication	• Communication dynamics to be changed • Low social presence • Inhibition in building trust	• Computer-mediated communication • Social presence
	Motivation	• Much effort needed to discover and manage common goals and interest of community members	• Intrinsic / extrinsic motivation
	Leaders	• Ensuring adequate levels of community activity and membership growth • Developing supportive climate	• Leadership • Team effectiveness
Technical perspective	Technology	• High cost for connections to Internet • Low-quality and low-speed lines for Internet connections • Skills needed for a range of computer technologies	• Computer-mediated communication • User computer self-efficacy • User interface

Figure 2: Virtual Community Challenges

Virtual Communities as Business Opportunities

A virtual community of committed members is of great strategic value to online firms and vendors owing to its ability to attract and retain members. However, online firms and vendors have found it difficult to instil commitment among their VC members. Therefore, one research objective in this area is to examine the mechanism of customer commitment formation in a relationship-cum-interest based VC. By understanding the mechanism of customer commitment formation in a VC, online firms and vendors can enhance customer commitment to the VC. Using the theory of reasoned action, this study suggests that encouraging participation among customers is the springboard for customer commitment to a VC. However, customer participation should be balanced with a proper mix of cognition and affect enhancing aspects, particularly those aspects that arouse customers' interests and encourage relationship building among them. Online firms and vendors could benefit by encouraging personal relationships among their VC participants.

Another objective is to investigate the use of digital items in commercial VCs. Recently, digital items (e.g., avatars) have become widely used in VCs and online games. Sales of digital items provide revenue for Internet companies and VC providers who are suffering from the lack of a profitable business model. However, there is a paucity of understanding about people's digital item purchase and usage. This project examines why people pay for digital items from the self-presentation perspective, by focusing on online identity, based on social identity theory. Preliminary findings show that the presentation desire of online identity leads to intention to purchase digital items. They also show the significance of online group norms and online group involvement in enhancing the presentation desire from the online social identity perspective. The work also identifies the significance of interaction effects between personal innovativeness and online group involvement in enhancing presentation desire from the online personal perspective. These findings can help advance theory and offer practical insights in the context of Internet business and VC.

Representative Publications

- Gupta, S. and H.W. Kim. Developing the Commitment to Virtual Community: The Balanced Effects of Cognition and Affect. Information Resource Management Journal (IRMJ), 20(1):28-45, 2007.
- Kim, H.W. and E. Que. Presentation Desire of Digital Identity in Virtual Community. Human Computer Interactions (HCI) International Conference, Beijing, China, 2007.
- Lee, M.S., J. Sutanto, A. Kankanhalli and B.C.Y. Tan. Virtual Community Models in Relation to E-business Models: Creating Value. Encyclopedia of Virtual Communities and Technologies, 2005.
- Lee, M.S., J. Sutanto, A. Kankanhalli and B.C.Y. Tan. Converting Online Community Visitors into Online Consumers. Encyclopedia of Virtual Communities and Technologies, 2005.

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Faculty Member	Name of Organisation
KANKANHALLI Atreyi	City University of Hong Kong, China University of New South Wales, Australia Standard Chartered, Singapore Barclays Capital, Singapore Infocomm Development Authority of Singapore, Singapore National Library Board, Singapore
KIM Hee Woong	The Logistic Institute - Asia Pacific, Singapore
TAN Cheng Yian, Bernard	City University of Hong Kong, China University of New South Wales, Australia Standard Chartered, Singapore Barclays Capital, Singapore

Award

Faculty Member	Name of Award
JIANG Zhenhui, Jack	Best Paper Award, 12th Americas Conference on Information Systems, Acapulco, Mexico, August 2006.
KANKANHALLI Atreyi	Honorable mention (Runner-up) for Reviewer of the Year Award, MIS Quarterly 2005.
KIM Hee Woong	Best Paper Award, Korea Management Information Systems Conference, Seoul, Korea 2006.

Electronic Government

Governments around the world are tapping on the potential of information and communication technologies (ICT) to transform the public sector, a phenomenon broadly known as e-Government. E-Government refers to the public sector's use of ICT with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process, and making governments more accountable, transparent and effective. Leading governments such as Singapore are providing a variety of e-services to citizens. As their political mandate requires them to serve all sections of the public, governments would be concerned that not all sections of society are able to use the e-services being provided and not everyone is satisfied with their use. Based on this motivation, one objective of our research is to investigate how to improve e-service delivery to citizens. For this purpose, we aim to develop models of citizens' acceptance of government-provided e-services to gain an understanding of what drives greater usage and satisfaction with the services.

While improving information and service delivery is important, as e-Government efforts mature, governments are further interested to use ICT to enhance citizen participation. E-Participation initiatives refer to governments' efforts in employing ICT for disseminating policy planning information and soliciting citizens' inputs in planning. While it is clear that these initiatives may offer a number of advantages over offline channels of citizen participation, to date there is a lack of knowledge of how ICT can be exploited to better achieve different objectives of e-Participation. Also, little is known about the factors that are responsible for motivating individuals' e-Participation behaviour. Therefore, the second objective of our research is to investigate how to enhance e-Participation for the purpose of facilitating e- Government. To this end, we seek to develop models that integrate participation antecedents and relevant ICT features for the understanding of what motivates citizen e-Participation.

The two objectives will be addressed by modelling and deriving best practices of e-Government based on previous literature, case studies, and surveys of such initiatives. This interdisciplinary project (deriving from information systems and public administration disciplines) will contribute academically by developing and testing frameworks and models for e-service acceptance and e-Participation that can serve as a foundation for future research. Also, the objectives are practically relevant for improving the reach and satisfaction of government e-services as well as enhancing e-Participation.

Representative Publications

- Phang, C.W., A. Kankanhalli, Z. Chua and K.Y. Goh. Investigating Participation in Online Policy Discussion Forums over Time: Does Network Structure Matter? International Conference on Information Systems, Montreal, Canada, December 2007.
- Chan, C.M.L. and S.L. Pan. Resource Enactment in the E-Government Systems Implementation: A Case Study On the E-File System. International Conference on Information Systems, Milwaukee, Wisconsin, USA, December 2006.
- Pan, S.L, C.W. Tan and E. Lim. Customer Relationship Management (CRM) in E-Government: A Relational Perspective. Decision Support Systems 42(1):237-250, 2006.
- Phang, C.W., J. Sutanto, A. Kankanhalli, L. Yan, B.C.Y. Tan and H.H. Teo. Senior Citizens' Acceptance of Information Systems: A Study in the Context of E-Government Services. IEEE Transactions on Engineering Management, 53(4):555-569, 2006.

The faculty members in the electronic government research are:

- KANKANHALLI Atreyi
- PAN Shan Ling

Professional Activities

Conference Committee

Faculty Member	Name of Conference	Position
TAN Cheng Yian, Bernard	International Conference on Information Systems 2006 Pacific Asia Conference on Information Systems 2006 International Conference on Information Systems 2007	Programme Track Chair Programme Chair Programme Track Chair
TEO Hock Hai	Pacific Asia Conference on Information Systems 2006 International Conference on Information Systems 2007 Pacific Asia Conference on Information Systems 2007	Programme Track Chair Programme Track Chair Programme Track Chair

Journal Editorial

Faculty Member	Name of Journal	Position
CHAN Hock Chuan	Journal of Database Management MIS Quarterly	Associate Editor Associate Editor
KIM Hee Woong	Journal of Database Management Journal of Global Information Management	Editorial Board Member Editorial Board Member
HUI Kai Lung	Journal of the AIS	Editorial Board Member
KANKANHALLI Atreyi	International Journal of Knowledge Management Journal of Global Information Management Journal of Information Privacy and Security	Editorial Board Member Editorial Board Member Editorial Board Member
LIM Lai Huat, John	International Journal of E-Business Research Journal of Web-based Learning and Teaching Technology	Associate Editor Associate Editor
PAN Shan Ling	Communications of AIS European Journal of Information Systems Information and Management	Editorial Board Member Associate Editor Editorial Board Member
PNG Paak Liang, Ivan	Management Science	Associate Editor
POO Chiang Choon	Journal of Business Information System	Editorial Board Member
SETIONO Rudy	IEEE Transactions on Neural Networks	Editorial Board Member
TAN Cheng Yian, Bernard	IEEE Transactions on Engineering Management Information and Management Journal of the AIS Journal of Global Information Management Journal of Management Information Systems MIS Quarterly Management Science	Department Editor Editorial Board Member Senior Editor Associate Editor Editorial Board Member Senior Editor Associate Editor
TEO Hock Hai	Database for Advances in Information Systems IEEE Transactions on Engineering Management Information Systems Research MIS Quarterly	Senior Editor Editorial Board Member Associate Editor Associate Editor
YEO Gee Kin	Simulation and Gaming	Associate Editor

Incubation Centre

Incubation Centre

The School of Computing (SoC) Incubation Centre was established in January 2001 with the aim of promoting technopreneurship among students and staff. Its goals are to nurture new businesses engaged in an innovative, technology-based product or service, and to help them survive and grow during the start-up period when they are most vulnerable. By providing the much needed space for young innovative students and staff, it is hoped that technopreneurs will emerge from among them.

SoC Incubation Centre offers infrastructure and management support to foster an entrepreneurial climate and help bring ideas through development to commercial fruition. It draws its funds from the Spin-Off-Incentive Scheme of the National Science and Technology Board (now the Agency for Science, Technology and Research or A*STAR) and the T21 Funds, a scheme established to promote technopreneurship at the University. Machines used in the Centre are partly sponsored by Hewlett-Packard (HP) and Sun Microsystems.

Since the launch of the Centre, 15 start-up companies have graduated from its nurturing support. Four other companies are currently incubating at the Centre. In addition, there are three more start-up companies from the School that pre-date the Centre. The details of the companies and highlights of their achievements are given in the next section. Further information on SoC Incubation Centre is available at: http://www.comp.nus.edu.sg/~socic. Enquiries may be directed to: socic@comp.nus.edu.sg

Companies Incubating at SoC Incubation Centre

DecisionWare Simulations and Games

The company focuses on developing simulation games for education. It operates on the belief that students learn better when they are involved in class activities, including games. The company's product, *MAGNUS*, is targeted at tertiary institutions. *MAGNUS* has been used in a number of universities, including National Cheng-chi University (Taiwan), Universidad Panamericana (Mexico) and University of Antwerp (Belgium). Locally, *MAGNUS* is used in NUS and Raffles Junior College. The company is also developing educational simulations for students at the secondary school and junior college levels.

Contact information:
URL: http://www.decisionwaresim.com
Tel: +65 6516 1368, Fax: +65 6779 1610
Email: kevinlow@decisionwaresim.com

LD-Tech Pte Ltd

LD-Tech was incorporated at the end of year 2005. The company employs a full-time staff of two and five part-timers. Currently, the company is self-funding but is also seeking support from the likes of The Enterprise Challenge group and Finn Evdemon Capital Partners.

The company's main areas of interest are artificial intelligence and human computer interaction. Currently, it is working on IT system integration, corporate IT outsourcing and IT product distribution. It is also offering a 2D e-commerce website dedicated to virtual online shopping and is planning to launch an intelligent 3D virtual online shopping environment.

Contact information:
URL: http://www.ld-tech.com/
Tel: +65 6516 1369, Fax: +65 6516 1610
Email: dusichao@ld-tech.com

Nineo.com

Nineo.com is a technology start-up whose main featured product is an Internet-based website dedicated to recruiting the best students and freelancers in the Asian region and bringing them together on a common platform. This group of freelancers can be deployed as an affordable yet reliable technical resource for fee-paying small and medium enterprises.

Nineo has been operating since 2004 and has offered projects to over hundreds of university students.

Contact information:
URL: http://www.nineo.com
Tel: +65 6516 4592 Fax: +65 6779 1610
Email: support@nineo.com

tenCube Pte Ltd

tenCube is a start-up founded in June 2005. The company aims to be the leader in mobile phone security, in particular, Smartphones. It focuses on being the leading mobile security provider for enterprises facing critical mobile security needs, with verticals including law enforcement, defence, finance, banking, healthcare and Fortune 500s.

tenCube's anchor product WaveSecure is a comprehensive mobile security product which enables users to:

- Lock their phone remotely, completely disabling it, protecting their privacy and making it worthless to unauthorised users
- Track their respective phones, find out everything about the phones
- Backup their data, wirelessly and effortlessly
- Wipe out their data on their phone memory, memory card and SIM, protecting their privacy and restoring their data to a new phone at the click of a button

Some of the accolades and awards tenCube has won include being awarded "Top 10 Wireless Innovations in Asia Pacific" by Frost & Sullivan, being in the top six finalists of the prestigious GES Award by Asian Wall Street Journal and Grand Champion of Startup@Singapore, a national business plan competition.

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URL: http://www.tenCube.com
Tel: +65 6516 4590 Fax: +65 6779 1610
Email: darius@tencube.com

Companies Graduated from SoC Incubation Centre

The companies that have left SoC Incubation Centre are:

Atsuma Technology Pte Ltd
http://www.atsuma.com/

Bestpeer
http://www.bestpeer.com/

Delcon Networks Pte Ltd
http://www.delconnetworks.com/

FriarTuck Pte Ltd
http://www.friartuck.net/

Frensville Pte Ltd
http://www.frensville.com/

IQExplorers Pte Ltd
http://www.iqexplorers.com/iqexplorers/public/

Innvo Systems Pte Ltd
http://www.innvo.com/

MicroAppli Pte Ltd
http://www.microappli.com/

Mozat Pte Ltd
http://www.mozat.com/

Multitrex Pte Ltd
http://www.multitrex.com/

Retriva Solutions Pte Ltd
http://www.retriva.com/

Thothe Technologies Pte Ltd (previously known as GeoFoto Pte Ltd)
http://www.thothe.com/

Usyntric
http://www.usyntric.com/

Intelligent Optimization

Presage Technologies

Start-ups from the School of computing

Cicada Cube
http://www.cicadacube.com

ReasonEdge Technologies Pte Ltd
http://www.reasonedge.com/

PrivyLink International Ltd
http://www.privylink.com/

Appendixes

Faculty Members

(Department of Computer Science)

Name of Faculty Member	Academic Qualification	Research Interest
AKKIHEBBAL L. Ananda Associate Professor Email: ananda@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ananda	PhD (University of Manchester, UK) MSc (University of Manchester, UK) MTech (IIT Kanpur, India) BE (Bangalore University, India)	high-speed computer networks, transport protocols, IPv4 to IPv6 transition mechanisms and distributed systems
ANDERSON Norman Hugh Lecturer Email: hugh@comp.nus.edu.sg http://www.comp.nus.edu.sg/~hugh	MSc (University of the South Pacific, Fiji Islands) BSc (Hons) (Victoria University of Wellington, New Zealand)	formal methods, refinement, tool support; network administration, distributed systems, encryption
BRESSAN Stephane Senior Lecturer Email: steph@comp.nus.edu.sg http://www.comp.nus.edu.sg/~steph	PhD (University of Lille, France) MSc (University of Lille, France) Engineering Degree (Ecole Universitaire d'Ingenieur de Lille, France)	integration and management of multimodal and multimedia information from distributed, heterogeneous, and autonomous sources, including peerto- peer architectures
CHAKRABORTY Samarjit Assistant Professor Email: samarjit@comp.nus.edu.sg http://www.comp.nus.edu.sg/~samarjit	PhD (ETH Zurich, Switzerland) MTech (IIT Kanpur, India) BE (Jadavpur University, India)	system-level design and analysis of real-time and embedded systems
CHAN Chee Yong Associate Professor Email: chancy@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chancy	PhD (University of Wisconsin at Madison, USA) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	XML databases, indexing techniques, data warehousing systems
CHAN Mun Choon Assistant Professor Email: chanmc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chanmc	PhD (Columbia University, USA) MPhil (Columbia University, USA) MS (Columbia University, USA) BSc (Purdue University, USA)	wireless data networking, network management, ad hoc and sensor networking
CHANG Ee Chien Assistant Professor Email: changec@comp.nus.edu.sg http://www.comp.nus.edu.sg/~changec	PhD (Courant Institute of Mathematical Sciences, New York University, USA) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	system security, multimedia watermarking and authentication multimedia delivery
CHENG Holun, Alan Assistant Professor Email: hcheng@comp.nus.edu.sg http://www.comp.nus.edu.sg/~hcheng	PhD (University of Illinois at Urbana Champaign, USA) MPhil (Hong Kong University of Science and Technology, China) BSc (Chinese University of Hong Kong, China)	computational geometry, parametric surfaces, computer graphics, visualization, bio-geometric modeling
CHIN Wei Ngan Associate Professor Email: chinwn@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chinwn	PhD (Imperial College, University of London, UK) MSc (University of Manchester, UK) BSc (Hons) (University of Manchester, UK)	programming languages, advanced type systems, program analysis and optimization, dependable software, verification
CHIONH Eng Wee Associate Professorial Fellow Email: chionhew@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chionhew	PhD (University of Waterloo, Canada) MMath (University of Waterloo, Canada) BSc (Nanyang University, Singapore)	computer algebra, computer curves and surfaces
CHUA Tat Seng Professor Email: chuats@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chuats	PhD (University of Leeds, UK) BSc (University of Leeds, UK)	multimedia information processing
DONG Jin Song Associate Professor Email: dongjs@comp.nus.edu.sg http://www.comp.nus.edu.sg/~dongjs	PhD (University of Queensland, Australia) BInfTech (Hons) (University of Queensland, Australia)	time concurrent system, specification, semantic web, formal methods, safety critical systems
FANG Chee Hung, Anthony Assistant Professor Email: afang@comp.nus.edu.sg http://www.comp.nus.edu.sg/~afang	PhD (Brown University, USA) MSc (Brown University, USA) BSc (Hons) (National University of Singapore)	computer graphics, animation and visualization, biomechanical analysis of optimal human movement, computer-aided assessment systems
GOLAM Ashraf Lecturer Email: ashraf@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ashraf	PhD (Nanyang Technological University) BASc (Hons) (Nanyang Technological University)	3D computer animation and graphics, video compression, game development, media/ ntertainment technologies

Name of Faculty Member	Academic Qualification	Research Interest
HENZ Martin Associate Professor Email: henz@comp.nus.edu.sg http://www.comp.nus.edu.sg/~henz	Dr. rer. nat. (Universitat des Saarlandes, Germany) MSc (State University of New York at Stony Brook, USA)	constraint programming systems, combinatorial optimization, evolutionary processes, artificial life
HSU David Associate Professor Email: dyhsu@comp.nus.edu.sg http://www.comp.nus.edu.sg/~dyhsu	PhD (Stanford University, USA) BSc (University of British Columbia, Canada)	robotics, computational biology, geometric algorithms
HSU Wynne Associate Professor Email: whsu@comp.nus.edu.sg http://www.comp.nus.edu.sg/~whsu	PhD (Purdue University, USA) MSc (Purdue University, USA) BSc (National University of Singapore)	data and image mining, multimedia XML information systems, image content analysis, medical imaging, artificial intelligence
JAFFAR Joxan Professor Email: joxan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~joxan	PhD (Monash University, Australia) MSc (University of Melbourne, Australia) BSc (Hons) (University of Melbourne, Australia)	programming languages, applications
JAIN Sanjay Professor Email: sanjay@comp.nus.edu.sg http://www.comp.nus.edu.sg/~sanjay	PhD (University of Rochester, USA) MS (University of Rochester, USA) BTech (IIT Kharagpur, India)	inductive inference, computational learning theory, structural complexity, recursion theory
JARZABEK Stanislaw Associate Professor Email: stan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~stan	PhD (Warsaw University, Poland) MSc (Warsaw University, Poland)	software reuse and evolution
KALNIS Panagiotis Assistant Professor Email: kalnis@comp.nus.edu.sg http://www.comp.nus.edu.sg/~kalnis	PhD (Hong Kong University of Science and Technology, China) Dip (University of Patras, Greece)	OLAP, data warehouses, peer-to-peer, spatial databases, mobile databases
KAN Min Yen Assistant Professor Email: kanmy@comp.nus.edu.sg http://www.comp.nus.edu.sg/~kanmy	PhD (Columbia University, USA) MS (Columbia University, USA) BS (Columbia University, USA)	natural language processing, digital libraries, information retrieval and human-computer interaction
KANKANHALLI Mohan Professor Email: mohan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~mohan	PhD (Rensselaer Polytechnic Institute, USA) MS (Rensselaer Polytechnic Institute, USA) BTech (IIT Kharagpur, India)	multimedia information systems, information security, digital video processing
KHOO Siau Cheng Associate Professor Email: khoosc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~khoosc	PhD (Yale University, USA) MPhil (Yale University, USA) MSc (National University of Singapore) BSc (National University of Singapore)	programming analysis, transformation and optimisation
LEE Mong Li, Janice Associate Professor Email: leeml@comp.nus.edu.sg http://www.comp.nus.edu.sg/~leeml	PhD (National University of Singapore) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	cleaning and integration of heterogeneous and semi-structured data, database performance issues in dynamic environments, biomedical informatics
LEE Wee Sun Associate Professor Email: leews@comp.nus.edu.sg http://www.comp.nus.edu.sg/~leews	PhD (Australian National University, Australia) BEng (Hons) (University of Queensland, Australia)	machine learning, computational learning theory
LEONG Hon Wai Associate Professor Email: leonghw@comp.nus.edu.sg http://www.comp.nus.edu.sg/~leonghw	PhD (University of Illinois at Urbana-Champaign, USA) BSc (University of Malaya, Malaysia)	algorithms for bioinformatics, practical solutions to resource allocation and scheduling (RAS) problems, VLSI CAD algorithms (applied research)
LEONG Tze Yun Associate Professor Email: leongty@comp.nus.edu.sg http://www.comp.nus.edu.sg/~leongty	PhD (Massachusetts Institute of Technology, USA) SM (Massachusetts Institute of Technology, USA) SB (Massachusetts Institute of Technology, USA)	decision-theoretic artificial intelligence, temporal probabilistic reasoning, machine learning, biomedical informatics
LEONG Wing Lup, Ben Assistant Professor Email: bleong@comp.nus.edu.sg http://www.comp.nus.edu.sg/~bleong/	PhD (Massachusetts Institute of Technology, USA) MEng (Massachusetts Institute of Technology, USA) SB (Massachusetts Institute of Technology, USA)	computer networking, network architecture, overlay networks, DHT, peer-to-peer networking, routing algorithms, network coding, distributed systems, organization, architecture and programming models, networked games, algorithms for self-organization, novel data structures
LEOW Wee Kheng Associate Professor Email: leowwk@comp.nus.edu.sg http://www.comp.nus.edu.sg/~leowwk	PhD (University of Texas at Austin, USA) MSc (National University of Singapore) BSc (National University of Singapore)	computer vision, medical image analysis, 3D models

Name of Faculty Member	Academic Qualification	Research Interest
LING Tok Wang Professor Email: lingtw@comp.nus.edu.sg http://www.comp.nus.edu.sg/~lingtw	PhD (Waterloo University, Canada) MMath (Waterloo University, Canada) BSc (Hons) (Nanyang University, Singapore)	data modeling, entity-relationship approach, object-oriented data model, normalization theory, logic and database, ntegrity constraint checking, semi-structured data model, data warehouse
LOW Kok Lim Assistant Professor Email: lowkl@comp.nus.edu.sg http://www.comp.nus.edu.sg/~lowkl/	PhD (University of North Carolina at Chapel Hill, USA) MSc (University of North Carolina at Chapel Hill, USA) BSc (National University of Singapore)	3D scanning and 3D reconstruction of real-world environments and objects from range data and images
MITRA Tulika Associate Professor Email: tulika@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tulika	PhD (State University of New York at Stony Brook, USA) MEng (Indian Institute of Science at Bangalore, India) BE (Jadavpur University, India)	computer architecture with emphasis on micro-architecture, embedded systems, and graphics processors
NG Hwee Tou Associate Professor Email: nght@comp.nus.edu.sg http://www.comp.nus.edu.sg/~nght	PhD (University of Texas at Austin, USA) MS (Stanford University, USA) BSc (University of Toronto, Canada)	natural language processing, information retrieval
NIEDERREITER Harald Professor Email: harald@comp.nus.edu.sg http://www.ricam.oeaw.ac.at/dismat/niederreiter.html	PhD (University of Vienna, Austria)	numerical analysis, pseudorandom numbers, quasi-monte carlo methods, cryptology, finite fields, applied algebra, algorithms, number theory, coding theory
ONG Ghim Hwee Senior Lecturer Email: onggh@comp.nus.edu.sg http://www.comp.nus.edu.sg/~onggh	PhD (Loughborough University of Technology, UK) MSc (Imperial College, University of London, UK) MSc (Nanyang University, Singapore) BSc (Nanyang University, Singapore)	text compression, image coding and compression, data communications techniques, network performance, optimal stable sorting and merging algorithms, parallel processing
OOI Beng Chin Professor Email: ooibc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ooibc	PhD (Monash University, Australia) BSc (Hons) (Monash University, Australia)	database performance issues, indexing techniques, XML and multimedia databases, moving object/RFID/sensor databases, P2P/parallel/distributed computing, embedded systems
OOI Wei Tsang Assistant Professor Email: ooiwt@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ooiwt	PhD (Cornell University, USA) BSc (Hons) (National University of Singapore)	distributed multimedia systems, multimedia middleware and applications
PUNG Hung Keng Associate Professor Email: punghk@comp.nus.edu.sg http://www.comp.nus.edu.sg/~punghk	PhD (University of Kent at Canterbury, UK) BSc (University of Kent at Canterbury, UK)	quality of services, context aware systems, service oriented architecture, mobile services, group communication
RAJAPAKSE Damith Chatura Lecturer Email: damithch@comp.nus.edu.sg http://www.comp.nus.edu.sg/~damithch/	PhD (National University of Singapore) BSc (University of Moratuwa, Sri Lanka)	software engineering, web engineering, software maintenance, software reuse, lightweight software processes, software development best practices
ROYCHOUDHURY Abhik Associate Professor Email: abhik@comp.nus.edu.sg http://www.comp.nus.edu.sg/~abhik	PhD (State University of New York at Stony Brook, USA) MS (State University of New York at Stony Brook, USA) BE (Jadavpur University, India)	models/methods for reasoning about programs, program debugging, reliable software development with focus on modeling/analysis techniques for embedded software development
SEAH Khoon Guan, Winston Adjunct Assistant Professor Email: wseah@comp.nus.edu.sg http://www.comp.nus.edu.sg/~wseah	DrEng (Kyoto University, Japan) MEng (National University of Singapore) BSc (National University of Singapore)	mobile ad-hoc and sensor networks with emphasis on quality of service and routing, focusing on mobility-enhanced lightweight protocols and communication (C3) and sensing applications in terrestrial and oceanographic networksalgorithms for command, control and communication (C3) and sensing applications in terrestrial and oceanographic networks
SIM Mong Cheng, Terence Assistant Professor Email: tsim@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tsim	PhD (Carnegie Mellon University, USA) MSc (Stanford University, USA) SB (Massachusetts Institute of Technology, USA)	face recognition, face rendering, biometrics, digital photography
STEPHAN Frank Associate Professor Email: fstephan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~fstephan/	PhD (University of Karlsruhe, Germany) BSc (University of Karlsruhe, Germany)	recursion theory, learning theory, computational complexity, automata and formal languages
SULZMANN Martin Assistant Professor Email: sulzmann@comp.nus.edu.sg http://www.comp.nus.edu.sg/~sulzmann	PhD (Yale University, USA) MSc (Yale University, USA) Dipl Inf (University of Karlsruhe, Germany)	programming languages and systems

Name of Faculty Member	Academic Qualification	Research Interest
SUNG Wing Kin, Ken Associate Professor Email: ksung@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ksung	PhD (University of Hong Kong, China) BSc (University of Hong Kong, China)	computational biology, algorithms
TAN Chew Lim Associate Professor Email: tancl@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tancl	PhD (University of Virginia, USA) MSc (University of Surrey, UK) BSc (Hons) (University of Singapore)	document image analysis, text mining, natural language processing, neural network applications, genetic programming
TAN Choon Leng, Raymond Lecturer Email: rtan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~rtan	MComp (National University of Singapore) BSc (Hons) (National University of Singapore)	computer science pedagogy, cryptography, security
TAN Keng Yan, Colin Lecturer Email: ctank@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ctank	PhD (National University of Singapore) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	defeasible reasoning, belief revision epistemic logic, ontologies, dialog and discourse modeling, chance discovery
TAN Kian Lee Associate Professor Email: tankl@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tankl	PhD (National University of Singapore) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	multimedia information retrieval, query processing, optimization in multiprocessor and distributed systems, database performance, database security, genome databases
TAN Soon Huat, Gary Associate Professor Email: gtan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~gtan	PhD (University of Manchester, UK) MSc (University of Manchester, UK) BSc (Hons) (National University of Singapore)	parallel and distributed computing, scheduling and load balancing, parallel and distributed simulation and high level architecture
TAN Sun Teck Senior Lecturer Email: tanst@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tanst	PhD (Essex University, UK) MSc (Essex University, UK) BSc (Nanyang University, Singapore)	multimedia computer-based tutoring system, artificial intelligence, chinese computing
TAN Tiow Seng Associate Professor Email: tants@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tants	PhD (University of Illinois at Urbana-Champaign, USA) MSc (National University of Singapore) BSc (National University of Singapore)	algorithms, computer graphics, computational geometry
TAN Tuck Choy, Aaron Lecturer Email: tantc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tantc	MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	algorithms, data structures, computational geometry
TAY Yong Chiang Professor Email: tayyc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tayyc	PhD (Harvard University, USA) BSc (Hons) (University of Singapore)	performance modeling (e.g. internet equilibrium, page faults, wireless access), global time in distributed computing, database systems
TEO Yong Meng Associate Professor Email: teoym@comp.nus.edu.sg http://www.comp.nus.edu.sg/~teoym	PhD (University of Manchester, UK) CEng (Engineering Council, UK) MSc (University of Manchester, UK) BTech (Hons) (University of Bradford, UK)	parallel/distributed computing, parallel computer architecture, performance modeling/analysis, grid omputing, parallel/distributed simulation
THIAGARAJAN P.S. Professor Email: thiagu@comp.nus.edu.sg http://www.comp.nus.edu.sg/~thiagu	PhD (Rice University, USA) MS (Rice University, USA) BTech (IIT Madras, India)	system level design methods for embedded systems, real time and hybrid systems, computational systems biology
TUNG Kum Hoe, Anthony Assistant Professor Email: atung@comp.nus.edu.sg http://www.comp.nus.edu.sg/~atung	PhD (Simon Fraser University, Canada) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	databases, data mining
VOICU Razvan Lecturer Email: razvan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~razvan	PhD (National University of Singapore) Dip-Ing (Technical University of Iasi, Romania)	program correctness, verification of concurrent programs, program analysis, model-checking and semantics-based program manipulation
WADHWA Bimlesh Lecturer Email: bimlesh@comp.nus.edu.sg http://www.comp.nus.edu.sg/~bimlesh	PhD (University of Delhi, India) MTech (National University of Singapore) MSc (University of Delhi, India) BSc (University of Delhi, India)	software metrics, virtual learning environments

Name of Faculty Member	Academic Qualification	Research Interest
WANG Ye Assistant Professor Email: wangye@comp.nus.edu.sg http://www.comp.nus.edu.sg/~wangye	PhD (Tampere University of Technology, Finland) Diplom-Ingenieur (Technische Universität Braunschweig, Germany) BSc (Southern China University of Technology, China)	computational music and computer-assisted music education, robust and scalable media streaming, audio processing and analysis, low power media processing, audio compression and compressed domain audio processing
WONG Limsoon Professor Email: wongls@comp.nus.edu.sg http://www.comp.nus.edu.sg/~wongls/	PhD (University of Pennsylvania, USA) MSc (University of Pennsylvania, USA) BSc (Imperial College London, UK)	query language theory, finite model theory, bioinformatics, knowledge discovery
WONG Weng Fai Associate Professor Email: wongwf@comp.nus.edu.sg http://www.comp.nus.edu.sg/~wongwf	DrEngSc (University of Tsukuba, Japan) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	embedded systems, compilers and runtime systems, computer architecture
XING Chaoping Professor Email: xingcp@comp.nus.edu.sg http://www.comp.nus.edu.sg/~xingcp	PhD (University of Science and Technology of China, China) MSc (Xi'an Electronic Engineering Institute of Science and Technology, University, China) BSc (Anhui Normal University, China)	coding theory, cryptography, number theory, scientific computing
YAP Hock Chuan, Roland Associate Professor Email: ryap@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ryap	PhD (Monash University, Australia) MSc (Monash University, Australia) BSc (Hons) (Monash University, Australia)	programming languages, applications
YU Haifeng Assistant Professor Email: yuhf@comp.nus.edu.sg http://www.comp.nus.edu.sg/~yuhf/	PhD (Duke University, USA) MSc (Duke University, USA) BEng (Shanghai Jiao Tong University, China)	distributed systems, peer-to-peer systems, fault-tolerance, distributed computing, and distributed system security
ZIMMERMANN Roger Associate Professor rogerz@comp.nus.edu.sg http://www.comp.nus.edu.sg/~rogerz/	PhD (University of Southern California, USA) MSc (University of Southern California, USA)	streaming media architectures, peer-to-peer streaming and architectures, spatio-temporal database systems and mobile data management, parallel and distributed systems, storage systems

Faculty Members

(Department of Information Systems)

Name of Faculty Member	Academic Qualification	Research Interest
CHAN Hock Chuan Associate Professor Email: chanhc@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chanhc	PhD (University of British Columbia, Canada) MA (University of Cambridge, UK) BA (Hons) (University of Cambridge, UK)	human computer interaction, information technology adoption, virtual community
GOH Khim Yong Assistant Professor Email: gohky@comp.nus.edu.sg http://www.comp.nus.edu.sg/~gohky	PhD (University of Chicago, USA) MSc (National University of Singapore) BSc (National University of Singapore)	internet marketing, online auctions, economics of IS
HENG Cheng Suang Assistant Professor Email: hengcs@comp.nus.edu.sg http://www.comp.nus.edu.sg/~hengcs	PhD (Stanford University, USA) MSc (National University of Singapore) BSc (National University of Singapore)	human robotic interaction, software project management, virtual communities
HUANG, Ke Wei Assistant Professor Email: huangkw@comp.nus.edu.sg http://www.comp.nus.edu.sg/~huangkw	PhD (New York University, USA) MPhil (New York University, USA) MSc (New York University, USA) MBA (National Taiwan University, Taiwan) BSc (National Taiwan University, Taiwan)	economics of information systems, e-commerce pricing, theoretical models of industrial organisation
HUI Kai Lung Associate Professor Email: lung@comp.nus.edu.sg http://www.comp.nus.edu.sg/~lung	PhD (Hong Kong University of Science and Technology, China) BBA (Hong Kong University of Science and Technology, China)	intellectual property copyright, information privacy, internet branding, product line design
HUNG Yu-Ting, Caisy Assistant Professor Email: chung@comp.nus.edu.sg http://www.comp.nus.edu.sg/~chung	PhD (Indiana University, USA) MBA (Indiana University, USA) MSc (University of Maryland, USA) BSc (Chun-Yuan Christian University, Taiwan)	cross cultural issues, group support systems, virtual community
JIANG Zhenhui, Jack Assistant Professor Email: jiang@comp.nus.edu.sg http://www.comp.nus.edu.sg/~jiang	PhD (University of British Columbia, Canada) MBA (Tsinghua University, China) BEcon (Tsinghua University, China) BEng (Tsinghua University, China)	human computer interaction, electronic commerce
KANKANHALLI Atreyi Assistant Professor Email: atreyi@comp.nus.edu.sg http://www.comp.nus.edu.sg/~atreyi	PhD (National University of Singapore) MSc (Rensselaer Polytechnic Institute, USA) BTech (IIT Delhi, India)	knowledge management, virtual community, information systems security
KIM Hee Woong Assistant Professor Email: kimhw@comp.nus.edu.sg http://www.comp.nus.edu.sg/~kimhw	PhD (Korea Advanced Institute of Science and Technology, South Korea) MSc (Pohang University of Science and Technology, South Korea) BSc (Pohang University of Science and Technology, South Korea)	online consumer behaviour, enterprise systems
LIM Lai Huat, John Associate Professor Email: jlim@comp.nus.edu.sg http://www.comp.nus.edu.sg/~jlim	PhD (University of British Columbia, Canada) MSc (National University of Singapore) BEng (Hons) (National University of Singapore)	negotiation and group support, information technology and education, cross cultural issues
NG Boon Yuen Lecturer Email: ngby@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ngby	MS (University of Illinois at Urbana-Champaign, USA) BS (University of California at Berkeley, USA)	information systems security, electronic commerce, information society policies
PAN Shan Ling Assistant Professor Email: pansl@comp.nus.edu.sg http://www.comp.nus.edu.sg/~pansl	PhD (University of Warwick, UK) MBA (University of Texas at San Antonio, USA) MA (University of London, UK) BSBA (Southeast Missouri State University, USA)	knowledge management, enterprise systems, electronic government
PNG Paak Liang, Ivan Chair Professor Email: ipng@comp.nus.edu.sg http://www.comp.nus.edu.sg/~ipng	PhD (Stanford University, USA) BA (Hons) (University of Cambridge, UK)	economics of copyright, information privacy
POO Chiang Choon, Danny Associate Professor Email: dpoo@comp.nus.edu.sg http://www.comp.nus.edu.sg/~dpoo	PhD (University of Manchester, UK) MSc (University of Manchester, UK) BSc (Hons) (University of Manchester, UK)	economics of information systems, e-commerce pricing, theoretical models of industrial organisation
SETIONO Rudy Associate Professor Email: rudys@comp.nus.edu.sg http://www.comp.nus.edu.sg/~rudys	PhD (University of Wisconsin-Madison, USA) MSc (Eastern Michigan University, USA) BSc (Eastern Michigan University, USA)	neural networks, data mining, non-linear optimization

Name of Faculty Member	Academic Qualification	Research Interest
SIOW Yuen Khong, Alex Adjunct Professor Email: asiow@comp.nus.edu.sg http://www.comp.nus.edu.sg/~asiow	MSc (Birmingham University, UK) BEng (Stuttgart Institute of Technology, Germany)	open source software, IT adoption
TAN Cheng Yian, Bernard Professor Email: btan@comp.nus.edu.sg http://www.comp.nus.edu.sg/~btan	PhD (National University of Singapore) MSc (National University of Singapore) BSc (Hons) (National University of Singapore)	cross cultural issues, group support systems, knowledge management, information privacy
TAN Gek Woo Lecturer Email: tangw@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tangw	PhD (University of Illinois at Urbana-Champaign, USA) MSc (Indiana University, USA) BSc (Hons) (National University of Singapore)	virtual community, knowledge management, supply chain management, website design
TAN Hung Pheng Senior Lecturer Email: tanhp@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tanhp	PhD (State University of New York at Buffalo, USA) MA (State University of New York at Buffalo, USA) BSc (Nanyang University, Singapore)	banking technology, banking security, risk management, information sharing
TAN Swee Lin, Sharon Assistant Professor Email: tansl@comp.nus.edu.sg http://www.comp.nus.edu.sg/~tansl	PhD (Carnegie Mellon University, USA) MSc (Carnegie Mellon University, USA) MSc (National University of Singapore) BSc (National University of Singapore)	knowledge management, IT in healthcare
TEO Hock Hai Associate Professor Email: teohh@comp.nus.edu.sg http://www.comp.nus.edu.sg/~teohh	PhD (National University Singapore) MSc (National University Singapore) BSc (Hons) (National University Singapore)	information technology adoption, electronic markets, virtual community, information privacy
WOON Mei Yen, Irene Senior Lecturer Email: iwoon@comp.nus.edu.sg http://www.comp.nus.edu.sg/~iwoon	PhD (Aston University, UK) MSc (Aston University, UK) BBA (University of Singapore)	information systems security
XU Yunjie, Calvin Assistant Professor Email: xuyj@comp.nus.edu.sg http://www.comp.nus.edu.sg/~xuyj	PhD (Syracuse University, New York, USA) MSc (Fudan University, China)	electronic commerce, online consumer behavior
YEO Gee Kin Associate Professor Email: yeogk@comp.nus.edu.sg http://www.comp.nus.edu.sg/~yeogk	PhD (University of Waterloo, Canada) BSc (Hons) (University of Singapore)	simulation and gaming, modeling for decision support, knowledge gaming
YEOH Song Chian, Francis Adjunct Associate Professor Email: fyeoh@comp.nus.edu.sg http://app.sgdi.gov.sg/listing.asp?agency_subtype=dept&agency_id=0000011980	PhD (Loughborough University, UK) MSc (Massachusetts Institute of Technology, USA) BSc (Loughborough University, UK)	IT entrepreneurship

Research Projects

Research Funding Statistics

Ongoing Projects from April 2005 to March 2007

Total Funding from the Ministry of Education:	$ 7,352,511.00
Total Funding from A*STAR:	$ 5,306,458.00
Total Funding from Other Agencies:	$ 198,734.00
Grand Total:	$ 12,857,703.00

New Projects Approved from April 2005 to March 2007

Total Funding from the Ministry of Education:	$ 5,338,842.00
Total Funding from A*STAR:	$ 3,948,614.00
Total Funding from Other Agencies:	$ 2,209,320.00
Grand Total:	$ 11,496,776.00

Research Projects Listing

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
AKKIHEBBAL L. Ananda	CS	A Reactive Transport Service for Converged Networks	Oct 2004	Dec 2008	138,000.00
AKKIHEBBAL L. Ananda	CS	Investigations into Cross Layer Architecture for IP Mobility Scenarios	Sep 2004	July 2007	81,274.00
CHAKRABORTY Samarjit	CS	ASTRA System-Level Design and Analysis of Architectures for Streaming Applications	Jun 2004	May 2008	180,000.00
CHAKRABORTY Samarjit	CS	ModNP : Models and Methods for Network Processor Design	Aug 2003	Oct 2006	23,500.00
CHAN Chee Yong	CS	Multi-Instance Conscious Database System	Aug 2006	Aug 2008	134,380.00
CHAN Chee Yong	CS	Skyline Query Processing	Mar 2005	Oct 2008	105,300.00
CHAN Chee Yong	CS	Querying XML with Security Views	July 2003	Sep 2005	23,500.00
CHAN Mun Choon	CS	Management and Control of Wireless Sensor Network	Jul 2006	Jun 2008	200,000.00
CHAN Mun Choon	CS	Resource Management and Transport Layer Issues in Heterogeneous Wireless Networks	Mar 2004	Mar 2007	75,000.00
CHANG Ee Chien	CS	Robust and Secure Technologies on Biometric and Multimedia Objects	Jul 2006	Jun 2008	66,800.00
CHANG Ee Chien	CS	A System for Remote Monitoring	Feb 2004	Jan 2006	75,500.00
CHENG Holun, Alan	CS	Adaptive Agents for Real-time Multiplayer Games	Mar 2007	Feb 2009	29,520.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
CHENG Holun, Alan	CS	Quality Meshing for Smooth Molecular Mode	May 2005	Aug 2007	27,520.00
CHENG Holun, Alan	CS	Visualisation of Deformable Skin Surfaces and Topology Optimization	May 2002	Oct 2005	104,580.00
CHIN Wei Ngan (Other Agency)	CS	Region Memory System for Scalable Performance	Jun 2006	May 2008	76,118.00
CHIN Wei Ngan (A*STAR)	CS	A Constructive Framework for Dependable Software	Sep 2005	Aug 2008	434,627.00
CHIN Wei Ngan (Other Agency)	CS	Inferring Nullness Safety for Rotor in Presence of Exceptions	Mar 2005	Feb 2006	24,600.00
CHIN Wei Ngan	CS	Verifying Software Safety with Constraint Type System	Mar 2005	Feb 2007	42,000.00
CHIN Wei Ngan	CS	Models and Methods for a Pattern Discovery Language	Aug 2003	Jan 2006	107,640.00
CHIONH Eng Wee	CS	Efficient Pure Bracket Sparse Resultants	Feb 2005	Dec 2007	11,000.00
CHUA Tat Seng (Other Agency)	CS	Project TACREA	Apr 2006	Mar 2008	258,000.00
CHUA Tat Seng (Other Agency)	CS	Topic Detection, Tracking and Threading in Multi-Lingual News Video	Sep 2005	Dec 2007	80,600.00
CHUA Tat Seng (A*STAR)	CS	Intelligent Media Processing Based on Graphical Models	Apr 2004	Mar 2008	365,000.00
CHUA Tat Seng (Other Agency)	CS	Compressed Domain Frontal Face Detector Using DCT Coefficients	Mar 2004	Jun 2006	59,125.00
CHUA Tat Seng	CS	Event-Based Question Answering	Feb 2004	Feb 2006	300,000.00
CHUA Tat Seng (Other Agency)	CS	Personalized News Video Retrieval in the Digital Broadcasting Environments	Aug 2003	Dec 2006	115,009.00
CHUA Tat Seng (A*STAR)	CS	Intelligent Media and Information Processing	May 2003	Apr 2006	662,000.00
DONG Jin Song (Other Agency)	CS	Formal Semantics for Semantic Web: Theory and Publication	Nov 2006	May 2007	2,000.00
DONG Jin Song (Other Agency)	CS	Timed Formalisms for Plan Ontology and Processes	Jul 2006	Jul 2007	38,060.00
DONG Jin Song	CS	Advanced Languages and Tools for Web Ontology with Defense Related Applications	Apr 2006	Mar 2009	144,300.00
DONG Jin Song (Other Agency)	CS	Advanced Languages and Tools for Web Ontology with Defense Related Applications	Apr 2006	Mar 2009	145,000.00
DONG Jin Song	CS	Reliable Software Design and Development for Sensor Network Systems	Apr 2005	Mar 2007	124,900.00
DONG Jin Song	CS	Rigorous Design Methods and Tools for Intelligent Autonomous Multi-Agent Systems	Nov 2004	Dec 2007	605,176.00
FANG Chee Hung, Anthony (A*STAR)	CS	Performance Visualization and Optimization in Sports Biomechanics	Jan 2006	Dec 2008	352,800.00
FANG Chee Hung, Anthony	CS	Physically Based Motion Editing	Oct 2003	Oct 2006	66,666.00
GOLAM Ashraf	CS	Real Time Animation and Modeling of Natural Phenomena	Mar 2005	Dec 2007	38,000.00
HENZ Martin	CS	Conditions for Life in Artificial Chemistries	Feb 2004	Dec 2005	48,000.00
HSU David (Other Agency)	CS	LOCAS: Multi-Robot Cooperative Target Tracking	Feb 2007	Jan 2009	75,000.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
HSU David	CS	Exploring the Structure of High Dimensional Space: Towards One Thousand Degrees of Freedom	Apr 2006	Mar 2008	29,500.00
HSU David	CS	Protein Motion Analysis Using Randomised Motion Planning	Mar 2003	May 2007	133,580.00
HSU Wynne (A*STAR)	CS	RetinaMiner: Discovering Changes in Retina Images	Sep 2004	Feb 2008	513,240.00
HSU Wynne (A*STAR)	CS	Knowledge Discovery in Biological and Clinical Data	Jul 2003	Jun 2007	937,000.00
JAFFAR Joxan	CS	Program Specification and Verification Using CLP	Oct 2005	Sep 2008	250,000.00
JAFFAR Joxan	CS	An Implementation of Constraint Transition Systems	Oct 2005	Jan 2008	38,500.00
JAFFAR Joxan	CS	Constraint Traces	Jul 2003	Dec 2005	139,000.00
JAIN Sanjay	CS	Complexity of Learning and Sublearning	Sep 2002	Aug 2006	37,000.00
JARZABEK Stanislaw	CS	Meta-level Parameterization and Generation for Enhanced Genericity	Dec 2005	Nov 2008	200,000.00
JARZABEK Stanislaw	CS	Assessment and Dynamic Analysis of Meta-Programs	Feb 2005	Dec 2006	59,000.00
JARZABEK Stanislaw	CS	Meta-Programming: Elimination of Software Redundancies and Tool Support	Jan 2004	Sep 2005	61,000.00
KALNIS Panagiotis	CS	Multiple Query Optimization in Mobile Wireless Systems	Feb 2006	Feb 2008	16,452.00
KALNIS Panagiotis	CS	Information Retrieval in Peer-to-Peer Networks	Sep 2004	Sep 2006	27,000.00
KAN Min Yen	CS	Mathematical Equation Indexing, Search and Retrieval	Feb 2007	Jan 2009	39.500.00
KAN Min Yen	CS	Natural Language Query Analysis for Web Queries	Jan 2006	Jan 2008	41,955.00
KAN Min Yen	CS	Corpus-Based Query Expansion in Online Public Access Catalogs	Jul 2003	Jun 2006	31,000.00
KANKANHALLI Mohan	CS	Coopetitive Visual Surveillance	Mar 2006	Mar 2008	77,520.00
KANKANHALLI Mohan	CS	Event-based Family E-Chronicles	Mar 2005	Sep 2008	146,150.00
KANKANHALLI Mohan	CS	Cryptographic Techniques for Media Security	Jul 2003	Oct 2006	43,000.00
KHOO Siau Cheng	CS	Principles and Practice of Aspect-Oriented Functional Languages	Feb 2006	Feb 2008	61,396.00
KHOO Siau Cheng	CS	A Language-Based Approach to Financial Analyses	Dec 2002	Nov 2006	310,600.00
LEE Mong Li Janice	CS	Medical Image Analysis and Visualization	Jul 2003	Jun 2008	142,000.00
LEE Wee Sun	CS	Bayesian Methods in Machine Learning	Nov 2005	Nov 2008	179,900.00
LEONG Wing Lup, Ben	CS	Hydra - A Peer-to-Peer Architecture for Massively Multiplayer Online Games	Jan 2007	Jan 2009	154,314.00
LEONG Hon Wai	CS	Algorithms for Peptide Sequencing and Fragment Assembly	Dec 2006	Dec 2008	69,000.00
LEONG Hon Wai	CS	Algorithms in Computational Biology	Sep 2004	Jun 2007	37,000.00
LEONG Tze Yun (Other Agency)	CS	Project ResEasy: A Trial Workbench for Facilitating Best Practices from Prospective to Acute Care in Respiratory Medicine	Mar 2006	Sep 2007	617,040.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
LEONG Wing Lup Ben	CS	Hydra - A Peer-to-Peer Architecture for Massively Multiplayer Online Games	Jan 2007	Jan 2009	154,314.00
LEONG Hon Wai	CS	Algorithms for Peptide Sequencing and Fragment Assembly	Dec 2006	Dec 2008	69,000.00
LEONG Hon Wai	CS	Algorithms in Computational Biology	Sep 2004	Jun 2007	37,000.00
LEONG Tze Yun (Other Agency)	CS	Project ResEasy: A Trial Workbench for Facilitating Best Practices from Prospective to Acute Care in Respiratory Medicine	Mar 2006	Dec 2007	617,040.00
LEONG Tze Yun	CS	An Intelligent Human Organ Motion Recognition and Segmentation System Using 3D Medical Magnetic Resonance Images (MRIs) to Support Medical Decision Making	Mar 2005	Feb 2007	146,000.00
LEOW Wee Kheng	CS	Atomistic Computational Modeling of Protein-Protein Interaction with Applications to WW Domains	Feb 2007	Jan 2009	87,000.00
LEOW Wee Kheng (A*STAR)	CS	MMedWeb - Multimedia Medical Conceptual Web for Intelligent Information Access	Jul 2006	Jun 2009	530,840.00
LEOW Wee Kheng	CS	Indexing, Matching and Retrieval of 3D Models	Nov 2002	Nov 2006	205,794.00
LING Tok Wang	CS	Building a Semi-Structured Data Repository	Jun 2001	Nov 2006	90,600.00
LING Tok Wang	CS	Integrating Data Warehousing on the Web	Dec 2001	Dec 2006	127,200.00
LOW Kok Lim	CS	Data Acquisition for Digital Reconstruction of 3D Objects and Environments	Feb 2006	Feb 2008	113,840.00
MITRA Tulika	CS	Designing Customizable Multiprocessor Systems-on-Chips	Feb 2007	Jan 2009	52,500.00
MITRA Tulika	CS	Techniques to Support Timing and Power Guarantees for Embedded Code	Aug 2003	Aug 2007	231,000.00
NG Hwee Tou	CS	Corpus-Based Semantic Parsing	Jun 2005	Dec 2008	256,800.00
NG Hwee Tou	CS	Scaling Up Word Sense Disambiguation with Application to Machine Translation	Jul 2002	Jul 2005	90,203.00
ONG Ghim Hwee	CS	Partitioning Schemes for Image Compression	May 2002	Oct 2006	57,000.00
OOI Beng Chin	CS	Idiot Proof Query Interface to Database Systems	Feb 2007	Feb 2008	36,500.00
OOI Beng Chin	CS	Query Processing on Data Streams	Mar 2006	Jun 2007	35,000.00
OOI Beng Chin	CS	Data Management and Query Processing in a Network of Small Databases	Mar 2005	Jun 2007	75,480.00
OOI Beng Chin (A*STAR)	CS	SANDY: A Spatio-temporal Autonomic Database System for Location-based Services	Feb 2004	Aug 2007	591,380.00
OOI Beng Chin	CS	Building an Infrastructure and Tools for Storing, Searching and Analyzing Sequences	Nov 2003	Jun 2006	150,000.00
OOI Beng Chin	CS	Database Support for Location Based Services	Mar 2003	Sep 2005	121,460.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
OOI Beng Chin	CS	P2P Based Data Management System	Mar 2003	Sep 2005	148,160.00
OOI Wei Tsang	CS	Goal-Oriented Video Streaming	Aug 2005	Jul 2007	87,800.00
PUNG Hung Keng (A*STAR)	CS	Context Aware Middleware Services and Programming Support for Sentient Computing	May 2006	Apr 2009	741,502.00
PUNG Hung Keng (A*STAR)	CS	A Semantic Based QoS Control and Management Framework for Grids	Sep 2005	Aug 2007	262,845.00
PUNG Hung Keng	CS	An Adaptive Business Service Model and Architecture for Small-And-Medium Enterprises	Apr 2005	Mar 2008	133,400.00
ROYCHOUDHURY Abhik (A*STAR)	CS	Tools and Techniques for Model Based Software Debugging	Sep 2004	Aug 2007	361,648.00
SIM Mong Cheng, Terence (Other Agency)	CS	Project Tallyface	Apr 2006	Mar 2009	500,000.00
SIM Mong Cheng, Terence (Other Agency)	CS	Continuous Biometric Authentication for Reactive Security in Operating Systems	Apr 2006	Apr 2007	24,491.00
SIM Mong Cheng, Terence	CS	Digicam ++	Oct 2004	Jan 2006	66,800.00
SIM Mong Cheng, Terence	CS	FACE Project	Mar 2003	Jun 2005	91,700.00
STEPHAN Frank	CS	Deciding, Predicting and Learning	Feb 2005	Jan 2008	41,000.00
SULZMANN Martin	CS	Program Verification via Expressive Types	Aug 2006	Jul 2008	35,000.00
SULZMANN Martin	CS	Type-Safe Polymorphic XML Transformations	Mar 2006	Feb 2008	52,800.00
SULZMANN Martin	CS	Writing Programs and Logics in Chameleon	Nov 2004	Nov 2006	48,040.00
SULZMANN Martin	CS	Constraint-based Program Verification in Chameleon	May 2003	Dec 2005	59,200.00
SUNG Win Kin, Ken	CS	Applying Probabilistic Bayesian Models to Bioinformatics	Jul 2003	Jun 2005	23,000.00
TAN Chew Lim	CS	Intelligent Search and Analysis of Medical Images Using Machine Learning and Text Mining Techniques	Feb 2007	Jan 2008	47,000.00
TAN Chew Lim (Other Agency)	CS	Document Information Mining for Digital Libraries	Oct 2006	Dec 2008	23,310.00
TAN Chew Lim (Other Agency	CS	Alignment and Translation Modeling on Comparable Corpus	Sep 2006	Dec 2007	49,000.00
TAN Chew Lim (A*STAR)	CS	Information Retrieval from Complex Document Images	Jan 2005	Dec 2007	300,490.00
TAN Chew Lim	CS	Information Extraction and Classification from Widely Varying Document Image Sources	Oct 2004	Mar 2008	143,200.00
TAN Chew Lim (A*STAR)	CS	Information Extraction for Biology Literature	Jul 2003	Aug 2007	188,920.00
TAN Chew Lim (A*STAR)	CS	Document Information Miniaturization and Portability	July 2002	Jun 2005	471,090.00
TAN Keng Yan Colin	CS	Discovery and Amelioration of inflight Risks in Real-Time Flight Data	Aug 2005	Aug 2008	85,400.00
TAN Kian Lee	CS	A Distributed System for Standing Subscriptions	Jan 2006	Dec 2008	260,000.00
TAN Kian Lee	CS	UNOdb: Towards Uncheatable Outsourced Databases	Aug 2005	Dec 2007	123,000.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
TAN Kian Lee	CS	Authentication and Dissemination of Data in Edge Computing	Mar 2004	Feb 2006	67,300.00
TAN Kian Lee	CS	Peer-based Data Management	Jul 2003	Jun 2005	83,000.00
TAN Soon Huat Gary	CS	Composability of Simulation Models	Feb 2005	Feb 2008	56,640.00
TAN Soon Huat Gary	CS	Distributed Supply Chain Simulation	Dec 2001	Jul 2005	33,100.00
TAN Tiow Seng	CS	Infra-Structure Presentation System	Mar 2006	Feb 2008	45,000.00
TAN Tiow Seng	CS	Line as Geometric Primitive for Computer Graphics Applications	Mar 2005	Feb 2007	38,000.00
TAN Tiow Seng	CS	Real-Time Rendering with Programmable Graphics Hardware	Feb 2004	Dec 2005	39,100.00
TAN Tiow Seng	CS	Geometric Design as Generic Spatial Forms	Aug 2003	Dec 2005	150,000.00
TEO Yong Meng (Other Agency)	CS	Performance Analysis of Petascale Systems	Jan 2007	Jan 2008	65,000.00
TEO Yong Meng	CS	Fault-tolerant Consensus Problem in Ad hoc Distributed Systems	Jan 2006	Dec 2007	62,200.00
TEO Yong Meng	CS	Formalization of Self-Stabilization in Large Distributed Systems	Jan 2005	Dec 2006	16,000.00
TEO Yong Meng	CS	Fault-tolerant Consensus in Distributed Systems	Jan 2004	Dec 2005	25,990.00
THIAGARAJAN P.S.	CS	Scenario-based Protocol and Interface Descriptions	Mar 2006	Feb 2008	34,000.00
THIAGARAJAN P.S. (A*STAR)	CS	Formal Design Techniques for Reactive Embedded Systems	Feb 2003	Aug 2006	429,200.00
TUNG Kum Hoe, Anthony	CS	GEMINI : Gene Expression Mining	Nov 2006	Oct 2009	250,000.00
TUNG Kum Hoe, Anthony	CS	Dominant Relationship Analysis	Jul 2006	Jun 2008	46,040.00
TUNG Kum Hoe, Anthony	CS	Applying Embedded System Technology for Data Mining	Apr 2003	Jun 2006	170,360.00
TUNG Kum Hoe, Anthony	CS	Pro-Active Data Mining	Mar 2002	Jun 2005	149,680.00
WANG Ye	CS	The Creation of an Interactive Digital Violin Tutor (iDVT)	Aug 2006	Jul 2008	108,200.00
WANG Ye	CS	Perception-Aware Low-Power Media Processing for Portable Devices	Nov 2005	Oct 2008	230,000.00
WANG Ye	CS	Creation of a Virtual Violin Player	Apr 2004	Mar 2007	140,000.00
WANG Ye	CS	Content-based Audio Processing and Delivery	Aug 2003	Jan 2006	63,180.00
WONG Limsoon (A*STAR)	CS	Individual-Based Modelling on the Spread of Infectious Diseases in Singapore	Jan 2007	Dec 2008	276,000.00
WONG Limsoon	CS	Graph-Based Protein Function Prediction	Oct 2006	Sep 2009	220,000.00
WONG Limsoon	CS	Pattern Spaces: Theory, Algorithms and Applications	Nov 2005	Oct 2008	50,100.00
WONG Weng Fai (A*STAR)	CS	EASEL : Engineering Architectures and Software in the Embedded Landscape	Mar 2006	Feb 2009	1,350,000.00
WONG Weng Fai	CS	High Level Synthesis for Embedded Applications on System-on-a-Chip	Feb 2006	Feb 2008	109,228.00
WONG Weng Fai	CS	Synthesis and Design Optimization for System-on-a-chip and Embedded System	Mar 2004	May 2006	32,200.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
WONG Weng Fai (A*STAR)	CS	FLARES: Flexible Architecture for Embedded Systems	Feb 2003	Jan 2006	486,490.00
YAP Hock Chuan, Roland (Other Agency)	CS	SELFMAN: Self Management for Large-Scale Distributed Systems based on Structured Overlay Networks and Components	Dec 2006	Nov 2009	255,701.00
YAP Hock Chuan, Roland	CS	Towards More Intelligent Search	Jun 2005	May 2008	141,200.00
YAP Hock Chuan, Roland	CS	Enabling Effective Distributed Computing	Mar 2004	Feb 2008	33,400.00
YU Haifeng	CS	Meeting New Challenges in Highly Available Decentralised Distributed Systems	Jan 2007	Jan 2009	173,716.00
ZIMMERMANN Roger	CS	Scalable Real-Time Collaboration Platform	Jan 2007	Jan 2009	143,686.00
CHAN Hock Chuan	IS	User Acceptance of Software Systems	Mar 2003	Feb 2007	45,700.00
GOH Khim Yong	IS	Consumer Choice and Firm Provision of Technology Products Under Network and Branding Effects	Nov 2005	Nov 2007	52,400.00
HENG Cheng Suan	IS	IT Technopreneurs: Safeguarding Against Failure	Nov 2005	Nov 2007	52,400.00
HUNG Yu Ting, Caisy	IS	Culture and Communication Effectiveness in Global Virtual Teams	Dec 2004	Nov 2007	41,666.00
JIANG Zhenhui, Jack	IS	Investigation of Website Aesthetics, Its Formation and Impact	Feb 2007	Feb 2008	30,020.00
JIANG Zhenhui, Jack	IS	Examining the Effects of Interactivity and Vividness of Virtual Product Experience	Dec 2004	Sep 2007	41,666.00
KANKANHALLI Atreyi	IS	Knowledge Management and IT Implementation in Public Sector	Jul 2006	Jun 2008	37,379.00
KANKANHALLI Atreyi	IS	Knowledge Management Systems and Applications	Jul 2004	Jun 2007	41,666.00
KIM Hee Woong	IS	Retaining Customers and Generating Price Premium in Electronic Markets	Sep 2005	Sep 2008	54,000.00
KIM Hee Woong	IS	Exploring the Mechanism Leading to the Success of Electronic Commerce	Aug 2003	Aug 2006	42,000.00
NG Boon Yuen	IS	Information Security Management	Jan 2004	Dec 2007	15,000.00
PAN Shan Ling	IS	The Role of Social Capital in Knowledge Management Practice: An Asia Pacific Study	Dec 2005	Nov 2007	90,836.00
PAN Shan Ling	IS	Exploring the Strategic Factors That Contribute to Successful ES Implementation: An Asia Pacific Study	Sep 2004	Sep 2006	24,200.00
PNG Paak Liang, Ivan	IS	Online Information Privacy and Consumer Preference	Feb 2004	Jun 2008	18,000.00
PNG Paak Liang, Ivan	IS	Information Privacy on the Internet	Sep 2003	Jun 2008	257,000.00
POO Chiang Choon, Danny	IS	Concept Extraction and Pesentation (CEPRes)	Feb 2006	Jan 2008	32,400.00
POO Chiang Choon, Danny	IS	3D Autonomous Agents in Inhabited Virtual Reality Worlds to Promote Effective Learning and Social Interaction	Jan 2003	Jun 2007	180,000.00
TAN Cheng Yian, Bernard	IS	Virtual Communities	Aug 2005	Jul 2008	75,440.00
TAN Cheng Yian, Bernard	IS	Global Electronic Commerce	Nov 2001	Oct 2005	52,000.00

Principal Investigator	Department	Project Title	Commencement Date	Completion Date	Total Project Value (S$)
TAN Gek Woo	IS	A Cognitive Approach to Effective Website Design	Feb 2004	Jan 2008	35,000.00
TAN Hung Pheng	IS	IT-Business Alignment and Interdependence	Feb 2004	Jan 2009	20,000.00
TAN Swee Lin, Sharon	IS	Knowledge Contribution in ITenabled Contexts	Apr 2006	Mar 2008	52,400.00
TEO Hock Hai	IS	Research on Organizational Adoption and Assimilation of Open Source Software	Feb 2007	Jan 2008	30,020.00
TEO Hock Hai	IS	Research on Recommendation Agents	Feb 2005	Jun 2007	75,040.00
WOON Mei Yen, Irene	IS	Organizations and Information Security	Feb 2007	Jan 2009	27,800.00
WOON Mei Yen, Irene	IS	A Framework for Security Decisions	May 2001	Oct 2005	84,000.00
XU Yunjie	IS	Information Seeking Behavior in Organization and Ecommerce Contexts	Feb 2006	Jan 2008	31,200.00
XU Yunjie	IS	Online Consumer Behaviour Research	Jun 2003	Jan 2006	42,000.00

Graduate Research Degrees Awarded

(Department of Computer Science)

Name	Degree	Supervisor	Thesis Title
ATREY Pradeep Kumar	PhD	Mohan Kankanhalli	Information Assimilation in Multimedia Surveillance Systems
AUNG Zeyar	PhD	Tan Kian Lee	Computational Analysis of 3D Protein Structures
BASIT Hamid Abdul	PhD	Jarzabek Stanislaw	Analysis and Semi-automated Detection of Design-level Similarity Patterns in Software
CAO Xia	PhD	Ooi Beng Chin	Approximate Matching in Genomic Sequence Data
CHEN Chen	MSc	Huang Zhiyong	Progressive Transmission and Rendering of Foveated Volume Data
CHEN Ying	MSc	Leow Wee Kheng	Model-Based Approach for Extracting Femur Contours in X-ray Images
CUI Hang	PhD	Chua Tat Seng Kan Min Yen	Soft Matching for Question Answering
FARAZ Ahmar	MSc	Tan Kian Lee David Hsu	Protein Classification using Functional Motifs as Sub-structures of Active Site
GAO Jiong	MSc	Lee Mong Li, Janice	Endosome Detection in Cell Images
GOH Hai Kiat	MSc	Chua Tat Seng	Integrating and Conceptualizing Heterogeneous Ontologies on the Web
GU Tao	PhD	Pung Hung Keng Zhang Da Qing	A Semantic Approach for Scalable and Self-organized Context-aware Systems
GUNAWAN Hady	MSc	Mohan Kankanhalli	Buyer-seller Watermarking Protocol in Digital Cinema
GUO Shuqiao	MSc	Huang Zhiyong Ooi Beng Chin	Indexing for Moving Objects
GUO Xinyu	MSc	Lee Mong Li, Janice	Temporal Registration of Vessels in Retinal Images
HE Qi	PhD	Ling Tok Wang	On Resolving Semantic Heterogeneities and Deriving Constraints in Schema Integration
JI Liping	PhD	Tan Kian Lee	Mining Localized Co-expressed Gene Patterns from Microarray Data
JIANG Zheng Ping	MSc	Ng Hwee Tou	Investigations into Semantic Role Labeling of Propbank and Nombank
KUNCHAMWAR Dinesh Rajendra	MSc	Wong Weng Fai	Synthesis of Multiprocessor Architectures for Multimedia Applications
LI Changqing	PhD	Ling Tok Wang	Querying and Updating XML Data based on Node Labeling Schemes
LI Haiquan	PhD	Lee Wee Sun Li Jinyan	Efficient Discovery of Binding Motif Pairs from Protein-protein Interactions
LI Hanyu	PhD	Lee Mong Li, Janice	Evaluation and Selectivity Estimation of XML Queries
LI Jia	MSc	Yap Hock Chuan, Roland	Robust Controllability of Temporal Constraint Network with Uncertainty
LI Qiming	PhD	Chang Ee Chien	Security in Watermarking and Authentication of Noisy Data
LI Yuan Feng	PhD	Dong Jin Song	A Formal Modeling Approach to Ontology Engineering
LIN Lin	MSc	Tan Chew Lim	Text Extraction from Name Card Images
LIU Chaochun	MSc	Chee Yam San	Model Construction and Transformation: A Study Exploring Students' Causal Explanations of Everyday Phenomena
LIU Tiefei	PhD	Sung Win Kin, Ken Mao Pei Lin	Learning Gene Network using Bayesian Network Framework

Name	Degree	Supervisor	Thesis Title
LIU Yao	PhD	Sung Sam Yuan	The Privacy Preservation of Data Cubes
LOW Jin Kiat	MSc	Ng Hwee Tou	Chinese Word Segmentation with a Maximum Entropy Approach
MA Xi	MSc	Tan Kian Lee Pang Hwee Hwa	Steganographic Database Management System
MADDAGE Namunu Chinthaka	PhD	Mohan Kankanhalli Xu Changsheng	Content-based Music Structure Analysis
MARIMUTHU Shanmuga Priya	MSc	Samarjit Chakraborty	A Generalized Framework for Hierarchical Real-time Scheduling
MISHRA Janardan	MSc	Martin Henz	Observing Artificial Life Evolution: A Formal Algberaic Framework
NG Chu Ming	MSc	Tan Tiow Seng	Synthesis Of Non-Regular Architectural Forms
PHAM Duc Minh	MSc	Leow Wee Kheng Wieslaw Nowinski K.N. Bhanu Prakash	Atlas-assisted Segmentation of Hippocampus
RAJAPAKSE Damith Chatura	PhD	Jarzabek Stanislaw	Exploiting Similarity Patterns in Web Applications for Enhanced Genericity and Maintainability
ROY Sujoy	PhD	Chang Ee Chien	Watermarking Techniques using Knowledge of Host Database
SHARMA Aurbind	MSc	Ananda A.L.	Investigations into Micromobility Issues in IP Networks
SHEN Ren	MSc	Chang Ee Chien	Extracting Information from Point Set for Robust Fingerprint Authentication
SHI Xinwei	PhD	Cheng Holun, Alan	Algorithms for Meshing Smooth Surfaces and their Volumes
SHU Yanfeng	PhD	Tan Kian Lee	Supporting Complex Queries in P2P Networks
SOO Yuen Jien	PhD	Yuen Chung Kwong	SAFA: Stack and Frame Architecture
SUBHASH Manesh	MSc	Chan Chee Yong	Incremental Processing of Twig Queries
SUN Chong	MSc	Chan Chee Yong	Optimizing Xpath Queries using Composite Axes
SUN Jun	PhD	Dong Jin Song	Complementary Formalisms - Synthesis, Verification and Visualization
SUN Ren Xu	MSc	Chua Tat Seng	Relation based Models for Passage Retrieval in Open Domain Question Answering
TAN Soon Heng	MSc	Sung Wing Kin, Ken Ng See Kiong	Automated Linear Motif Discovery from Protein Interaction Network
TAN Zhenqiang	PhD	Tung Kum Hoe, Anthony	Query and Mining in Biological Databases
TRAN Tuan Anh	MSc	P.S. Thiagarajan	Automatic Generation of Protocol Converters from Scenario-based Specifications
WAN Zhiguo	PhD	Ananda A.L. Robert Deng Bao Feng	Authentication and Key Establishment in Wireless Networks
WANG Dehong	MSc	Sung Wing Kin, Ken Gao Sheng Tian Qi	Semantic Concept Detection from Visual Content with Statistical Learning
WANG Hongguang	PhD	Chi Chi Hung	Modelling Dynamic Content Behavior for Efficient WEB Caching and Distribution
WANG Junmei	PhD	Wynne Hsu Tay Seng Chuan	Association Pattern Mining in Spatio-temporal Databases
WANG Wen Qiang	PhD	Ooi Beng Chin	Efficient Processing of XML Documents

Name	Degree	Supervisor	Thesis Title
XIA Chenyi	PhD	Ooi Beng Chin	Advanced Similarity Queries and their Application in Data Mining
XIAO Juan	MSc	Tan Chew Lim Zhou Guodong	Protein-protein Interaction: A Supervised Learning Approach
XU Xin	PhD	Tung Kum Hoe, Anthony	Data Mining Techniques in Gene Expression Data Analysis
YANG Shaofa	PhD	P.S. Thiagarajan	Controller Synthesis for Reactive Systems in Distributed, Real-time and Hybrid Settings
YANG Xiaofeng	PhD	Tan Chew Lim Su Jian	A Twin-Candidate Model for Learning Based Coreference Resolution
YANG Yanjiang	PhD	Ooi Beng Chin Bao Feng Robert Deng	Ensuring Data Security and Individual Privacy in Health Care Systems
YANG Zixiang	MSc	Ooi Wei Tsang Sun Qibin	Efficient Video Identification based on Locality Sensitive Hashing and Triangle Inequality
YAO Zhen	MSc	Tung Kum Hoe, Anthony	Finding all Maximal Common Substructures in Proteins
YU Feng	MSc	Tan Kian Lee	Towards an Internet-scale Stream Processing Service with Loosely-coupled Entities
YU Hang	PhD	Chang Ee Chien	Limited Resource Visualization with Region-of-interest
YUAN Bo	PhD	Tan Chew Lim	Skew Estimation for Document Images
YUAN Junli	PhD	Chi Chi Hung	Modeling and Acceleration of Content Delivery in World Wide Web
ZENG Yiming	MSc	Chan Chee Yong	Dominant Skyline Query Processing
ZHANG Rui	PhD	Ooi Beng Chin	Monitoring Network Data Streams
ZHANG Xia	MSc	Tan Tiow Seng	Physically based Animation and Fast Rendering of Large-scale Prairie
ZHANG Xiaoli	MSc	Lee Mong Li, Janice	Bright Lesion Detection in Retinal Images
ZHANG Xinhua	MSc	Lee Wee Sun	Hyper-parameter Learning for Graph based Semi-supervised Learning Algorithms
ZHOU Xiaoming	PhD	Ang Chuan Heng Ling Tok Wang	Intelligent Iconic Pictorial Database System
ZHOU Yongluan	PhD	Tan Kian Lee	Scalable and Adaptable Distributed Stream Processing
ZHU Bo	PhD	Mohan Kankanhalli Bao Feng Robert Deng	Security and Privacy for Large Ad-hoc Networks
ZHU Qili, Kenny	PhD	Joxan Jaffar Yap Hock Chuan, Roland	Open Constraint Programming

Graduate Research Degrees Awarded

(Department of Information Systems)

Name	Degree	Supervisor	Thesis Title
GHOLAMI Roghieh	PhD	Lee Sang-Yong, Tom Lim Lai Huat, John	Essays on Information and Communication Technology: Investment, Post-adoption and Economic Impacts
GUPTA Sumeet	PhD	Kim Hee-Woong	Examining Online Purchase Decision Calculus: The Mental Accounting Theory Perspective
LIU Chengliang	MSc	Xu Yunjie	The Dynamics of Interactive Information Retrieval: An Activity Theory Perspective
LIU Xin	MSc	Teo Hock Hai	Interactivity, Presence, and Purchase Intention: An Empirical Study in Virtual Collaborative Shopping
MENG Zhaoli	PhD	Lee Sang-Yong, Tom Png Paak Liang, Ivan	Three Applications of Economic Theory and Methodology in Information Systems Research
PILLAI Brojo Paul Joseph	MSc	Raman K.S.	Role of Government in the Growth of India's Software Industry
RAVISHANKAR Mayasandra Nagaraja	PhD	Pan Shan Ling	Examining the Influence of Organizational Subcultures and Organizational Identification on Knowledge Management (KM) Initiatives
SANTOSA Paulus Insap	PhD	Wei Kwok Kee Chan Hock Chuan	The Effect of Web Search Strategy on Online Purchase Intention: A Web Design Element-related Cost Benefit Approach
TAN Teck Keong, Michael	PhD	Wei Kwok Kee	Realising the Business Value of Interorganizational Systems: The Case of Booknet, Corenet and Lawnet in Singapore
WANG Qiuhong	PhD	Hui Kai Lung Png Paak Liang, Ivan	The Industrial Organization of Information Goods Industries
Xu Heng	PhD	Teo Hock Hai	Privacy Considerations in the Adoption of L-Commerce
YANG Li	MSc	Tan Cheng Yian, Bernard	An Empirical Study of Interpersonal Information Seeking for Task Information

Visitors to the School

(Department of Computer Science)

Name of Visitor/Affiliation	Title of Seminar
ABBADI Amr El University of California, USA	Managing Data Streams in Advertising Networks
ACHARYA Arup IBM T. J. Watson Research Center, USA	SIP/SIMPLE: Impact, Architecture and Challenges
AHUJA Ravi IBM Toronto Lab, Canada	DB2 9: The Pure XML Data Server from IBM
AUSTIN Todd University of Michigan, USA	Razor: A Low-power Pipeline based on Circuit-level Timing Speculation
BALAN Rajesh Krishna Carnegie Mellon University, USA	A Usable Approach to Retargeting Software for Mobile Devices
BASIN David ETH Zurich, Switzerland	From Security Protocols to Secure Systems
BASWANA Surender Max-Planck Institute for Computer Science, Germany	Randomized Algorithms for Path Problems and Graph Spanners
BERTACCO Valeria University of Michigan, USA	Continuous Verification: Guaranteeing Design Correctness, No Matter What
BJORNER Dines Technical University of Denmark, Denmark	Security Rules
BJORNER Nikolaj S. Microsoft, USA	Better Safe than Sorry: Design and Validation of a Distributed File Replication System
BROWN Michael California State University, USA	Advances in Large-scale Tiled Displays
BRYANT Randal E. Carnegie Mellon University, USA	Automated Formal Verification of Software: Status and Prospects
BUHAN Ileana University of Twente, Netherlands	Security and Biometrics: New Applications and Existing Constraints
CARMINATI Barbara University of Insubria, Italy	Access Control for XML Data
CASE John University of Delaware, USA	Machine Self-reference and the Theater of Consciousness
CHANG Chin-Chen Feng Chia University, Taiwan	Information Hiding Techniques
CHAUDHRI Akmal B. IBM Toronto Lab, Canada	PureXML: Database Technology Meets XML
CHEN Danny Z. University of Notre Dame, USA	Computer-assisted Surgical Planning for Radiation Cancer Treatment
CHEN Weifeng University of Massachusetts, USA	Efficient Internet Information Distribution with Security and Privacy Considerations
CHEN Xin Nanyang Technological University, Singapore	On the Minimum Common Integer Partition
CHEN Yi-Ping Phoebe Deakin University, Australia	Gene Identification and Pattern Discovery in Genomic Contexts
CHEONG Otfried KAIST, Korea	Minimizing a Box for Flat Objects
CHIANG David University of Southern California, USA	An Introduction to Synchronous Grammars
CHIN Francis University of Hong Kong, China	Finding Exact Optimal Motif in Matrix Representation by Partitioning
CHU Xiaowen Hong Kong Baptist University, China	How to Improve the Blocking Performance of Wavelength-routed WDM Networks?
CIOBANU Gabriel Institute of Computer Science, Romania	Computation in Membrane Systems
CIORTUZ Liviu University of Iasi, Romania	GR: An Efficient Algorithm for Feature Selection in Large Scale Typed Unification Grammars

Name of Visitor/Affiliation	Title of Seminar
CLARK Keith Imperial College, UK	Go! for Multi-threaded Deliberative Agents
CORRADINI Andrea University of Southern Denmark, Denmark	Multimodal User Interfaces for Immersive Environments
CURIC Adrian Verimag Laboratory, France	Implementing Lustre Programs on Distributed Platforms with Real-time Constraints
DAUME Hal III University of Southern California, USA	Flexible Machine Learning for Hard Language Problems
DAVIES Jim University of Oxford, UK	Model-driven Software Engineering
DEB Kalyanmoy IIT Kanpur, India	Evolutionary Computing in Applied Search and Optimization
DING Chris Lawrence Berkeley National Laboratory, USA	Protein Interaction Module Detection using Matrix-based Graph Algorithms
DITMARSCH Hans Van University of Otago, New Zealand	Logic Puzzles
DONG Guozhu Wright State University, USA	Detection and Tracking of Region-based Evolving Targets in Sensor Networks
DUTTA Santanu nVIDIA Corporation, USA	Recent Trends in Design of Multimillion-gate Multimedia SoCs
EISENHABER Frank Research Institute of Molecular Pathology, Austria	A Bioinformatics Group Embedded in an Experimental Biological Institute: Experience at the IMP/Vienna 1999-2006
ENGELHARDT Kai University of New South Wales, Australia	Causing Communication Closure: Safe Program Composition with Non-FIFO Channels
FAN Wenfei University of Edinburgh, UK	Information Preserving XML Schema Embedding
FERRARI Elena University of Insubria, Italy	Secure Content Management in Third-party Architectures
FRANCOIS Alexandre R. J. University of Southern California, USA	An Architectural Framework for Interactive Software Systems
FU Yuxi Shanghai Jiao Tong University, China	Relating Two Models of Mobile Computing
FUJITA Masahiro University of Tokyo, Japan	Object-oriented Analysis and Specification for HW/SW Codesign with UML Diagrams
GANAPATHI K. G. Fidelica Microsystems, USA	Emerging Technologies Stimulating Mass Market Adoption of Fingerprint Biometrics
GENEST Blaise IRISA/CNRS, France	Distributed Dynamic Verification
GEOFF Dromey R. Griffith University, Australia	Principles for Engineering Large-scale Systems
GHOSE Aditya University of Wollongong, Australia	Process Lifecycle Management using Enterprise Models
GINIGE Athula University of Western Sydney, Australia	CBEADS: A Framework for Developing Evolutionary Web Applications
GRETTON Arthur Max Planck Institute, Germany	Hypothesis Testing with Kernels
GRIGORAS Romulus ENSEEIHT - IRIT - INP, Toulouse, France	Dynamic Multimedia Adaptation
GUIBAS Leonidas Stanford University, USA	Sensor Networks: A Digital Bridge to the Physical World
HELDT Thomas Harvard University, USA	Integrating Data, Models and Reasoning in Critical Care
HELGER Lipmaa Cybernetica AS and University of Tartu, Estonia	Designated Verifier Signature Schemes: Attacks, New Security Notions and a New Construction
HENNING Fernau University of Hertfordshire, UK	Roman Domination: A Case Study on Parameterized Complexity
HINCHEY Mike Loyola College, USA	Developing New Classes of Space Exploration Missions

Name of Visitor/Affiliation	Title of Seminar
HIRST Graeme University of Toronto, Canada	Fine-grained Differences and Similarities in Meanings
HOI Chu Hong Steven Chinese University of Hong Kong, China	Batch Mode Active Learning
HON Hsiao-Wuen Microsoft Research Asia, China	New Generation Web Search Technologies and Microsoft Research Asia Fellowship Award Presentation
HOSKING John University of Auckland, New Zealand	Model-driven Design and Implementation of Statistical Surveys
HUANG Chao Princeton University, USA	Distributed Logic-memory Architecture and Computation-unit Integrated Memory-based High-level Synthesis
HUI Ji University of Maryland, USA	Towards Autonomous Navigation
INOUE Katsuro Osaka University, Japan	Code Clone Analysis and Application
JAGADISH H. V. University of Michigan, USA	Keyword and Natural Language Queries against Databases
JAIN Ramesh University of California, USA	Event Web: The Next Disruptive Evolutionary Stage in WWW
JUNG Moon-Ryul Sogang University, Korea	Hierarchical Retargeting of Fine Facial Motions
KALINICHENKO Leonid Russian Academy of Sciences, Moscow, Russia	Synthesis of Canonical Models Aimed at Semantic Interoperability of Heterogeneous Information Sources
KALYANARAMAN Shivkumar Rensselaer Polytechnic Institute, USA	New Directions in Internet Congestion Control: Quality-ofservice (QoS), Uncooperative Users, Large Bandwidth-delay and Lossy Networks
KANADE Takeo Carnegie Mellon University, USA	Digital Human Project
KATONA Gyula O. H. Alfred Renyi Institute of Mathematics, Hungary	Search When the Lie Depends on the Target
KHAN Latifur R. University of Texas, USA	Data Mining for Network Security
KHOO Christopher Nanyang Technological University, Singapore	Automatic Sentiment Classification
KRALL Andreas Vienna University of Technology, Austria	Effective Compiler Generation by Architecture Description
KUO Dean University of Manchester, UK	Consistency in Service Oriented Systems
KUTYLOWSKI Miroslaw Wroclaw University of Technology, Poland	Self-organization of Ad Hoc Networks: Making the Algorithms Immune to Malicious Transmission Failures
LACOSTE Caroline Institute for Infocomm Research, Singapore	Coronary Tree Extraction from X-ray Angiograms using Object Processes
LECKIE Chris University of Melbourne, Australia	Distributed Network Intrusion Detection
LEE Dik Hong Kong University of Science and Technology, China	Adapting Search Engine Results using Clickthroughs
LEE Dong Won Pennsylvania State University, USA	The Data Linkage Project
LEE Edward A. University of California, Berkeley, USA	The Future of the Embedded Systems
LEE Ruby B. Princeton University, USA	Processor Architecture for Trustworthy Computers
LEE Sang Yup KAIST, Korea	Systems Biotechnology: Making Systems Biology Work in Industry
LEE Seung Joon University of Maryland, USA	Protocol Design under Cooperative and Selfish Settings in Wireless Networks
LEE Wang-Chien Pennsylvania State University, USA	DSI: A Fully Distributed Spatial Index for Location-based Wireless Broadcast Services

Name of Visitor/Affiliation	Title of Seminar
LEI Chen University of Waterloo, Canada	Similarity-based Search over Time Series and Trajectory Data
LEONG Bernard Genome Institute of Singapore, Singapore	Biocomputing Startups: Can they Survive in Singapore?
LEONTYEV Hennadiy University of North Carolina, USA	Applicability of FIFO for Soft Real-time Scheduling of Sporadic Tasks on Multiprocessors
LEUNG Ho-Fung Chinese University of Hong Kong, China	Multi-auction Approach for Solving Task Allocation Problems
LEWIS F. University of Texas, USA	A Matrix Framework for Discrete Event Control of Wireless Sensor Networks
LEYMAN Rahim A. Institute for Infocomm Research, Singapore	HOME 2015: A Vision of a Future Home
LI Hang Microsoft Research Asia, China	Statistical Learning Methods for Information Retrieval
LIM Lip Yeow IBM T. J. Watson Research Center, USA	CXHist: An Online Classification-based Histogram for XML String Selectivity Estimation
LINK Sebastian Massey University, New Zealand	Unlocking Keys for XML Trees
LIU Alan Uniformed Services, University of the Health Sciences, USA	Surgical Simulation: Technology, Research and Practice
LIU Bing University of Illinois, Chicago, USA	On Diagnostic Data Mining
LIU Guanfeng Stanford University, USA	Motion Planning for Closed-chain Manipulators with Application to Structural Biology
LIU Ting Harbin Institute of Technology, China	Language Technology Platform (LTP) and WSD based on Equivalent Pseudoword
LU Lie Microsoft Research Asia, China	Towards a Unified Framework for Composite Audio Analysis
LUCANU Dorel A. I. Cuza University of Iasi, Romania	On Logical Foundation of the Semantic Web: An Institution-based Approach
LUI John C. S. Chinese University of Hong Kong, China	A Game Theoretic Approach to Provide Incentive and Service Differentiation in P2P Networks
LUK Wayne Imperial College, UK	Recent Custom Computing Research at Imperial College London
MADDEN Patrick H. State University of New York, USA	New Challenges for Physical Design
MAMITSUKA Hiroshi Kyoto University, Japan	A Probabilistic Model for Mining Labeled Ordered Trees: Capturing Patterns in Carbohydrate Sugar Chains
MARKAKIS Evangelos University of Toronto, Canada	Computational Aspects of Game Theory and Microeconomics
MENCER Oskar Imperial College, UK	Flexible Number Representations for Computing with FPGAs
MOHANIA Mukesh IBM, India	Policy Management for Autonomic Data Management
MORRIS Quaid University of Toronto, Canada	GeneMANIA: Real-time Integration of Functional Genomic Datasets for Gene Function Prediction
MOULIN Pierre University of Illinois, Urbana-Champaign, USA	Discreet Signaling: From the Chinese Emperors to the Internet
MURAVYOV Sergey V. Tomsk Polytechnic University, Russia	Multi-sensor Data Fusion in Ordinal Scale: An Introduction
MURUGESAN San Southern Cross University, Australia	Web Engineering: Successfully Creating Complex Web Applications
NANDY S. K. Indian Institute of Science, India	Molecular Caches: A Caching Structure for Dynamic Creation of Application-specific Heterogeneous Cache Regions
NARAYANAN Shrikanth University of Southern California, USA	Machine Recognition and Synthesis of Emotions in Speech
NASCIMENTO Mario A. University of Alberta, Canada	Exploiting Redundancy in Sensor Networks for Energy Efficient Processing of Spatiotemporal Region Queries

Name of Visitor/Affiliation	Title of Seminar
NG Pan-Wei Ivar Jacobson International, Singapore	Aspect Oriented Software Development with Use Cases
NG See-Kiong Institute for Infocomm Research, Singapore	Unraveling the Common Denominators of Protein-protein Interaction Networks
NUGGEHALLI Pavan S. Indian Institute of Science, India	Online Association Policies in IEEE 802.11 WLANs
ONG Luke University of Oxford, UK	Game Semantics and Software Model Checking
OTT David University of North Carolina, USA	An Open Architecture for Transport-level Protocol Coordination in Distributed Multimedia Applications
OZSU Tamer University of Waterloo, Canada	Sliding Window Query Processing over Data Streams
PAL Ajit IIT Kharagpur, India	Low Power Sensor Node for a Wireless Sensor Network
PANCHANATHAN Sethuraman Arizona State University, USA	Cognitive Ubiquitous Computing
PARAMESWARAN Sri University of New South Wales, Australia	Hardware/Software Support for Reliability and Security in Embedded Processors
PARTHASARATHY Srinivasan Ohio State University, USA	Mining Protein-protein Interaction Networks
PAULK Mark C. Carnegie Mellon University, USA	The E-sourcing Capability Model for Service Providers
PETTERSSON Ulf ST Electronics, Singapore	Industrial Experience with Building a Web Portal Product Line using a Lightweight, Reactive Approach
PEVZNER Pavel University of California, USA	Identification of Post-translational Modifications via Blind Search of Mass-spectra
PIERANTONIO Alfonso University of L'Aquila, Italy	Model Transformations and Weaving with Abstract State Machines
PIETER Reinder Van De Riet Vrije Universiteit, Netherlands	GuarSP@CE-Ref or Guaranteeing Security and Privacy in Cyberspace as Applied to the Future Refereeing Process for DKE
PLATTNER Christian ETH Zurich, Switzerland	Ganymed: A Research Platform for Database Replication
PLATZNER Marco University of Paderborn, Germany	Scheduling Periodic Real-time Tasks on FPGAs
POSE Ronald Monash University, Australia	The Monash Multiprocessor, its Password-capability System, its Evolution into a Massively Parallel ystem, and How Such a Distributed Operating System can Form the Basis for a Wireless Ad Hoc Cooperative Network (SAHN)
RACOCEANU Daniel University of Franche-Comté of Besançon, France	Dynamic Neuro-fuzzy System for Diagnosis Assistance
RADHOUANI Said University of Geneva, Switzerland	Ontology-based Approach for Multilingual Information Retrieval in CLEF-2005
RAHMANI Rouhollah Washington University, USA	Accio! A Localized Content-based Image Retrieval System
SAITO Rintaro Keio University, Japan	Mining of Genomic, Transcriptomic and Proteomic Data
SANG Lyul Min Seoul National University, Korea	Advanced Flash Memory-based Storage System
SCHONBACH Christian Riken Genomic Sciences Center, Japan	Deducing Function from Mammalian Genome and Transcriptomic Data
SHANKAR N. SRI International Computer Science Laboratory, USA	Beyond Satisfiability: Extensions and Applications
SIKDAR Biplab Rensselaer Polytechnic Institute, USA	Energy Aware Information Dissemination and Acquisition in Mobile Ad Hoc Wireless Networks
SIM Ben K. M. Hong Kong Baptist University, China	Market-driven Bargaining Strategy and Relaxed-criteria Protocol for Grid Resource Allocation
SINHA Ranjan RMIT University, Australia	Compact Tries for Efficient Sorting and Searching

Name of Visitor/Affiliation	Title of Seminar
SNOEYINK Jack University of North Carolina, USA	Bivariate B-splines from Centroid Triangulations
SOLIHIN Yan North Carolina State University, USA	Improving Performance, Reliability and Security through Helper Threading
SON Vuong University of British Columbia, Canada	On-demand Media Streaming via COOL Search and Bitvampire
SRIKANT Y. N. Indian Institute of Science, India	Energy-aware Instruction Scheduling
STASCHULAT Jan Technical University of Braunschweig, Germany	Cache Performance Verification in Preemptive Real Time Systems
SUE Moon KAIST, Korea	Infrastructure Design for IPTV Service
SUKHOMLIN Vladimir A. Moscow State University, Russia	IT-education System in Russia
SURAL Shamik IIT Kharagpur, India	A Two-tiered Architecture for Credit Card Fraud Detection
TAM S. W. Adrian Chinese University of Hong Kong, China	A Study of the Coexistence of Heterogeneous Flows on Data Network
TAN Wang Chiew University of California, USA	Debugging Schema Mappings with Routes
TATSUYA Makoto National Institute of Informatics, Japan	Substitution Theorem
THAO Dang CNRS, France	Computing Schedules for Multithreaded Real-time Programs using Geometry
THING Vrizlynn Imperial College, UK	Traffic Redirection Attack Protection System (TRAPS): Mitigation of Distributed Denial-of-service Attacks
TIWARI Ashish SRI International, USA	Combining Abstract Interpreters
TRAN-GIA Phuoc University of Wuerzburg, Germany	Performance of Business-case Peer-to-peer Platforms
TSANG Wai Hung, Ivor Hong Kong University of Science and Technology, China	Machine Learning on Very Large Data Sets
UDEN Lorna Staffordshire University, UK	E-learning to E-learning Ecosystem
UNLAND Rainer University of Duisburg- Essen, Germany	A Novel Architecture for a Medical Diagnostic System based on MAS Technology and Swarm Intelligence
VISHWANATHAN S.V.N. National ICT Australia, Australia	Exponential Families in Feature Space
VOSSEN Gottfried University of Muenster, Germany	Metaprogramming in Databases
WALLACE Mark Monash University, Australia	Painless Problem Decomposition
WANG Jianyong Tsinghua University, China	Efficient Frequent Closed Sequence Mining and Beyond
WANG Ke Simon Fraser University, Canada	Simultaneous Information Sharing and Privacy Preservation
WANG Wei University of North Carolina, USA	Mining Patterns from Protein Structures
WEI Fan IBM T. J. Watson Research Center, USA	Could Random Inductive Models be Better than Well-thought Models?
WONG Kam-Fai Chinese University of Hong Kong, China	A Phonetic-based Approach to Chinese Chat Text Normalization
WU Tai-Pang Hong Kong University of Science and Technology, China	From Photometric Stereo to Interactive 3D Markup
WYSE Lonce Institute for Infocomm Research, Singapore	Audio for Interactive Media
XING Eric Carnegie Mellon University, USA	Reasoning in Open Possible Worlds: On a New Class of Nonparametric Bayesian Models for Haplotype Phasing, LD Modeling and Demographic Inference in Open Ancestral Space

Name of Visitor/Affiliation	Title of Seminar
XUE Chun Jason University of Texas, USA	Full Parallelism and Complete Memory Latency Hiding on Multi-core Architectures
YANG Lingpeng Institute for Infocomm Research, Singapore	Chinese Document Re-ranking based on Term Distribution and Maximal Marginal Relevance and Supervised Categorization of Javascript using Program Analysis Features
YANG Shiqiang Tsinghua University, China	Introduction to the Media and Network Joint Research Lab and its Current Research Activities
YANG Xiaowei University of California, USA	Source Selectable Path Diversity via Routing Deflections
YASUGI, Masahiro Kyoto University, Japan	Lightweight Lexical Closures for Legitimate Execution Stack Access
ZEUGMANN Thomas Hokkaido University, Japan	Text Mining using Markov Chains of Variable Length

Visitors to the School

(Department of Information Systems)

Name of Visitor/Affiliation	Title of Seminar
BIN Mai University of Texas, USA	Obtaining Product Preferences and Valuation of Customers through Strategic Pricing
CHELLAPA, Ramnath K. University of Southern California, USA	Incentive Design for "Free" but "No Free Disposal" Services: The Case of Personalization under Privacy Concerns
CHU Chao Hsien College of Information Sciences and Technology, USA	Exploring DDoS Attacks in Mobile Ad Hoc Networks
CORBITT, Brian Deakin University, Australia	Knowledge Management as a Strategic Resource: A CEO Perspective
FARRIS, George Rutgers University, USA	How to Publish in IEEE Transactions on Engineering Management and Other Top Journals
HU Nan Singapore Management University, Singapore	Analyzing Demand Patterns, Business Models and Governance to Facilitate the Growth of Grid Services in Singapore
HUANG Ke-Wei New York University, USA	Optimal and Equilibrium Price Discrimination Metrics for Digital Goods
KANUNGO, Shivraj George Washington University, USA	Framework for IS Value Creation and Sustainability
LEE Young Eun University of British Columbia, Canada	Influence of Effort, Accuracy, and Tradeoff Difficulty on User Acceptance of Recommendation Agents: Investigations on Desktop and Handheld Devices
LIU Ying University of Pennsylvania, USA	Offshore Outsourcing of Services: A Model of the Extended Organizational Form
MENON Nirup University of Texas, USA	Obtaining Product Preferences and Valuation of Customers through Strategic Pricing
MILLER Steven Singapore Management University, Singapore	Analyzing Demand Patterns, Business Models and Governance to Facilitate the Growth of Grid Services in Singapore
MITRA Sushmita Indian Statistical Institute, India	Soft Computing in Bioinformatics
RAGHUNATHAN Srinivasan University of Texas, USA	Obtaining Product Preferences and Valuation of Customers through Strategic Pricing
RAVICHANDRAN T. Lally School of Management and Technology, USA	Governance of Business-to-business Information Systems: A Political Economy Perspective
SARKAR Sumit University of Texas, USA	Obtaining Product Preferences and Valuation of Customers through Strategic Pricing
SARKER Suprateek Washington State University, USA	Qualitative Research Genres in the IS Literature: Emerging Issues and Potential Implications
SENGUPTA Kishore INSEAD, France	What is IT Agility? Does it Affect Organizational Performance? A Conceptualization and some Empirical Evidence
SUH Kil Soo Yonsei University, Korea	Effects of Featured Listing on Online Auction
TE'ENI Dov Tel-Aviv University, Israel	Contextualization, Complexity and Language Diversity in Computer-supported Communication
WEIGEND Andreas S. Stanford University, USA	From E-business to Me-business
XU Sean University of California, USA	Network Effects and Herd Behaviour in Open Standard Adoption: Evidence from Electronic Integration
ZHANG Xiaoquan Michael Massachusetts Institute of Technology, USA	Finding Edgeworth Cycles in Online Advertising Auctions

PUBLICATIONS

(Department of Computer Science)

Agrawal, M., F. Stephan, P.S. Thiagarajan and S. Yang. Behavioural Approximations for Restricted Linear Differential Hybrid Automata. Hybrid Systems: Computation and Control. International Workshop on Hybrid Systems: Computation and Control (HSCC), Santa Barbara, California, USA, March 2006.

Akanksha, G., Z.Y. Huang, B. Prabhakaran and JR. C.R. Ruiz. Animation Toolkit based on Database Approach for Reusing Motions and Models. Multimedia Tools and Applications, 32(3):293-327, 2007.

An, L., H.K. Pung and L. Zhou. Design and Implementation of a Dynamic Protocol Framework. Computer Communications, 29(9):1309-1315, 2006.

Anderson, N.H., S.C. Khoo, S. Andrei and B. Luca. Calculating Polynomial Runtime Properties. Asian Symposium on Programming Languages and Systems (APLAS), Tsukuba, Japan, November 2005.

Andrei, S. and M.K. Cheng. Optimization of Real-time Systems Timing Specifications. IEEE International Conference on Embedded and Real-time Computing Systems and Applications (RTCSA), Sydney, Australia, August 2006.

Andrei, S., G.S.H. Tan and G. Manolache. Teaching Programming Languages Concepts in a Uniform Way. International Conference on Teaching and Learning in Higher Education (TLHE), Singapore, December 2006.

Andrei, S., W.N. Chin and M. Rinard. Incremental Deterministic Planning. International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC), Timisoara, Romania, September 2006.

Andrei, S., W.N. Chin, M.K. Cheng and M.L. Mihai. Automatic Debugging of Real-time Systems based on Incremental Satisfiability Counting. IEEE Transactions on Computers, 55(9):830-842, 2006.

Andrei, S., W.N. Chin, M.K. Cheng and Y. Zhu. Runtime-coordinated Scalable Incremental Checksum Testing of Combinational Circuits. International Conference on Real-time and Embedded Computing Systems and Applications (RTCSA), Hong Kong, China, August 2005.

Ang, C.H. Dynamic Interactive Spatial Similarity Retrieval in Iconic Image Database using Enhanced Digraph. ACM Symposium on Applied Computing (SAC), Dijon, France, April 2006.

Ang, W.T., M. Krichane and T.M.C. Sim. Zero Phase Filtering for Active Compensation of Periodic Physiological Motion. IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob), Pisa, Tuscany, Italy, February 2006.

Ankit, G. and A. Roychoudhury. Synthesis and Traceability of Scenario-based Executable Models. IEEE International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (ISoLA), Paphos, Cyprus, November 2006.

Ankit, G., S. Meng, A. Roychoudhury and P.S. Thiagarajan. Interacting Process Classes. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Apt, K.R., F. Rossi and K.B. Venable. CP-nets and Nash Equilibria. International Conference on Computational Intelligence, Robotics and Autonomous Systems (CIRAS), Singapore, September 2005.

Arimura, H. and S. Jain. Algorithmic Learning Theory. Theoretical Computer Science, 248(1), 2005.

Atrey, P.K., M.S. Kankanhalli and J.B. Oommen. Goal-oriented Optimal Subset Selection of Correlated Multimedia Streams. ACM Transactions on Multimedia Computing, Communications and Applications, 3(1), 2007.

Atrey, P.K., M.S. Kankanhalli and R. Jain. A Framework for Information Assimilation in Multimedia Surveillance Systems. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Atrey, P.K., N.C. Maddage and M.S. Kankanhalli. Audio-based Event Detection for Multimedia Surveillance. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Toulouse, France, May 2006.

Atrey, P.K., W. Yan and M.S. Kankanhalli. A Scalable Signature Scheme for Video Authentication. Multimedia Tools and Applications, 34(1):107-135, 2007.

Aung, Z. and K.L. Tan. Automatic 3D Protein Structure Classification without Structural Alignment. Journal of Computational Biology, 12(9):1221-1241, 2005.

Aung, Z. and K.L. Tan. MatAlign: Precise Protein Structure Comparison by Matrix Alignment. Journal of Bioinformatics and Computational Biology, 4(6):1197-1216, 2006.

Bandyopadhyay, T., Y.P. Li, M.H. Ang and D. Hsu. A Greedy Strategy for Tracking a Locally Predictable Target among Obstacles. IEEE International Conference on Robotics and Automation (ICRA), Orlando, Florida, USA, May 2006.

Baruah, S. and S. Chakraborty. Schedulability Analysis of Non-preemptive Recurring Real-time Tasks. International Workshop on Parallel and Distributed Real-time Systems (WPDRTS), Rhodes Island, Greece, April 2006.

Basit, A.H., D.C. Rajapakse and S. Jarzabek. An Empirical Study on Limits of Clone Unification using Generics. International Conference on Software Engineering and Knowledge Engineering (SEKE), Taipei, Taiwan, July 2005.

Basit, A.H., D.C. Rajapakse and S. Jarzabek. Beyond Templates: A Study of Clones in the STL and Some General Implications. International Conference on Software Engineering (ICSE), St Louis, USA, May 2005.

Basit, H.A. and S. Jarzabek. Detecting Higher-level Similarity Patterns in Programs. European Software Engineering Conference and ACM SIGSOFT Symposium on Foundations of Software Engineering (ESEC-FSE), Lisbon, Portugal, September 2005.

Basit, H., L. Yuan, J.S. Dong and J. Sun. Generic Fault Tolerant Software Architecture Reasoning and Customization. IEEE Transactions on Reliability, 55(3):421-435, 2006.

Bessiere, C., J.C. Regin, R.H.C. Yap and Y. Zhang. An Optimal Coarse-grained Arc Consistency Algorithm. Artificial Intelligence, 165(2):165-185, 2005.

Bessiere, C., P. Meseguer, B. O'Sullivan, R.H.C. Yap, P. Jeavons, P. Pesant, P. Van Hentenryck, T. Walsh, M. Sellman, P. Barahona, L. Bordeaux, F. Rossi, C. Schulte, M. Wallace and T. Schiex. The Next 10 Years of Constraint Programming, Trends in Constraint Programming. ISTE Publishing Company, 2007.

Bhunre, P.K., W.K. Leow and T.S. Howe. Recovery of 3D Pose of Bones in Single 2D X-ray Images. IEEE Workshop on Applications of Computer Vision (WACV), Austin, Texas, USA, February 2007.

Bimlesh, W., S. Andrei and Y.J. Soo. Software Engineering - An Object-oriented Approach. McGraw Hill, 2007.

Bordoloi, U. and S. Chakraborty. Interactive Schedulability Analysis. IEEE Real-time and Embedded Technology and Applications Symposium (RTAS), San Jose, California, USA, April 2006.

Brand, S. and R.H.C. Yap. Propagation = Logic + Control. International Conference on Logic Programming (ICLP), Seattle, USA, August 2006.

Brebner, G.J., S. Chakraborty and W.F. Wong. IEEE International Conference on Field-programmable Technology (FPT), Singapore, 2005.

Brebner, J., S. Chakraborty and W.F. Wong. (eds.) Journal of VLSI Signal Processing, 47(1):1-92, 2007.

Bressan, S. and B. Catania. Introduction to Database Systems. McGraw-Hill, Singapore, 2005.

Bressan, S. and C. Zhang. GeOO7: A Benchmark for XML-GIS Management Systems. International Workshop on Geographic Information Management (GIM), Copenhagen, Denmark, August 2005.

Bressan, S. and L.Y. Yap. A Structured Approach to Online Peer Learning and Assessment. International Conference on Education, Singapore, December 2005.

Bressan, S. and C. Zhang. GeOO7: A Benchmark for XML-GIS Management Systems. International Workshop on Geographic Information Management (GIM), Copenhagen, Denmark, August 2005.

Bressan, S. and L.Y. Yap. A Structured Approach to Online Peer Learning and Assessment. International Conference on Education, Singapore, December 2005.

Bressan, S. Food for Thought or the Business of Education. International Conference on Information Integration and Web-based Applications and Services (iiWAS), Kuala Lumpur, Malaysia, September 2005.

Bressan, S. From XML to Web Services. XML Asia, Singapore, 2005.

Bressan, S. Opportunities for XML Data Mining in Modern Applications or XML Data Mining: Where Is the Ore? Workshop on Knowledge Discovery from XML Documents (KDXD), Singapore, April 2005.

Bressan, S., A. Hidayanto and Z. Hasibuan. Exploiting Local Popularity to Prune Routing Indices in Peer-to-peer Systems. DEXA Workshop on P2P Data Management, Security and Trust (PDMST), Copenhagen, Denmark, August 2005.

Bressan, S., B. Catania, Z. Lacroix, Y.G. Li and A. Maddalena. Accelerating Queries by Pruning XML Documents. Data and Knowledge Engineering, 54(2):211-240, 2005.

Bressan, S., J. Kueng and R. Wagner. Database and Expert Systems Applications. Springer Verlag, 2006.

Bressan, S., S. Ceri, E. Hunt, Z. Ives, Z. Bellahsene, M. Rys and R. Unland. Database and XML Technologies. Springer Verlag, 2005.

Buddi, I., S. Bressan, G. Wahyudi, Z. Hasibuan and B. Nazief. Named Entity Recognition for the Indonesian Language: Combining Contextual, Morphological and Part-of-speech Features into a Knowledge Engineering Approach. International Conference on Discovery Science (DS), Singapore, October 2005.

Cai, Z. and H.W. Leong. Improving Performance of DNA Sequencing-by-hybridization with Gapped-probes via Domain Knowledge. BioTechnology and Bioinformatics Symposium (BIOT), Provo, Utah, USA, October 2006.

Cao, X., S. Li and A.K.H. Tung. Indexing DNA Sequences using q-Grams. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Carlucci, L., J. Case, S. Jain and F. Stephan. Non U-shaped Vacillatory and Team Learning. International Conference on Algorithmic Learning Theory (ALT), Singapore, October 2005.

Carlucci, L., S. Jain, K. Efim and F. Stephan. Variations on U-shaped Learning. Information and Computation, 204(8):1264-1294, 2006.

Case, J., K. Chen, S. Jain, W. Merkle and J.S. Royer. Generality's Price: Inescapable Deficiencies in Machine-learned Programs. Annals of Pure and Applied Logic, 139(1-3):303-326, 2006.

Case, J., S. Jain, E. Martin, A. Sharma and F. Stephan. Identifying Clusters from Positive Data. SIAM Journal on Computing, 36(1):28-55, 2006.

Case, J., S. Jain, R. Reischuk, F. Stephan and T. Zeugmann. Learning a Subclass of Regular Patterns in Polynomial Time. Theoretical Computer Science, 364(1):115-131, 2006.

Chai, E., M.C. Chan and A.L. Ananda. Coverage Aware Buffer Management and Scheduling for Wireless Sensor Network. IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), Reston, VA, USA, September 2006.

Chaisorn, L. and T.S. Chua. Information Extraction from News Video using Global Rule Induction Technique. IEEE International Conference on Multimedia and Expo (ICME), Toronto, Canada, July 2006.

Chakraborty, B., T. Chen, T. Mitra and A. Roychoudhury. Handling Constraints in Multi-objective GA for Embedded System Design. International Conference on VLSI Design, Hyderabad, India, January 2006.

Chakraborty, S. Flexible Modelling and Performance Debugging of Real-time Embedded Multimedia Systems. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Chakraborty, S. Towards a Framework for System-level Design of Multiprocessor SoC Platforms for Media Processing. IEEE International Conference on Application-specific Systems, Architectures and Processors (ASAP), Samos, Greece, July 2005.

Chakraborty, S., L. Thiele, Y. Liu, E. Wandeler and N. Stoimenov. Interface-based Rate Analysis of Embedded Systems. IEEE International Real-time Systems Symposium (RTSS), Rio de Janeiro, Brazil, December 2006.

Chakraborty, S., P.S. Thiagarajan and T.X.L. Phan. Event Count Automata: A State-based Model for Stream Processing Systems. IEEE International Real-time Systems Symposium (RTSS), Miami, Florida, USA, December 2005.

Chakraborty, S., T. Mitra, A. Roychoudhury and L. Thiele. Cache-aware Timing Analysis of Streaming Applications. Euromicro Conference on Real-time Systems (ECRTS), Pisa, Italy, July 2007.

Chakraborty, S., Y. Wang and W. Huang. A Perception-aware Low-power Software Audio Decoder for Portable Devices. IEEE Workshop on Embedded Systems for Real-time Multimedia (ESTIMedia), New York, USA, September 2005.

Chan, C.Y., H.V. Jagadish, K.L. Tan, A.K.H. Tung and Z. Zhang. On High-dimensional Skylines. International Conference on Extending Database Technology (EDBT), Munich, Germany, March 2006.

Chan, C.Y., J., H.V., K.L. Tan, A.K.H. Tung and Z. Zhang. Finding k-dominant Skylines in High Dimensional Space. ACM SIGMOD/PODS International Conference on Management of Data, Chicago, Illinois, USA, June 2006.

Chan, C.Y., P.K. Eng and K.L. Tan. Efficient Processing of Skyline Queries with Partially-ordered Domains. IEEE International Conference on Data Engineering (ICDE), Tokyo, Japan, April 2005.

Chan, C.Y., P.K. Eng and K.L. Tan. Stratified Computation of Skyline Queries with Partially-ordered Domains. ACM SIGMOD/PODS International Conference on Management of Data, Baltimore, Maryland, USA, June 2005.

Chan, H., T. Lam, S. Tam, S. Wong and W.K. Sung. Compressed Indexes for Approximate String Matching. Annual European Symposium on Algorithms (ESA), Zurich, Switzerland, September 2006.

Chan, H., T. Lam, W.K. Sung, S. Tam and S.S. Wong. A Linear Size Index for Approximate Pattern Matching. Annual Symposium on Combinatorial Pattern Matching (CPM), Barcelona, Spain, July 2006.

Chan, M.C. and P. Tan. AMCM: A Multi-channel MAC Protocol for IEEE 802.11 Wireless Networks. International Conference on Broadband Communications, Networks and Systems (BROADNETS), San Jose, California, USA, October 2006.

Chan, M.C. and Y.J. Lin. Behaviours and Effectiveness of Rerouting: A Study. IEEE International Conference on Communications (ICC), Seoul, South Korea, May 2005.

Chan, M.C. Connectivity, Performance and Resiliency of IP-based CDMA Radio Access Networks. IEEE Transactions on Mobile Computing, 5(8):1103-1118, 2006.

Chan, M.C., E.C. Chang, L. Lu and S. Ng. Effect of Malicious Synchronization. International Conference on Applied Cryptography and Network Security (ACNS), Singapore, June 2006.

Chan, Y.S. and H.T. Ng. Estimating Class Priors in Domain Adaptation for Word Sense Disambiguation. International Conference on Computational Linguistics and Annual Meeting of the Association for Computational Linguistics (COLING/ACL), Sydney, Australia, July 2006.

Chan, Y.S. and H.T. Ng. Scaling Up Word Sense Disambiguation via Parallel Texts. National Conference on Artificial Intelligence (AAAI), Pittsburgh, Pennsylvania, USA, July 2005.

Chan, Y.S. and H.T. Ng. Word Sense Disambiguation with Distribution Estimation. International Joint Conference on Artificial Intelligence (IJCAI), Edinburgh, Scotland, UK, August 2005.

Chang, C.A., T.Y. Leong and K.L. Poh. PGMC: A Framework for Probabilistic Graphic Model Combination. Annual Symposium on Biomedical and Health Informatics (AMIA), Washington, USA, October 2005.

Chang, E.C. and Q. Li. Hiding Secret Points amidst Chaff. International Cryptology Conference, EUROCRYPT, St Petersburg, Russia, May 2006.

Chang, E.C., R. Shen and S. Ng. Finding the Original Point Set Hidden among Chaff. ACM Symposium on InformAction, Computer and Communications Security (ASIACCS), Taipei, Taiwan, March 2006.

Chang, E.C., S. Choi, D. Kwon, H. Park and C. Yap. Shortest Path amidst Disc Obstacles is Computable. International Journal of Computational Geometry and Applications, 16:567-590, 2006.

Chang, S., W. Hsu and M.L. Lee. Mining Dense Periodic Patterns in Time Series Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Chen, B. and M.C. Chan. Coordinated Resource Assignment in Heterogeneous Wireless Networks. International Conference on Communication System Software and Middleware (COMSWARE), New Delhi, India, January 2006.

Chen, B. and M.C. Chan. Proportional Fairness for Overlapping Cells in Wireless Networks. IEEE Vehicular Technology Conference (VTC), Montreal, Canada, September 2006.

Chen, B., J. Lu and T.W. Ling. Keyword Search in Bibliographic XML Data. International Conference on Ubiquitous Information Management and Communication, Suwon, South Korea, February 2007.

Chen, C., Z.Y. Huang, H. Yu and E.C. Chang. Progressive Transmission and Rendering of Foveated Volume Data. International Conference on Computer Graphics Theory and Applications (GRAPP), Setubal, Portugal, February 2006.

Chen, C.Q. and J.S. Dong. Applying Timed Interval Calculus to Simulink Diagrams. International Conference on Formal Engineering Methods (ICFEM), Macau, China, November 2006.

Chen, J., D. Ji, C.L. Tan and Z. Niu. Automatic Relation Extraction with Model Order Selection and Discrimination Label Identification. International Joint Conference on Natural Language Processing (IJCNLP), Jeju Island, South Korea, October 2005.

Chen, J., D. Ji, C.L. Tan and Z. Niu. Relation Extraction using Label Propagation. Association for Computational Linguistics (Coling/ACL), Sydney, Australia, July 2006.

Chen, J., D. Ji, C.L. Tan and Z. Niu. Unsupervised Feature Selection from Relation Extraction. International Joint Conference on Natural Language Processing (IJCNLP), Jeju Island, South Korea, October 2005.

Chen, J., D. Ji, C.L. Tan and Z. Niu. Unsupervised Relation Disambiguation using Spectral Clustering. Conference on Empirical Methods in Natural Language Processing (EMNLP), Sydney, Australia, July 2006.

Chen, J., D. Ji, C.L. Tan and Z. Niu. Unsupervised Relation Disambiguation using Spectral Clustering. Joint Conference on Computational Linguistics (COLING/ACL), Sydney, Australia, July 2006.

Chen, J., H.N. Chua, W. Hsu, M.L. Lee, S.K. Ng, R. Saito, W.K. Sung and L. Wong. Increasing Confidence of Protein-protein Inteactomes. International Conference on Genome Informatics (GIW), Yokohama, Japan, December 2006.

Chen, J., W. Hsu, M.L. Lee and S. Ng. Discovering Reliable Protein Interactions from High-throughput Experimental Data using Network Topology. Artificial Intelligence in Medicine, 35(1-2):37-47, 2005.

Chen, J., W. Hsu, M.L. Lee and S.K. Ng. Dissecting Genome Wide Protein-protein Interactions with Repeated and Unique Network Motifs. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), Philadelphia, USA, August 2006.

Chen, J., W. Hsu, M.L. Lee and S.K. Ng. Increasing Confidence of Protein Interactomes using Network Topological Metrics. Bioinformatics, 22(16):1998-2004, 2006.

Chen, L., N. Koudas, A.K.H. Tung and R. Vernica. Relaxing Join and Selection Queries. International Conference on Very Large Databases (VLDB), Seoul, South Korea, August 2006.

Chen, T., T. Mitra, A. Roychoudhury and V. Suhendra. Exploiting Branch Constraints without Exhaustive Path Enumeration. International Workshop on Worst-case Execution Time Analysis (WCET), Palma de Mallorca, Spain, July 2005.

Chen, W., H. Pang and K.L. Tan. Authenticating Multi-dimensional Query Results in Data Publishing. Annual IFIP WG 11.3 Working Conference on Data and Applications Security, Sophia Antipolis, France, July 2006.

Chen, Y., T.W. Ling and M.L. Lee. Maintaining Semantics in the Design of Valid and Reversible Semi-structured Views. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Cheng, C.K. and R.H.C. Yap. Constrained Decision Diagrams. National Conference on Artificial Intelligence (AAAI), Pittsburg, Pennsylvania, USA, July 2005.

Cheng, C.K. and R.H.C. Yap. Global Ad-hoc Constraints for Life. Principles and Practice of Constraint Programming. International Conference on Principles and Practice of Constraint Programming (CP), Barcelona, Spain, October 2005.

Cheng, C.K.K. and R.H.C. Yap. Applying Ad-hoc Global Constraints with the Case Constraint to Still-life. Constraints Journal, 11(2-3):91-114, 2006.

Cheng, C.K.K. and R.H.C. Yap. Maintaining Generalized Arc Consistency on Ad-hoc n-ary Boolean Constraints. European Conference on Artificial Intelligence (ECAI), Riva del Garda, Italy, August 2006.

Cheng, H. and T. Tan. Approximating Polygonal Objects by Deformable Smooth Surfaces. International Symposium on Mathematical Foundations of Computer Science (MFCS), Gdansk, Poland, August 2005.

Cheng, H. and X.W. Shi. Quality Mesh Generation for Molecular Skin Surfaces using Restricted Union of Balls. IEEE Visualization (VIS), Minneapolis, USA, October 2005.

Cheng, H. Approximating Polygonal Objects by Deformable Smooth Surfaces. Computational Geometry - Theory and Applications. International Symposium on Mathematical Foundations of Computer Science (MFCS), Gdansk, Poland, August 2005.

Cheng, H. Quality Tetrahedral Mesh Generation for Macromolecules. International Symposium on Algorithms and Computation (ISAAC), Kolkata, India, December 2006.

Cheng, H. Superimposing Voronoi Complexes for Shape Deformation. International Journal of Computational Geometry and Applications, 16(2-3):159-174, 2006.

Cheng, H., D. Hsu, J.C. Latombe and G. Sanchez-Ante. Multi-level Free-space Dilation for Sampling Narrow Passages in PRM Planning. IEEE International Conference on Robotics and Automation (ICRA), Orlando, Florida, USA, May 2006.

Chia, H.W.K., C.L. Tan and S.Y. Sung. Enhancing Knowledge Discovery via Association-based Evolution of Neural Logic Networks. IEEE Transactions on Knowledge and Data Engineering, 18(7): 889-901, 2006.

Chiang, T.H., M.S. Apaydin, D.L. Brutlag, D. Hsu and J.C. Latombe. Predicting Experimental Quantities in Protein Folding Kinetics using Stochastic Roadmap Simulation. Annual International Conference on Research in Computational Molecular Biology (RECOMB), Venice, Italy, April 2006.

Chieu, H.L., W.S. Lee and L. Kaelbling. Activity Recognition from Physiological Data using Conditional Random Fields. SMA Symposium, Singapore, January 2006.

Chin, W.N., F. Craciun, S.C. Khoo and C. Popeea. A Flow-based Approach for Variant Parametric Types. ACM SIGPLAN International Conference on Object-oriented Programming, Systems, Languages and Applications (OOPSLA), Portland, Oregon, USA, October 2006.

Chin, W.N., H.H. Nguyen, S. Qin and M. Rinard. Memory Usage Verification for Object Oriented Programmes. International Static Analysis Symposium (SAS), London, UK, September 2005.

Chin, W.N., S.C. Khoo and N. Jones. Redundant Call Elimination via Tupling. Fundamenta Informaticae, 69(1-2):1-37, 2006.

Chin, W.N., S.C. Khoo, S. Qin, C. Popeea and H.H. Nguyen. Verifying Safety Policies with Size Properties and Alias Controls. International Conference on Software Engineering (ICSE), St Louis, Missouri, USA, May 2005.

Ching, K. and G.H. Ong. A Two-pass Improved Encoding Scheme for Fractal Image Compression. International Conference on Computer Graphics, Imaging and Visualisation (CGIV), Sydney, Australia, July 2006.

Ching, K. and G.H. Ong. Fractal Image Compression using a Two-pass Improved Encoding Scheme. International Conference on Distributed Computing and Applications for Business Engineering and Sciences (DCABES), Hangzhou, China, October 2006.

Ching, K.E. and G.H. Ong. A Two-pass Improved Encoding Scheme for Fractal Image Compression. International Conference on Computer Graphics, Imaging and Visualisation (GRAPHICON), Sydney, Australia, July 2006.

Chionh, C.H., Z.Y. Huang, K.L. Tan and Z. Yao. Towards SCALEable Protein Structure Comparison and Database Search. International Journal on Artificial Intelligence Tools, 14(5):827-848, 2005.

Chionh, E.W., X. Gao and L. Shen. Inherently Improper Surface Parametric Supports. Computer Aided Geometric Design, 23:629-639, 2006.

Chong, K. and H.W. Leong. An Extension of Dead End Elimination for Protein Side-chain Conformation using Merged-decoupling. ACM Symposium on Applied Computing (SAC), Dijon, France, April 2006.

Chong, K. and H.W. Leong. A Merge-decoupling Dead End Elimination Algorithm for Protein Side-chain Conformation. Journal on Data Mining and Bioinformatics, 1(4):372-388, 2007.

Chong, K., K. Ning, H.W. Leong and P. Pevzner. Characterization of Multi-charge Mass Spectra for Peptide Sequencing. Asia-pacific Bioinformatics Conference (APBC), Taipei, Taiwan, February 2006.

Chong, K., K. Ning, H.W. Leong and P. Pevzner. Modelling and Characterization of Multi-charged Mass Spectra for Peptide Sequencing. Journal of Bioinformatics and Computational Biology, 4(6):1329-1352, 2006.

Chowdhary, R., L. Wong and V.B. Bajic. Finding Functional Promoter Motifs by Computational Methods: A Word of Caution. International Journal of Bioinformatics Research and Applications, 2(3): 282-288, 2006.

Chowdhary, R., S.L. Tan, R.A. Ali, B. Boerlage, L. Wong and V.B. Bajic. Dragon Promoter Mapper (DPM): A Bayesian Framework for Modeling Promoter Structures. Bioinformatics, 22(18):2310-2312, 2006.

Chua, H.N., W.K. Sung and L. Wong. Exploiting Indirect Neighbours and Topological Weight to Predict Protein Function from Protein-protein Interactions. Bioinformatics, 22(13):1623-1630, 2006.

Chua, K.B., L. Zhang, C.L. Tan and Y. Zhang. A Fast and Stable Approach for Restoration of Warped Document Images. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Craciun, F., H.Y. Goh, C. Popeea and W.N. Chin. Core-Java: An Expression-oriented Java. ACM SIGPLAN International Conference on Object-oriented Programming, Systems, Languages and Applications (OOPSLA), Portland, Oregon, USA, October 2006.

Cui, B., D. Lin and K.L. Tan. IMPACT: A Twin-index Framework for Efficient Moving Object Query Processing. Data and Knowledge Engineering, 59(1):63-85, 2006.

Cui, H., M. Kan and T.S. Chua. Generic Soft Pattern Models for Definitional Question Answering. ACM International Conference on Research and Development on Information Retrieval (SIGIR), Salvador, Brazil, August 2005.

Cui, H., M. Kan and T.S. Chua. Soft Pattern Matching Models for Definitional Question Answering. ACM Transactions on Information Systems, 25(2):8, 2007.

Cui, H., R. Sun, K. Li, M. Kan and T.S. Chua. Question Answering Passage Retrieval using Dependency Relations. ACM International Conference on Research and Development on Information Retrieval (SIGIR), Salvador, Brazil, August 2005.

Donatelli, S. and P.S. Thiagarajan. (eds.) International Conference on Application and Theory of Petri Nets and other Models of Concurrency (ATPN), Turku, Finland, June 2006.

Dong, G., C. Jiang, J. Pei, J. Li and L. Wong. Mining Succinct Systems of Minimal Generators of Formal Concepts. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Dong, G.D., J.Y. Li and L. Wong. The Use of Emerging Patterns in the Analysis of Gene Expression. Profiles for the Diagnosis and Understanding of Diseases. New Generation of Data Mining Applications. John Wiley, 2005.

Dong, J.S. From Semantic Web to Expressive Software Specifications: A Modeling Languages Spectrum. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Dong, J.S. Modeling Languages Spectrum: From Web Ontology to Behaviour Specifications. International Symposium on Formal Methods (FM), Newcastle, UK, July 2005.

Dong, J.S., H. Wang and Y.F. Li. TCOZ Approach to OWL-S Process Model Design. International Conference on Software Engineering and Knowledge Engineering (SEKE), Taipei, Taiwan, July 2005.

Dong, J.S., J. Sun and S. Jarzabek. CAD System Family Architecture Models and Reasoning. Software, 153(3):102-112, 2006.

Dong, J.S., P. Hao, J. Sun and X. Zhang. A Reasoning Method for Timed CSP based on Constraint Solving. International Conference on Formal Engineering Methods (ICFEM), Macau, China, November 2006.

Dong, J.S., P. Hao, X. Zhang and S.C. Qin. HighSpec: A Tool for Building and Checking OZTA Models. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Dong, J.S., P. Hao, X. Zhang and S.C. Qin. The Semantics and Tool Support of OZTA. International Conference on Formal Engineering Methods (ICFEM), Manchester, UK, November 2005.

Dong, J.S., R.W. Duke and P. Hao. Integrating Object-Z with Timed Automata. International Conference on Engineering of Complex Computer Systems (ICECCS), Shanghai, China, June 2005.

Dong, J.S., Y. Liu, J. Sun and X. Zhang. Verification of Computation Orchestration via Timed Automata. International Conference on Formal Engineering Methods (ICFEM), Macau, China, November 2006.

Dorel, L., Y.F. Li and J.S. Dong. Institution Morphisms for Relating OWL and Z. International Conference on Software Engineering and Knowledge Engineering (SEKE), Taipei, Taiwan, July 2005.

Dutta, R., E.C. Chang and M. Sourav. Efficient Self-healing Key Distribution with Revocation for Wireless Sensor Networks using One Way Key Chains, Applied Cryptography and Network Security.

Erdmann, M., D. Hsu, M. Overmars and F. Stappen. Algorithmic Foundations of Robotics VI. Springer Verlag, 2005.

Feng, L., M. Wonham and P.S. Thiagarajan. Designing Communicating Transaction Processes by Supervisory Control Theory. Formal Methods in System Design, 30(2):117-141, 2006.

Fong, Q., F.M. Ng and Z.Y. Huang. Spatio-temporal Visualization of Battlefield Entities and Events. International Conference on Computer Graphics (CGI), Hangzhou, China, June 2006.

Fyrat, A., S. Madnick, N. Yahaya, W.K. Choo and S. Bressan. Information Aggregation using the Cameleon Web Wrapper. International Conference on Electronic Commerce and Web Technologies (ECWeb), Copenhagen, Denmark, August 2005.

Gao, C., K.L. Tan, A.K.H. Tung and X. Xu. Mining Top-k Covering Rule Groups for Gene Expression Data. ACM SIGMOD/PODS International Conference on Management of Data, Baltimore, Maryland, USA, June 2005.

Gao, S., W. Wu, C. Lee and T.S. Chua. A Maximal Figure-of-merit (MFoM) Learning Approach to Robust Classifier Design for Text Categorization. ACM Transactions on Information Systems, 24(2): 190-218, 2006.

Garriss, S., M. Kaminsky, M. Freedman, B. Karp, D. Mazieres and H. Yu. Re: Reliable E-mail. Symposium on Networked Systems Design and Implementation (NSDI), San Jose, USA, May 2006.

Ge, Z., H.B. Lim and W.F. Wong. A Reconfigurable Instruction Memory Hierarchy for Embedded Systems. International Conference on Field Programmable Logic and Applications (FPL), Tampere, Finland, August 2005.

Ghinita, G. and Y.M. Teo. Adaptive Stabilization Framework for Distributed Hash Tables. IEEE International Parallel and Distributed Processing Symposium (IPDPS), Rhodes Island, Greece, April 2006.

Ghinita, G., P. Kalnis and S. Skiadopulos. PRIVE: Anonymous Location-based Queries in Distributed Mobile Systems. International World Wide Web Conference (WWW), Alberta, Canada, May 2007.

Goh, C.L., Y. Shu, Z.Y. Huang and B.C. Ooi. Dynamic Buffer Management with Extensible Replacement Policies. VLDB International Journal, 15(2):99-120, 2006.

Gonzalez-banos, H.H., D. Hsu and J.C. Latombe. Motion Planning: Recent Developments. Autonomous Mobile Robots: Sensing, Control, Decision-making and Applications. CRC Press, 2006.

Gu, T., H.K. Pung and D. Zhang. A Hierarchical Semantic Overlay for P2P Search. IEEE Conference on Computer Communications (IEEE INFOCOM), Barcelona, Catalunya, Spain, April 2006.

Gu, T., H.K. Pung and D. Zhang. A Peer-to-peer Architecture for Context Lookup. International Conference on Mobile and Ubiquitous Systems: Networking and Services (MOBIQUITOUS), San Diego, California, USA, July 2005.

Gu, T., H.K. Pung and D. Zhang. An Ontology-based DHT Approach to Service Discovery. International Conference on Service Oriented Computing (ICSOC), Chicago, USA, December 2006.

Gu, Y. and W.T. Ooi. Packetization of 3D Progressive Meshes for Streaming over Lossy Networks. International Conference on Computer Communications and Networks (ICCCN), San Diego, California, USA, October 2005.

Gu, Y., S. Chakraborty and W.T. Ooi. Games are Up for DVFS. Design Automation Conference (DAC), San Francisco, California, USA, July 2006.

Guo, L., A. Roychoudhury and T. Wang. Accurately Choosing Execution Runs for Software Fault Localization. International Conference on Compiler Construction (CC), Vienna, Austria, March 2006.

Guo, S., Z.Y. Huang, H.V. Jagadish, B.C. Ooi and Z. Zhang. Relaxed Space Bounding for Moving Objects: A Case for the Buddy Tree. SIGMOD Record, 35(4):24-29, 2006.

Guo, X., W. Hsu, M.L. Lee and T.Y. Wong. A Tree Matching Approach for the Temporal Registration of Retinal Images. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), Washington, USA, November 2006.

Ha, S. and S. Chakraborty. Workshop on Embedded Systems for Real-time Multimedia, 2006.

Halim, S., R.H.C. Yap and H.C. Lau. Visualization for Analyzing Trajectory-based Metaheuristic Search Algorithms. European Conference on Artificial Intelligence (ECAI), Riva del Garda, Italy, August 2006.

Halim, S., R.H.C. Yap and H.C. Lau. Viz: A Visual Analysis Suite for Explaining Local Search Behaviour. ACM Symposium on User Interface Software and Technology (UIST), Montreux, Switzerland, October 2006.

Han, X., W.K. Sung and L. Feng. PEM: A General Statistical Approach for Identifying Differentially Expressed Genes in Time-course cDNA Microarray Experiment without Replicate. Computational Systems Bioinformatics Conference (CSB), Stanford, California, USA, August 2006.

Hao, S., K.N. Sridhar, M.C. Chan and A.L. Ananda. EGRESS: Environment for Generating Realistic Scenarios for Simulations. IEEE/ACM International Symposium on Distributed Simulation and Real- time Applications (DS-RT), Torremolinos, Malaga, Spain, October 2006.

He, J. and H.K. Pung. Performance Modelling and Evaluation of IEEE 802.11 Distributed Coordination Function in Multihop Wireless Networks. Computer Communications, 29(9):1300-1308, 2006.

He, Q. and T.W. Ling. An Ontology-based Approach to the Integration of Entity-relationship Schema. Data and Knowledge Engineering, 58(3):299-326, 2006.

He, Y., J. Jannson, Huynh, N. and W.K. Sung. Inferring Phylogenetic Relationships Avoiding Forbidden Rooted Triplets. Journal of Bioinformatics and Computational Biology, 4(1):59-74, 2006.

Henz, M.J. and J. Misra. Towards a Framework for Observing Artificial Life Forms. IEEE Symposium on Artificial Life (IEEE ALife), Honolulu, Hawaii, USA, April 2007.

Henz, M.J. Optimization Techniques for Sport Tournament Scheduling. Operations Research, Bremen, Germany, September 2005.

Hsu, D., G. Sanchez-ante and Z. Sun. Hybrid PRM Sampling with a Cost-sensitive Adaptive Strategy. IEEE International Conference on Robotics and Automation (ICRA), Barcelona, Spain, April 2005.

Hsu, D., J.C. Latombe and H. Kurniawati. On the Probabilistic Foundations of Probabilistic Roadmap Planning. International Journal of Robotics Research, 25(7):627–643, 2006.

Hu, T., C. Qu, C.L. Tan, S.Y. Sung and W. Zhou. Preserving Patterns in Bipartite Graph Partitioning. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), Washington, USA, November 2006.

Huang, W., C.L. Tan and W.K. Leow. Associating Text and Graphics for Scientific Chart Understanding. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Huang, W.D. and Y. Wang. A Method for Separating Drum Objects from Polyphonic Musical Signals. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), New York, USA, October 2005.

Huang, W.D., Y. Wang and S. Chakraborty. Power-aware Bandwidth and Stereo-image Scalable Audio Decoding. ACM Multimedia, Singapore, November 2005.

Huang, Y.C., J.T. Korhonen and Y. Wang. Optimization of Source and Channel Coding for Voice over IP. IEEE International Conference on Multimedia and Expo (ICME), Amsterdam, Netherlands, July 2005.

Huang, Y.C., S. Chakraborty and Y. Wang. Using Offline Bitstream Analysis for Power-aware Video Decoding in Portable Devices. ACM Multimedia, Singapore, November 2005.

Huang, Z.Y., C.S. Jensen, H. Lu and B.C. Ooi. Skyline Queries against Mobile Lightweight Devices in MANETs. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Huang, Z.Y., H. Lu, B.C. Ooi and A.K.H. Tung. Continuous Skyline Queries for Moving Objects. IEEE Transactions on Knowledge and Data Engineering, 18(12):1645-1658, 2006.

Huynh, Q.T. and A. Roychoudhury. A Memory Model Sensitive Checker for C#. International Symposium on Formal Methods (FM), Hamilton, Ontario, Canada, August 2006.

International Conference on Applied Cryptography and Network Security (ACNS), Zhuhai, China, June 2007.

Iskandar, D., Y. Wang, M. Kan and H. Li. Syllabic Level Automatic Synchronization of Music Signals and Text Lyrics. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Jaffar, J., A.E. Santosa and R. Voicu. A CLP Method for Compositional and Intermittent Abstraction. International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI), Charleston, South Carolina, USA, January 2006.

Jaffar, J., A.E. Santosa and R. Voicu. Modeling Systems in CLP with Co-inductive Tabling. International Conference on Logic Programming (ICLP), Barcelona, Spain, October 2005.

Jaffar, J., A.E. Santosa and R. Voicu. Relative Safety. International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI), Charleston, South Carolina, USA, January 2006.

Jaffar, J., K.Q. Zhu and R.H.C. Yap. Generalized Committed Choice. International Conference on Coordination Models and Languages (COORD), Paphos, Cyprus, June 2007.

Jaffar, J., R.H.C. Yap and K.Q. Zhu. Coordination of Many Agents. International Conference on Logic Programming (ICLP), Barcelona, Spain, October 2005.

Jaffar, J., R.H.C. Yap and K.Q. Zhu. Indexing for Dynamic Abstract Regions. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Jagadish, H., B.C. Ooi, K.L. Tan, Q. Vu and R. Zhang. Speeding up Search in Peer-to-peer Networks with a Multi-way Tree Structure. ACM SIGMOD/PODS International Conference on Management of Data, Chicago, Illinois, USA, June 2006.

Jagadish, H.V., B.C. Ooi, H.T. Shen and K.L. Tan. Towards Efficient Multi-feature Query Processing. IEEE Transactions on Knowledge and Data Engineering, 18(2):350-363, 2006.

Jagadish, H.V., B.C. Ooi, K.L. Tan, C. Yu and R. Zhang. iDistance: An Adaptive B+-tree based Indexing Method for Nearest Neighbour Search. ACM Transactions on Database Systems, 30(2): 364-397, 2005.

Jagadish, H.V., B.C. Ooi, Q.H. Vu, R. Zhang and A.Y. Zhou. VBI-Tree: A Peer-to-peer Framework for Supporting Multi-dimensional Indexing Schemes. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Jain, S. and F. Stephan. Some Recent Results in U-shaped Learning. Theory and Applications of Models of Computation (TAMC), Beijing, China, May 2006.

Jain, S. and K. Efim. Iterative Learning from Positive Data and Negative Counterexamples. International Conference on Algorithmic Learning Theory (ALT), Barcelona, Spain, October 2006.

Jain, S. and K. Efim. Learning and Extending Sublanguages. International Conference on Algorithmic Learning Theory (ALT), Barcelona, Spain, October 2006.

Jain, S. and K. Efim. Learning Languages from Positive Data and a Finite Number of Queries. Information and Computation, 204(1):123-175, 2006.

Jain, S. and K. Efim. Learning Languages from Positive Data and Negative Counter Examples. Journal of Computer and System Sciences, 51(5):273–285, 2005.

Jain, S. and K. Efim. Learning Multiple Languages in Groups. International Conference on Algorithmic Learning Theory (ALT), Singapore, October 2005.

Jain, S. and K. Efim. Negative Data in Learning Languages. Asian Logic Conference (ALC), Novosibirsk, Russia, August 2005.

Jain, S. and K. Efim. On Learning Languages from Positive Data and a Limited Number of Short Counterexamples. Annual Conference on Learning Theory (COLT), Pittsburgh, Pennsylvania, USA, June 2006.

Jain, S., E. Martin and F. Stephan. Absolute versus Probabilistic Classification in a Logical Setting. International Conference on Algorithmic Learning Theory (ALT), Singapore, October 2005.

Jain, S., H.U. Simon and E. Tomita. Algorithmic Learning Theory (ALT), Springer Verlag, Singapore, 2005.

Jain, S., J. Nessel and F. Stephan. Invertible Classes. Theory and Applications of Models of Computation (TAMC), Beijing, China, May 2006.

Jain, S., K. Efim and F. Stephan. Variations on U-shaped Learning. Annual Conference on Learning Theory (COLT), Bertinoro, Italy, June 2005.

Jain, S., S. Lange and S. Zilles. Gold-style and Query Learning under Various Constraints on the Target Class. International Conference on Algorithmic Learning Theory (ALT), Singapore, October 2005.

Jain, S., S. Lange and S. Zilles. Towards a Better Understanding of Iterative Learning. International Conference on Algorithmic Learning Theory (ALT), Barcelona, Spain, October 2006.

Jain, S., Y. Ng and T. Tay. Learning Languages in a Union. Journal of Computer and System Sciences, 73(1):89-108, 2007.

Jansson, J., N.B. Nguyen and W.K. Sung. Algorithms for Combining Rooted Triplets into a Galled Phylogenetic Network. SIAM Journal on Computing, 35(5):1098-1121, 2006.

Jansson, J., S. Ng, W. Sung, W. Hugo. A Faster and More Space-efficient Algorithm for Inferring Arc-annotations of RNA Sequences through Alignment. Algorithmica, 46(2):223-245, 2006.

Jansson, J., T. Ngo and W.K. Sung. Local Gapped Subforest Alignment and its Application in Finding RNA Structural Motifs. Journal of Computational Biology, 13(3):702-718, 2006.

Jarzabek, S. and P.K. Eng. Teaching an Advanced Design, Team-oriented Software Project Course. International Conference on Software Engineering Education and Training (CSEE&T), Ottawa, Canada, April 2005.

Jarzabek, S. and S. Li. Unifying Clones with a Generative Programming Technique: A Case Study. Journal of Software Maintenance - Research and Practice, 18(4):267-292, 2006.

Jarzabek, S. and U. Pettersson. Cost-effective Engineering of Web Applications – Pragmatic Reuse: Building Web Application Product Lines. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Jarzabek, S. and U. Pettersson. Project-driven University-industry Collaboration: Modes of Collaboration, Outcomes, Benefits, Success Factors. International Summit on Software Engineering Education (SSEE), Shanghai, May 2006.

Jarzabek, S. and U. Pettersson. Research Journey towards Industrial Application of Reuse Technique. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Jarzabek, S. Genericity - Missing in Action? Key to Software Simplification and Reuse. Asia Pacific Software Engineering Conference (APSEC), Bangalore, India, December 2006.

Jarzabek, S., S. Ru, H. Zhang and Z. Sun. Analysis of Meta-programs: A Case Study. International Journal of Software Engineering and Knowledge Engineering, 16(1):77-101, 2006.

Jarzabek, S., Y. Bo and S. Sam. Addressing Quality Attributes in Domain Analysis for Product Lines. Software, 153(2):61-73, 2006.

Jayaseelan, R., H. Liu and T. Mitra. Exploiting Forwarding to Improve Data Bandwidth of Instruction-set Extensions. Design Automation Conference (DAC), San Francisco, California, USA, July 2006.

Jayaseelan, R., T. Mitra and X. Li. Estimating the Worst-case Energy Consumption of Embedded Software. IEEE Real-time and Embedded Technology and Applications Symposium (RTAS), San Jose, California, USA, April 2006.

Jayasena, S., S. Bressan and S. Madnick. A Case Study of Electronic Bill Presentment and Payment (EBPP) Integration using the COIN Mediation Technology. Journal of Internet Banking and Commerce, 10(2), 2005.

Jensen, C.S., D. Lin, B.C. Ooi and R. Zhang. Effective Density Queries of Continuously Moving Objects. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Ji, L. and K.L. Tan. Quick Hierarchical Biclustering on Microarray Gene Expression Data. IEEE International Symposium on Bioinformatics and Bioengineering (BIBE), Washington, USA, October 2006.

Ji, L., K.L. Tan and A.K.H. Tung. Mining Frequent Closed Cubes in 3D Datasets. International Conference on Very Large Data Bases (VLDB), Seoul, South Korea, September 2006.

Jiang, C.A., T.Y. Leong and K.L. Poh. PGMC: A Framework for Probabilistic Graphical Model Combination. Annual Symposium on Biomedical and Health Informatics (AMIA), Washington, USA, October 2005.

Jiang, T., U.C. Yang, Y.P.P. Chen and L. Wong. Advances in Bioinformatics and Computational Biology. Imperial College Press, 2006.

Jiang, Z.P. and H.T. Ng. Semantic Role Labeling of NomBank: A Maximum Entropy Approach. Conference on Empirical Methods in Natural Language Processing (EMNLP), Sydney, Australia, July 2006.

Jiang, Z.P., J. Li and H.T. Ng. Semantic Argument Classification Exploiting Argument Interdependence. International Joint Conference on Artificial Intelligence (IJCAI), Edinburgh, Scotland, UK, August 2005.

Jun, H. and H.K. Pung. Fairness of Medium Access Control Protocols for Multi-hop Ad Hoc Wireless Networks. Computer Networks, 48(6):867-890, 2005.

Kalnis, P., N. Mamoulis, S. Bakiras and X. Li. Ad-hoc Distributed Spatial Joins on Mobile Devices. International Parallel and Distributed Processing Symposium (IPDPS), Rhodes Island, Greece, April 2006.

Kalnis, P., W.S. Ng, B.C. Ooi and K.L. Tan. Answering Similarity Queries in Peer-to-peer Networks. Information Systems, 31(1):57-72, 2006.

Kan, M. and C.C.D. Poo. Detecting and Supporting Known Item Queries in Online Public Access Catalogs. ACM IEEE Joint Conference on Digital Libraries (JCDL), Denver, Colorado, USA, June 2005.

Kan, M. and Y. How. Optimizing Predictive Text Entry for Short Message Service on Mobile Phones. International Conference on Human-computer Interaction (HCI), Las Vegas, Nevada, USA, July 2005.

Kan, M. SlideSeer: A Digital Library of Aligned Document and Presentation Pairs. ACM IEEE Joint Conference on Digital Libraries (JCDL), Vancouver, Canada, June 2007.

Kankanhalli, M.S., J. Wang and R. Jain. Experiential Sampling on Multiple Data Streams. IEEE Transactions on Multimedia, 8(5):937-946, 2006.

Koh, G., H.F.C. Teong, M.V. Clement, D. Hsu and P.S. Thiagarajan. A Decompositional Approach to Parameter Estimation in Pathway Modeling: A Case Study of the Akt and MAPK Pathways and their Crosstalk. Bioinformatics, 12(14):271-280, 2006.

Kohomban, U. and W.S. Lee. Optimizing Classifier Performance in Word Sense Disambiguation by Redefining Sense Classes. International Joint Conference on Artificial Intelligence (IJCAI), Hyderabad, India, January 2007.

Korhonen, J.T. and Y. Wang. Power-efficient Streaming for Mobile Terminals. International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV), Skamania, Washington, USA, June 2005.

Korhonen, J.T., Y. Wang and D. Isherwood. Towards Bandwidth-efficient and Error-robust Audio Streaming over Lossy Packet Networks. Multimedia Systems, 10(5):402-412, 2005.

Korshunov, P. and W.T. Ooi. Critical Video Quality for Distributed Automated Video Surveillance. ACM Multimedia, Singapore, November 2005.

Kotsis, G., D. Taniar, S. Bressan, I. Ibrahim and S. Mokhtar. Information Integration and Web-based Applications and Services. Austrian Computer Society, 2006.

Kumar, S., T.M.C. Sim, S. Zhang and R. Janakiraman. Using Continuous Biometric Verification to Protect Interactive Login Sessions. Annual Computer Security Applications Conference, Tucson, Arizona, USA, December 2005.

Kurniawati, H. and D. Hsu. Workspace-based Connectivity Oracle: An Adaptive Sampling Strategy for PRM Planning. International Workshop on the Algorithmic Foundations of Robotics (WAFR), New York, USA, July 2006.

Kuznetsov, V., W. Zhang, P. Robson, Q. Wu, C. Lee, J. Liu, L. Stanton, B. Lim, J. Chew, H. Ng, L. Lipovich, Y. Loh, X. Chen, J. George, V. Vega, C. Wei, K. Chiu, Y. Ruan, G. Bourque, X. Zhao, B. Leong, K. Wong and W.K. Sung. The Oct4 and Nanog Transcription Network Regulates Pluripotency in Mouse Embryonic Stem Cells. Nature Genetics, 38(4):431-440, 2006.

Kyi, W. and W.F. Wong. Cooperative Instruction Scheduling with Linear Scan Register Allocation. High Performance Computing (HiPC), Goa, India, December 2005.

Lam, T., S. Yiu, K. Sadakane, W.K. Sung and W. Hon. A Space and Time Efficient Algorithm for Constructing Compressed Suffix Arrays. Algorithmica, 40(1):33-50, 2006.

Lan, M., C.L. Tan and H.B. Low. Proposing a New Term Weighting Scheme for Text Categorization. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.

Lan, M., C.L. Tan, H.B. Low and S.Y. Sung. A Comprehensive Comparative Study on Term Weighting Schemes for Text Categorization with Support Vector Machines. International World Wide Web Conference (WWW), Chiba, Japan, May 2005.

Lan, M., S.Y. Sung, H.B. Low and C.L. Tan. A Comparative Study on Term Weighting Schemes for Text Categorization. International Joint Conference on Neural Networks (IJCNN), Montreal, Canada, July 2005.

Lau, H.C., J. Li and R.H.C. Yap. Robust Controllability of Temporal Constraint Networks under Uncertainity. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), Washington, USA, November 2006.

Lee, M.L., K.L. Tan and V. Wuwongse. (eds.) International Conference on Database Systems for Advanced Applications (DASFAA), Singapore, April 2006.

Leong, H.W. and B. Guan. Improving the Performances of Proxy Cache Replacement Policies by Considering Infrequent Objects. ACM Symposium on Applied Computing (SAC), Dijon, France, April 2006.

Leong, H.W. and M. Liu. A Multi-agent Algorithm for Vehicle Routing Problem with Time Windows. ACM Symposium on Applied Computing (SAC), Dijon, France, April 2006.

Leong, H.W. Berth Allocation and Planning. Innovation Magazine - The Magazine of Research and Technology, 6(1):20-21, 2006.

Leong, T.Y. Context-aware Probabilistic Reasoning for Proactive Health Care. Workshop on Artificial Intelligence Techniques for Ambient Intelligence (AITAmI), Hyderabad, India, January 2007.

Leow, Y.Y., C.Y. Ng and W.F. Wong. Generating Hardware from OpenMP Programs. IEEE International Conference on Field Programmable Technology (FPT), Bangkok, Thailand, December 2006.

Li, C. and T.W. Ling. A Basis for Semantic Web and e-Business: Efficient Organization of Ontology Languages and Ontologies. Semantic Technology and e-Business: Towards the Integrated Virtual Organization and Business Process Automation. Idea Group Publishing, 2007.

Li, C., A.K.H. Tung, B.C. Ooi and W. Shan. DADA: A Data Cube for Dominant Relationship Analysis. ACM SIGMOD/PODS International Conference on Management of Data, Chicago, Illinois, USA, June 2006.

Li, C., T.W. Ling and M. Hu. Efficient Processing of Updates in Dynamic XML Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Li, C., T.W. Ling and M. Hu. Efficient Updates in Dynamic XML Data: From Binary String to Quaternary String. VLDB International Journal, 15(1), 2006.

Li, C., T.W. Ling and M. Hu. Reuse or Never Reuse the Deleted Labels in XML Query Processing based on Labeling Schemes. International Conference on Database Systems for Advanced Applications (DASFAA), Singapore, April 2006.

Li, G., T.Y. Leong and L. Zhang. Comparison of Missing Value Estimation in Cell-cycleregulated Genes Prediction. Asia Pacific Bioinformatics Conference (APBC), Hong Kong, China, January 2007.

Li, G., T.Y. Leong and L. Zhang. Comparison of Missing Value Estimation in Cell-cycleregulated Genes Prediction. TRB9/06, Singapore, 2006.

Li, G., T.Y. Leong and L. Zhang. Estimating Relative Transcriptional Time Delays from Multiple Microarray Time-series Data. Annual RECOMB Satellite Workshop on Regulatory Genomics, Singapore, July 2006.

Li, G.L. and T.Y. Leong. Feature Selection for the Prediction of Translation Initiation Sites. Genomics, Proteomics and Bioinformatics, 3(2):73-83, 2005.

Li, H., J. Li and L. Wong. Discovering Motif Pairs at Interaction Sites from Protein Sequences on a Proteom-wide Scale. Bioinformatics, 22(8):989-996, 2006.

Li, H., J. Li, L. Wong, M. Feng and Y.P. Tan. Relative Risk and Odds Ratio: A Data Mining Perspective. ACM SIGMOD/PODS Symposium on Principles of Database Systems, Baltimore, Maryland, USA, June 2005.

Li, H., M.L. Lee and W. Hsu. A Histogram-based Selectivity Estimator for Skewed XML Data. International Conference on Database and Expert Systems Applications (DEXA), Copenhagen, Denmark, August 2005.

Li, H., M.L. Lee and W. Hsu. A Path-based Labeling Scheme for Efficient Structural Join. International XML Database Symposium (xSym), Trondheim, Norway, August 2005.

Li, H., M.L. Lee, W. Hsu and G. Cong. An Estimation System for XPath Expressions. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Li, H., W. Hsu, M.L. Lee and T.Y. Wong. Automatic Grading of Retinal Vessel Caliber. IEEE Transactions on Biomedical Engineering, 52(7):1352-1355, 2005.

Li, J. and L. Wong. Structural Geography of the Space of Emerging Patterns. Intelligent Data Analysis, 9(6):567-588, 2005.

Li, J., H. Li, D.C.L. Soh and L. Wong. A Correspondence between Maximal Complete Bipartite Subgraphs and Closed Patterns. European Conference on Principles and Practice of Knowledge Discovery in Databases, Porto, Portugal, October 2005.

Li, J., H. Li, L. Wong, J. Pei and G. Dong. Minimum Description Length Principle: Generators are Preferable to Closed Patterns. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.

Li, L., M.L. Lee and W. Hsu. Rewriting Queries for XML Integration Systems. International Conference on Database and Expert Systems Applications (DEXA), Krakow, Poland, September 2006.

Li, Q. and E.C. Chang. Robust, Short and Sensitive Authentication Tags using Secure Sketch. ACM Multimedia and Security Workshop (ACM), Geneva, Switzerland, September 2006.

Li, Q. and E.C. Chang. Zero-knowledge Watermark Detection Resistant to Ambiguity Attacks. ACM Multimedia and Security Workshop (ACM), Geneva, Switzerland, September 2006.

Li, X., A. Roychoudhury and T. Mitra. Modeling Out-of-order Processors for WCET Analysis. Real-time Systems. International Journal of Time-critical Computing Systems, 34(3):195-227, 2006.

Li, X., A. Roychoudhury, T. Mitra, P. Mishra and X. Cheng. A Retargetable Software Timing Analyzer using Architecture Description Language. Asia and South Pacific Design Automation Conference (ASP-DAC), Yokohama, Japan, January 2007.

Li, Y., T.S. Tan, I. Volkau and W.L. Nowinski. Model-guided Segmentation of 3D Neuroradiological Image using Statistical Surface Wavelet Model. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), Minneapolis, Minnesota, USA, June 2007.

Li, Y., W.K. Sung and L.D. Miller. Multimodality as a Criterion for Feature Selection in Unsupervised Analysis of Gene Expression Data. IEEE International Symposium on Bioinformatics and Bioengineering (BIBE), Minneapolis, USA, October 2005.

Lillykutty, J. and H.K. Pung. (eds.) International Journal of Network Management, 27(2), 2007.

Lim, C.W. and T.S. Tan. Surface Reconstruction by Layer Peeling. Visual Computer, 22(9-11):593-603, 2006.

Lim, H.B., Y.M. Teo, P. Mukherjeel, V.T. Lam, W.F. Wong and S. See. Sensor Grid: Integration of Wireless Sensor Networks and the Grid. IEEE Conference on Local Computer Networks (LCN), Sydney, Australia, November 2005.

Lim, Y.J. and W.S. Lee. Properties of Forward Pruning in Game-tree Search. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.

Lim, Y.J. and W.S. Lee. RankCut - A Domain Independent Forward Pruning Method for Games. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.

Lin, L. and C.L. Tan. Text Extraction from Name Cards using Neural Network. International Joint Conference on Neural Networks (IJCNN), Montreal, Canada, July 2005.

Lin, L. and C.L. Tan. Text Extraction from Name Cards with Complex Design. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Lin, L., L. Wong, T.Y. Leong and P.S. Lai. LinkageTracker: A Discriminative Pattern Tracking Approach to Linkage Disequilibrium Mapping. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Ling, T.W. and G. Dobbie. Towards Semantic Query Optimization in XML. International ConferUbiquitous Information Management and Communication, Suwon, South Korea, February 2007.

Ling, T.W. Capturing Semantics in XML Documents. Workshop on Knowledge Discovery from XML Documents (KDXD), Singapore, April 2006.

Liu, G., J.Y. Li, L. Wong and W. Hsu. Positive Borders or Negative Borders: How to Make Generator-based Lossless Representation Concise. SIAM Conference on Data Mining (SDM), Maryland, USA, April 2006.

Liu, H., J. Li and L. Wong. Use of Extreme Patient Samples for Outcome Prediction from Gene Expression Data. Bioinformatics, 21(16):3378-3384, 2005.

Liu, H.Z., T.W. Ling, T. Yu and J. Wu. Efficient Processing of Multiple XML Twig Queries. International Conference on Database and Expert Systems Applications (DEXA), Krakow, Poland, September 2006.

Liu, J., T.Y. Leong, B. Tan, K. Chee, B. Shuter and S.C. Wang. A Set-based Hybrid Approach (SHA) for MRI Segmentation. International Conference on Control, Automation, Robotics and Vision (ICARCV), Singapore, December 2006.

Liu, J., T.Y. Leong, K. Chee, B. Tan, B. Shuter and S.C. Wang. A Hybrid Approach using Set Theory (HAST) for Magnetic Resonance Image Segmentation. International Workshop on Pattern Recognition in Information Systems (PRIS), Paphos, Cyprus, May 2006.

Liu, J., T.Y. Leong, K. Chee, B. Tan, B. Shuter and S.C. Wang. Set-based Cascading Approaches for Magnet in Resonance Image Segmentation (SCAMIS). Annual Symposium on Biomedical and Health Informatics (AMIA), Washington, USA, November 2006.

Liu, L., Y. Jiong and A.K.H. Tung. Data Mining Techniques for Microarray Datasets. IEEE International Conference on Data Engineering (ICDE), Tokyo, Japan, April 2005.

Liu, T.F., W.K. Sung, Y. Li, J.J. Liu, A. Mittal and P.L. Mao. Effective Algorithms for TagSNP Selection. Journal of Bioinformatics and Computational Biology, 3(5):1089-1106, 2005.

Liu, Y., S. Chakraborty and R. Marculescu. Generalized Rate Analysis for Media-processing Platforms. IEEE International Conference on Embedded and Real-time Computing Systems and Applications (RTCSA), Sydney, Australia, August 2006.

Liu, Y., S. Chakraborty and W.T. Ooi. Approximate VCCs: A New Characterization of Multimedia Workloads for System-level MpSoC Design. Design Automation Conference (DAC), Anaheim, California, USA, June 2005.

Liu, Y., S. Chakraborty, W.T. Ooi, A. Gupta and S. Mohan. Cost-quality Tradeoffs in MPEG-4 Decoding on Resource-constrained Devices. IEEE Workshop on Embedded Systems for Real-time Multimedia (ESTIMedia), New York, USA, September 2005.

Liu, Y.R., K.R.K. Murthy and W.K. Sung. Cell-cycle Regulated Promoter Motif Prediction using Time-course Microarray Data. IEEE International Symposium on Bioinformatics and Bioengineering (BIBE), Minneapolis, Minnesota, USA, October 2005.

Lo, D. and S.C. Khoo. QUARK: Empirical Assessment of Automaton-based Specification Miners. Working Conference on Reverse Engineering (WCRE), Benevento, Italy, October 2006.

Lo, D. and S.C. Khoo. SMArTIC: Towards Building an Accurate, Robust and Scalable Specification Miner. ACM SIGSOFT Symposium on Foundations of Software Engineering (ACM SIGSOFT/FSE), Portland, Oregon, USA, November 2006.

Lorenzo, C., J. Case, S. Jain and F. Stephan. Memory-limited U-shaped Learning. Annual Conference on Learning Theory (COLT), Pittsburgh, Pennsylvania, USA, June 2006.

Low, J.K., H.T. Ng and W. Guo. A Maximum Entropy Approach to Chinese Word Segmentation. SIGHAN Workshop on Chinese Language Processing, Jeju Island, South Korea, October 2005.

Low, K.H., W.K. Leow and M.H. Ang. Autonomic Mobile Sensor Network with Self-coordinated Task Allocation and Execution. IEEE Transactions on Systems, Man and Cybernetics Part C - Applications and Reviews, 36(3):315-327, 2006.

Low, K.L. and A. Lastra. An Adaptive Hierarchical Next-best-view Algorithm for 3D Reconstruction of Indoor Scenes. Pacific Conference on Computer Graphics and Applications, Taipei, Taiwan, October 2006.

Low, K.L. and A. Lastra. Efficient Constraint Evaluation Algorithms for Hierarchical Next-best-view Planning. IEEE International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT), North Carolina, USA, June 2006.

Low, K.L. and A. Lastra. Predetermination of ICP Registration Errors and its Application to View Planning. International Conference on 3-D Digital Imaging and Modeling (3DIM), Montreal, Quebec, Canada, August 2007.

Lu, H., B.C. Ooi, H. Shen and X. Xue. Hierarchical Indexing Structure for Efficient Similarity Search in Video Retrieval. IEEE Transactions on Knowledge and Data Engineering, 18(11):1544-1559, 2006.

Lu, J., T.W. Ling, C.Y. Chan and T. Chen. From Region Encoding to Extended Dewey: On Efficient Processing of XML Twig Pattern Matching. International Conference on Very Large Databases (VLDB), Trondheim, Norway, August 2005.

Lu, L. and G.H. Ong. A Time-space Optimal Parallel Merging and Sorting Algorithm. Joint International Symposium on Distributed Computing and Applications to Business, Engineering and Science and International Conference on Parallel Algorithms and Computing Environments, Greenwich, London, UK, August 2005.

Lu, L. and G.H. Ong. Parallelizing Transport-aware IP Routers for the Resilience of Distributed Denial of Service Attacks. Joint International Symposium on Distributed Computing and Applications to Business, Engineering and Science and International Conference on Parallel Algorithms and Computing Environments, Greenwich, London, UK, August 2005.

Lu, S. and C.L. Tan. Automatic Document Orientation Detection and Categorization through Document Vectorization. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Lu, S. and C.L. Tan. Camera Document Restoration for OCR. International Conference on Camera based Document Analysis and Recognition (CBDAR), Seoul, South Korea, August 2005.

Lu, S. and C.L. Tan. Camera Text Recognition based on Perspective Invariants. International Conference on Pattern Recognition (ICPR), Hong Kong, China, August 2006.

Lu, S. and C.L. Tan. Document Flattening through Grid Modeling and Regularization. International Conference on Pattern Recognition (ICPR), Hong Kong, China, August 2006.

Lu, S. and C.L. Tan. Script and Language Identification in Degraded and Distorted Document Images. National Conference on Artificial Intelligence (AAAI), Boston, Massachusetts, USA, July 2006.

Lu, S. and C.L. Tan. The Restoration of Camera Documents through Image Segmentation. IAPR Workshop on Document Analysis Systems (DAS), Nelson, New Zealand, February 2006.

Lu, S., C.L. Tan and W. Huang. Language Identification in Degraded and Distorted Document Images. IAPR Workshop on Document Analysis Systems (DAS), Nelson, New Zealand, February 2006.

Lu, W. and M. Kan. Supervised Categorization of Javascript using Program Analysis Features. Asia Information Retrieval Symposium (AIRS), Jeju Island, South Korea, October 2005.

Lu, W. and M. Kan. Supervised Categorization of Javascript using Program Analysis Features. Information Processing and Management, 43(2):431-444, 2006.

Lu, Y. and C.L. Tan. Constructing Area Voronoi Diagrams in Document Images. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Luca, B., S. Andrei, N.H. Anderson and S.C. Khoo. Program Transformation by Solving Recurrences. ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation (PEPM), Charleston,

Lucano, D., Y.F. Li and J.S. Dong. Semantic Web Languages - Towards an Institutional Perspective, 2006.

Lum, V.L.F., W.K. Leow, Y. Chen, T.S. Howe and M.A. Png. Classifiers for Bone Fracture Detection in X-ray Images. International Conference on Image Processing (ICIP), Genoa, Italy, September 2005.

Ma, L. and W.T. Ooi. Retransmission in Distributed Media Streaming. International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV), Skamania, Washington, USA, June 2005.

Ma, X., H. Pang and K.L. Tan. Masking Page Reference Patterns in Encryption Databases on Untrusted Storage. Data and Knowledge Engineering, 58(3):466-483, 2006.

Maddage, N.C., H.Z. Li and M.S. Kankanhalli. A Vector Space Modeling Approach for Music Content Indexing and Retrieval. ACM International Conference on Research and Development for Information Retrieval (SIGIR), Seattle, USA, August 2006.

Madhwacharyula, C., M. Davis, P. Mulhem and M.S. Kankanhalli. Metadata Handling: A Video Perspective. ACM Transactions on Multimedia Computing, Communications and Applications, 2(4):358-388, 2006.

March, V. and Y.M. Teo. Multi-attribute Range Queries on Read-only DHT. International Conference on Computer Communications and Networks (ICCCN), Arlington, Virginia, USA, October 2006.

March, V., Y.M. Teo and X. Wang. DGRID: A DHT-based Resource Indexing and Discovery Scheme for Computational Grids. Australasian Symposium on Grid Computing and e-Research (AusGrid), Ballarat, Australia, February 2007.

March, V., Y.M. Teo, H.B. Lim, P. Eriksson and R. Ayani. Collision Detection and Resolution in Hierarchical Peer-to-peer Systems. IEEE Conference on Local Computer Networks (LCN), Sydney, Australia, November 2005.

Marchenko, Y., T.S. Chua and I. Aristarkhova. Analysis of Paintings using Colour Concepts. IEEE International Conference on Multimedia and Expo (ICME), Amsterdam, Netherlands, July 2005.

Marchenko, Y., T.S. Chua and R. Jain. Semi-supervised Annotation of Brushwork in Paintings Domain using Serial Combinations of Multiple Experts. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Marchenko, Y., T.S. Chua and R. Jain. Transductive Inference using Multiple Experts for Brushwork Annotation in Paintings Domain. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Marimuthu, P. and S. Chakraborty. A Framework for Compositional and Hierarchical Real-time Scheduling. IEEE International Conference on Embedded and Real-time Computing Systems and Applications (RTCSA), Sydney, Australia, August 2006.

Maxiaguine, S., S. Chakraborty and L. Thiele. DVS for Buffer-constrained Architectures with Predictable QoS-energy Tradeoffs. International Conference on Hardware/Software Codesign and System Synthesis (CODES/ISSS), New York, USA, September 2005.

Mekie, J., S. Chakraborty, G. Venkataramani, P.S. Thiagarajan and D.K. Sharma. Interface Design for Rationally Clocked GALS Systems. International Symposium on Advanced Research in Asynchronous Circuits and Systems (ASYNC), Grenoble, France, March 2006.

Meng, S., Z. Zhang and L. Wong. A +1 Programmed Ribosomal Frameshifting in A Human C2H2 Zinc Finger Gene Discovered by Computational Analysis. Biotechnology, 4(4):316-324, 2005.

Miao, X.P. and T.M.C. Sim. Ambient Image Recovery and Rendering from Flash Photographs. International Conference on Image Processing (ICIP), Genoa, Italy, September 2005.

Mittal, A., T.F. Liu and W.K. Sung. Model Gene Network by Semi-fixed Bayesian Network. Expert Systems with Applications, 30(1):42-49, 2006.

Monteverde, L.C., C.R. Ruiz and Z.Y. Huang. A Shape Distribution for Comparing 3D Models. International Conference on Multimedia Modeling (MMM), Singapore, January 2007.

Mstislav, M., H. Goh and T.S. Chua. ARE: Instance Splitting Strategies for Dependency Relation-based Information Extraction. Joint Conference on Computational Linguistics (COLING/ACL), Sydney, Australia, July 2006.

Nath, S., H. Yu, P. Gibbons and S. Seshan. Subtleties in Tolerating Correlated Failures in Wide-area Storage Systems. Symposium on Networked Systems Design and Implementation (NSDI), San Jose, USA, May 2006.

Neo, S. and T.S. Chua. News Video Retrieval using Multi-modal Query-dependent Model and Parallel Text Corpus. ACM SIGIR International Conference on Research and Development in Information Retrieval (SIGIR), Salvador, Brazil, August 2005.

Neo, S., T.S. Chua and M. Kan. Video Retrieval using High-level Features: Exploiting Query-matching and Confidence-based Weighting. Conference on Image and Video Retrieval (CIVR), Tempe, Arizona, USA, July 2006.

Neo, S., Y. Zheng, T.S. Chua and T. Qi News Video Search with Fuzzy Event Clustering using High-level Features. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Ng, C.M., C.T. Nguyen, D.N. Tran, T.S. Tan and S.W. Yeow. Analyzing Pre-fetching in Large-scale Visual Simulation. Computer Graphics International (CGI), New York, USA, June 2005.

Ng, C.M., C.T. Nguyen, D.N. Tran, T.S. Tan and S.W. Yeow. Analyzing Pre-fetching in Large-scale Visual Simulation. Computer Graphics International, 100-107, 2005.

Ng, H. and H.W. Leong. Multi-point Query in Large Spatial Databases. IEEE International Database Engineering and Applications Symposium (IDEAS), New Delhi, India, December 2006.

Ng, H.T. and O.O.Y. Kwong. SIGHAN Workshop on Chinese Language Processing, Sydney, Australia, 2006.

Ng, H.T., M.K. Leong, M. Kan and D. Ji. (eds.) Information Retrieval Technology. Springer Verlag, 2006.

Ng, H.T., Y. Zhou, R. Dale and M. Gardiner. A Machine Learning Approach to Identification and Resolution of One-anaphora. International Joint Conference on Artificial Intelligence (IJCAI), Edinburgh, Scotland, UK, August 2005.

Ng, T.Y., C.H. Wen, T.S. Tan, X.Y. Zhang and Y.J. Kim. Generating a W-tile Set for Texture Synthesis. Computer Graphics International (CGI), New York, USA, June 2005.

Nguyen, B.N., C.T. Nguyen and W.K. Sung. Fast Algorithms for Computing the Tripartition-based Distance between Phylogenetic Networks. International Symposium on Algorithms and Computation (ISAAC), Sanya, Hainan, China, September 2005.

Nguyen, H.H., C. David, S. Qin and W.N. Chin. Automated Verification of Shape and Size Properties via Separation Logic. International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI), Nice, France, January 2007.

Nguyen, K.D., A. Goel, A. Roychoudhury and P.S. Thiagarajan. UML-based Modeling of Process Classes for System Level Design. DAC Workshop on UML for SoC Design, Anaheim, California, USA, June 2005.

Nguyen, K.D., Z. Sun, P.S. Thiagarajan and W.F. Wong. Model-driven SoC Design: The UML-systemC Bridge. UML for SoC Design. Springer Verlag, 2005.

Nguyen, N., S. Jarzabek, S. Ow, R. Sinson and H. Rivepiboon. Software Practices in Five ASEAN Countries: An Exploratory Study. International Conference on Software Engineering (ICSE), Shanghai, China, May 2006.

Nguyen, T. and M. Kan. Fast Webpage Classification using URL features. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, November 2005.

Ni, Y. and C.Y. Chan. Content-based Dissemination of Fragmented XML Data. IEEE International Conference on Distributed Computing Systems, Lisboa, Portugal, July 2006.

Ning, K. and H.W. Leong. The Distribution and Deposition Method for the Multiple Oligo Nucleotide Arrays. IEEE Symposium on Bioinformatics and Bioengineering (BIBE), Washington, USA, October 2006.

Ning, K. and H.W. Leong. Towards a Better Solution to the Shortest Common Supersequence Problem: The Deposition and Reduction Algorithm. BMC Bioinformatics, 7(4):12, 2006.

Ning, K. and H.W. Leong. Towards a Better Solution to the Shortest Common Supersequence Problem: The Deposition and Reduction Algorithm. IEEE Symposium on Computations in Bioinformatics and Bioscience, Hangzhou, China, June 2006.

Ning, K., H. Ng and H.W. Leong. Finding Patterns in Biological Sequences by Longest Common Subsequences and Shortest Common Supersequences. IEEE Symposium on Bioinformatics and Bioengineering (BIBE), Washington, USA, October 2006.

Ning, K., K. Chong and H.W. Leong. A Database Search Algorithm for Identification of Peptides with Multiple Charges using Tandem Mass Spectrometry. Workshop on Data Mining for BioMedical Applications (BioDM), Singapore, April 2006.

Ning, K., K.P. Choi, H.W. Leong and L. Zhang. A Post Processing Method for Optimizing Synthesis Strategy for Oligonucleotide Microarrays. Nucleic Acids Research, 33(17):144, 2005.

Niu, Z., D. Ji and C.L. Tan. Partially Supervised Sense Disambiguation by Learning Model Order from Labeled and Unlabeled Data. Conference on Empirical Methods in Natural Language Processing (EMNLP), Sydney, Australia, July 2006.

Niu, Z., D. Ji and C.L. Tan. Semi-supervised Feature Clustering with Application to Word Sense Disambiguation. Human Language Technology Conference/Conference on Empirical Methods in Natural Language Processing (HLT/EMNLP), Vancouver, Canada, October 2005.

Niu, Z., D. Ji and C.L. Tan. Using Cluster Validation Criterion to Identify Optimal Feature Subset and Cluster Number for Document Clustering. Information Processing and Management, 43(3):730-739, 2006.

Niu, Z., D.H. Ji and C.L. Tan. Word Sense Disambiguation using Label Propagation based Semi-supervised Learning. Annual Meeting of Association of Computational Linguistics (ACL), Michigan, USA, June 2005.

Nwe, T.L., Y. Wang and H.Z. Li. Integrating Articulatory based Features with Auditory based Features for Robust Stressed Speech Recognition. International Conference on Information, Communications and Signal Processing (ICICS), Bangkok, Thailand, December 2005.

Obanaik, V., J. Lillykutty and A.L. Ananda. SPEP: A Secure and Efficient Scheme for Bulk Data Transfer over Wireless Networks. IEEE Wireless Communications and Networking Conference (WCNC), Atlanta, Georgia, USA, March 2004.

Oh, D. and C.L. Tan. Making Better Recommendations with Online Profiling Agents. AI Magazine, 26(3):29-39, 2005.

Ong, G.H. and J.P. Ng. Dynamic Markov Compression using a Crossbar-like Tree Initial Structures for Chinese texts. International Conference on Information Technology and Applications (ICITA), Sydney, Australia, July 2005.

Ong, G.H. and J.P. Ng. Dynamic Markov Modeling with Various Initial Structures for Chinese Text Compression. International Conference on Computational Science and its Applications (ICCSA), Singapore, May 2005.

Ong, G.H. and K. Ching. Parallelizing a Two-pass Improved Encoding Scheme for Fractal Image Compression. International Conference on Distributed Computing and Applications for Business Engineering and Sciences (DCABES), Hangzhou, China, October 2006.

Ong, G.H. and K. Yang. A Binary Partitioning Approach to Image Compression using Weighted Finite Automata for Large Images. Computers and Mathematics with Applications, 51(11):1705-1714, 2006.

Ong, G.H. and L. Fan. An Efficient Parallel Algorithm for Hexagonal-based Fractal Image Compression. International Journal of Computer Mathematics, 84(2):203-218, 2007.

Ong, G.H. and L. Fan. An Efficient Parallel Algorithm for Hexagonal-based Fractal Image Compression. Joint International Symposium on Distributed Computing and Applications to Business, Engineering and Science and International Conference on Parallel Algorithms and Computing Environments, Greenwich, London, UK, August 2005.

Ong, G.H. and W. Koh. Rate Limiting with Network Monitor Approach to Counter DDoS Attacks in Distributed Computing Environments. International Conference on Distributed Computing and Applications for Business Engineering and Sciences (DCABES), Hangzhou, China, October 2006.

Ooi, B.C., Z.Y. Huang, D. Lin, H. Lu and L. Xu. Adapting Relational Database Engine to Accommodate Moving Objects in SpADE. IEEE International Conference on Data Engineering (ICDE), Istanbul, Turkey, April 2007.

Ooi, W.T. Plasma: A Scripting Language for Processing Media Streams. Multimedia Computing and Networking Conference (MMCN), San Jose, California, USA, January 2007.

Palmer, M., H.T. Ng and H.T. Dang. Evaluation of WSD Systems, 2006.

Pang, B., K. Vellaisamy, J. Rohit, H. Yin, K. Lee, B. Ang, J. Lee, T.Y. Leong and I. Ng. A Hybrid Outcome Prediction Model for Severe Trauma Brain Injury. Journal of Neurotrauma, 24(1):136-146, 2007.

Pang, H., A. Jain, K. Ramamritham and K.L. Tan. Verifying Completeness of Relational Query Results in Data Publishing. ACM SIGMOD/PODS International Conference on Management of Data, Baltimore, Maryland, USA, June 2005.

Peng, N., Z.Y. Huang and Z. Hou. An Image Registration Method based on the Local and Global Structures. International Conference on Multimedia Modeling (MMM), Singapore, January 2007.

Perbost, C., M. Fullwood, P. Ng, Y. Ruan, K. Srinivasan, K. Chiu, H. Ooi, J. Tan, C. Wei, Y. Lee, L. Du and W.K. Sung. Multiplex Sequencing of Paired-end Ditags (MS-PET): A Strategy for the Ultra-high-throughput Analysis of Transcriptomes and Genomes. Nucleic Acids Research, 34(12):84, 2006.

Pettersson, U. and S. Jarzabek. Industrial Experience with Building a Web Portal Product Line using a Lightweight, Reactive Approach. European Software Engineering Conference and ACM SIGSOFT Symposium on Foundations of Software Engineering (ESEC-FSE), Lisbon, Portugal, September 2005.

Popeea, C. and W.N. Chin. Inferring Disjunctive Postconditions. Annual Asian Computing Science Conference (ASIAN), Tokyo, Japan, December 2006.

Prabawa, J. and M. Kan. A Rich OPAC User Interface with AJAX. ACM IEEE Joint Conference on Digital Libraries (JCDL), Vancouver, Canada, June 2007.

Pramila, N.A., H. Ooi, Q. Chen, C. L. Wei, K. Chiu, Y. Ruan, C. Wong and W.K. Sung. PET-Tool: A Software Suite for Comprehensive Processing and Managing of Paired-end diTag (PET) Sequence Data. BMC Bioinformatics, 7:390, 2006.

Pung, H.K. Feedforward Neural Networks without Orthonormalization. International Conference on Enterprise Information Systems (ICEIS), Funchal, Madeira, Portugal, June 2007.

Pung, H.K. Grid Workflow Scheduling with Temporal Decomposition. International Conference on Enterprise Information Systems (ICEIS), Funchal, Madeira, Portugal, June 2007.

Pung, H.K. Knowledge Modeling for End-to-end QoS Management. International Conference on Communications and Networking in China (ChinaCom), Beijing, China, October 2006.

Pung, H.K. Query-based Wireless Sensor Storage Management for Real-time Applications. IEEE International Conference on Industrial Informatics (INDIN), Singapore, August 2006.

Qi, X.Y., L. Zhang and C.L. Tan. Motion Deblurring for Optical Character Recognition. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Qiu, L., M. Kan and T.S. Chua. Paraphrase Recognition via Dissimilarity Significance Classification. Association for Computational Linguistics (Coling/ACL), Sydney, Australia, July 2006.

Rajapakse, D.C. and S. Jarzabek. A Need-oriented Assessment of Technological Trends in Web Engineering. International Conference on Web Engineering (ICWE), Sydney, Australia, July 2005.

Rajapakse, D.C. and S. Jarzabek. An Investigation of Cloning in Web Applications. International World Wide Web Conference (WWW), Chiba, Japan, May 2005.

Rajapakse, D.C. and S. Jarzabek. An Investigation of Cloning in Web Portals. International Conference on Web Engineering (ICWE), Sydney, Australia, July 2005.

Rajapakse, D.C. and S. Jarzabek. Using Server Pages to Unify Clones in Web Applications: A Trade-off Analysis. International Conference on Software Engineering (ICSE), Minneapolis, USA, May 2007.

Rajapakse, J.C., L. Wong and R. Acharya. Pattern Recognition in Bioinformatics. Springer Verlag, 2006.

Rajeev, S., A.L. Ananda, M.C. Chan and W.T. Ooi. (eds.) Mobile Wireless and Sensor Networks. John Wiley, 2006.

Raman, B. and S. Chakraborty. Application-specific Workload Shaping in Multimedia-enabled Personal Mobile Devices. International Conference on Hardware Software Codesign and System Synthesis (CODES ISSS), Seoul, Korea, October 2006.

Raman, B., S. Chakraborty and W.T. Ooi. Meeting CPU Constraints by Delaying Playout of Multimedia Tasks. International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV), Skamania, Washington, USA, June 2005.

Ramnath, R., Sufatrio, R.H.C. Yap and Y.Z. Wu. WinResMon: A Tool for Discovering Software Dependencies, Configuration and Requirements in Microsoft Windows. Large Installation System Administration Conference (LISA), Washington, USA, December 2006.

Rao, K.N. and M.C. Chan. Stability and Hop-count based Approach for Route Computation in MANET. International Conference on Computer Communications and Networks (ICCCN), San Diego, California, USA, October 2005.

Rohit, J. and T.Y. Leong. Patient-specific Inference and Situation-dependent Classification using Context-sensitive networks. Annual Symposium on Biomedical and Health Informatics (AMIA), Washington, USA, November 2006.

Rong, G.D. and T.S. Tan. Jump Flooding - An Efficient and Effective Communication on GPU. ShadeX5, 5:185-192, 2007.

Rong, G.D. and T.S. Tan. Jump Flooding Algorithm Revisited. Symposium on Interactive 3D Graphics and Games (i3D), Seattle, USA, April 2007.

Rong, G.D. and T.S. Tan. Jump Flooding in GPU with Applications to Voronoi Diagram and Distance Transform. Symposium on Interactive 3D Graphics and Games (i3D), Redwood City, California, USA, March 2006.

Rong, G.D. and T.S. Tan. Utilizing Jump Flooding in Image-based Soft Shadows. ACM Symposium on Virtual Reality Software and Technology, Limassol, Cyprus, November 2006.

Roychoudhury A., P.S. Thiagarajan, T.A. Tran and V. Zvereva. Automatic Generation of Protocol Converters from Scenario-based Specifications. IEEE International Real-time Systems Symposium (RTSS), Lisbon, Portugal, December 2004.

Rui, S., T.S. Chua, C. Lee and G. Sheng. Bayesian Learning of Hierarchical Multinomial Mixture Models of Concepts for Automatic Image Annotation. International Conference on Image and Video Retrieval (CIVR), Tempe, Arizona, USA, July 2006.

Shao, T. and A.L. Ananda. A Smart TCP Socket for Distributed Computing. International Conference on Parallel Processing (ICPP), Oslo, Norway, June 2005.

Shao, X., C.S. Xu, N.C. Maddage, M.S. Kankanhalli, Q. Tian and J.S. Jin. Automatic Summarization of Music Videos. ACM Transactions on Multimedia Computing, Communications and Applications, 2(2):127-148, 2006.

Shen, H., J. Shepherd, B. Cui and K.L. Tan. HSI: A Novel Framework for Efficient Automated Singer Identification in Large Music Databases. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Shen, H., K.L. Tan, X. Zhou and B. Cui. ICICLE: A Semantic-based WWW Image Retrieval System. ACM Multimedia Systems, 61(1):1-17, 2006.

Shen, H.T., B.C. Ooi and K.L. Tan. SaveRF: Towards Efficient Relevance Feedback Search. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Shen, J., B. Cui, J. Shepherd and K.L. Tan. Towards Efficient Automated Singer Identification in Large Music Databases. ACM International Conference on Research and Development on Information Retrieval, Seattle, Washington, USA, August 2006.

Sheng, C., W. Hsu and M.L. Lee. Mining Dense Periodic Patterns in Time Series Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Shenoy, A. and Y. Wang. Key, Chord and Rhythm Tracking of Popular Music Recordings. Computer Music Journal, 29(3):75-86, 2005.

Shenoy, A., Y.S. Wu and Y. Wang. Singing Voice Detection for Karaoke Application. Visual Communications and Image Processing (VCIP), Beijing, China, July 2005.

Shu, Y., B.C. Ooi, K.L. Tan and A. Zhou. Supporting Multi-dimensional Range Queries in Peer-to-peer Systems. IEEE International Conference on Peer-to-peer Computing (P2P), Konstanz, Germany, August 2005.

Sim, T.M.C. Biometrics and Privacy. Synthesis Journal, 81-88, 2006.

Sim, T.M.C. Let Go My Lego. CDTL Brief, 10(2):3-4, 2007.

Siva, R.G.S.V.S., K.R. Ramakrishnan, P.K. Atrey, V.K. Singh and M.S. Kankanhalli. A Design Methodology for Selection and Placement of Sensors in Multimedia Surveillance Systems. ACM International Workshop on Video Surveillance and Sensor Networks (VSSN), Santa Barbara, California, USA, October 2006.

Song, I.Y., S.W. Liddle and T.W. Ling. (eds.) Data and Knowledge Engineering, 59(3):509-510, 2006.

South Carolina, USA, January 2006.

Sridhar, K.N. and M.C. Chan. Interference-based Call Admission Control for Wireless Ad hoc Networks. International Conference on Mobile and Ubiquitous Systems: Networks and Services (MOBIQUITOUS), San Jose, California, USA, July 2006.

Stupnikov, N.V., L. Kalinichenko and S. Bressan. Interactive Discovery and Composition of Complex Web Services. East-european Conference on Advances in Databases and Information Systems, Thessaloniki, Greece, September 2006.

Sufatrio and R.H.C. Yap. Improving Host-based IDS with Argument Abstraction to Prevent Mimicry Attacks. International Symposium on Recent Advances in Intrusion Detection, Seattle, USA, September 2005.

Suhendra, V., T. Mitra, A. Roychoudhury and T. Chen. Efficient Detection and Exploitation of Infeasible Paths for Software Timing Analysis. Design Automation Conference (DAC), San Francisco, California, USA, July 2006.

Suhendra, V., T. Mitra, A. Roychoudhury and T. Chen. WCET Centric Data Allocation to Scratchpad Memory. IEEE International Real-time Systems Symposium (RTSS), Miami, Florida, USA, December 2005.

Sulzmann, M. A Framework for Extended Algebraic Data Types. International Symposium on Functional and Logic Programming (FLOPS), Tokyo, Japan, April 2006.

Sulzmann, M. A Theory of Overloading. ACM Transactions on Programming Languages and Systems, 27(6):1-54, 2005.

Sulzmann, M. A Type-safe Embedding of XDuce into ML. ACM SIGPLAN Workshop on ML, Tallinn, Estonia, September 2005.

Sulzmann, M. and E. Lam. Towards Agent Programming in CHR. TR CW 452, 2006.

Sulzmann, M. and R. Voicu. Language-based Program Verification via Expressive Types. Workshop on Programming Languages and Program Verification (PLPV), Seattle, Washington, USA, August 2006.

Sulzmann, M. Chameleon: Systematic Type System Design via Constraint Handling Rules. Workshop on Constraint Handling Rules (CHR), Sitges, Spain, October 2005.

Sulzmann, M. Extracting Programs from Type Class Proofs. International Conference on Principles and Practice of Declarative Programming (PPDP), Venice, Italy, July 2006.

Sulzmann, M. Language-based Program Verification via Expressive Types. Workshop on Programming Languages and Program Verification (PLPV), Seattle, Washington, USA, August 2006.

Sulzmann, M. Modular Generic Programming with Extensible Superclasses. ACM SIGPLAN Workshop on Generic Computing (WGP), Portland, Oregon, USA, September 2006.

Sulzmann, M. Observable Confluence for Constraint Handling Rules. TR CW 452, 2006.

Sulzmann, M. Principal type inference for GHC-style Multi-parameter Type Classes. Asian Symposium on Programming Languages and Systems (APLAS), Sydney, Australia, November 2006.

Sulzmann, M. System F with Type Equality Coercions. ACM SIGPLAN Workshop on Types in Language Design and Implementation (TLDI), Nice, France, January 2007.

Sulzmann, M. Type Processing by Constraint Reasoning. Asian Symposium on Programming Languages and Systems (APLAS), Sydney, Australia, November 2006.

Sulzmann, M. Understanding Functional Dependencies via Constraint Handling Rules. Journal of Functional Programming, 17(1):83-129, 2007.

Sulzmann, M. XHaskell. Programming Language Technologies for XML (PLAN-X), Charleston, USA, January 2006.

Sun, J. and J.S. Dong. Design Synthesis from Interaction and State-based Modelling. IEEE Transactions on Software Engineering, 32(6):349-364, 2006.

Sun, J. and J.S. Dong. Extracting FSMs from Object-Z Specifications with History Invariants. International Conference on Engineering of Complex Computer Systems (ICECCS), Shanghai, China, June 2005.

Sun, J. and J.S. Dong. Model Checking Live Sequence Charts. International Conference on Engineering of Complex Computer Systems (ICECCS), Shanghai, China, June 2005.

Sun, J. and J.S. Dong. Synthesis of Distributed Processes from Scenario-based Specifications. International Symposium on Formal Methods Europe (FM), Hamilton, Ontario, Canada, July 2005.

Sun, J., S. Jarzabek, J.S. Dong and H. Wang. CAD System Family Architecture and Verification: An Integrated Formal Approach. Software, 153(3):102-112, 2006.

Sun, R.X, C.H. Ong and T.S. Chua. Mining Dependency Relations for Query Expansion in Passage Retrieval. ACM International Conference on Research and Development for Information Retrieval (SIGIR), Seattle, USA, August 2006.

Sun, R.X., H. Cui, M. Kan and T.S. Chua. Dependency Relation Matching for Answer Selection. ACM International Conference on Research and Development on Information Retrieval (SIGIR), Salvador, Brazil, August 2005.

Sun, Z., D. Hsu, T.T. Jiang, H. Kurniawati and J.H. Reif. Narrow Passage Sampling for Probabilistic Roadmap Planning. IEEE Transactions on Robotics and Automation, 21(6):1105-1115, 2005.

Sung, W.K. A Global Map of p53 Transcription-factor Binding Sites in the Human Genome. Cell, 124(1):207-219, 2006.

Sung, W.K., A. Mittal and T. Liu. Learning Gene Network using Time-delayed Bayesian Network. International Journal of Artificial Intelligence Tools, 15(3):353-370, 2006.

Szabo, C. and Y.M. Teo. On Syntactic Composability and Model Reuse. Asia Modelling Symposium (AMS), Phuket, Thailand, March 2007.

Tan, B. and S. Bressan. Environmental Noise Classification for Multimedia Libraries. International Conference on Database and Expert Systems Applications (DEXA), Copenhagen, Denmark, August 2005.

Tan, C.K.Y. A Belief-based Model of Trust. International FLAIRS Conference. Florida, USA, May 2005.

Tan, C.L., L. Zhang, Z. Zhang and T. Xia. Restoring Warped Document Images through 3D Shape Modeling. IEEE Transactions on Pattern Analysis and Machine Intelligence, 28(2):195-208, 2006.

Tan, G.S.H., A. Persson and R. Ayani. HLA Federate Migration. IEEE Annual Simulation Symposium, San Diego, California, USA, April 2005.

Tan, G.S.H., A. Persson and R. Ayani. Migration of HLA Federates. Spring Interoperability Workshop (SIW), San Diego, California, USA, April 2005.

Tan, Y., M. Kan and D. Lee. Search Engine Driven Author Disambiguation. ACM IEEE Joint Conference on Digital Libraries (JCDL), North Carolina, USA, June 2006.

Tan, Y., M. Kan and H. Cui. Extending Corpus-based Identification of Light Verb Constructions using a Supervised Learning Framework. EACL Workshop on Multi-word-expressions in a Multilingual Context (MWEmc), Trento, Italy, April 2006.

Tedjokusumo, J. and W.K. Leow. Normalization and Alignment of 3D Objects. International Conference on Multimedia Modeling (MMM), Singapore, January 2007.

Teo, Y.M. and S.S. Bhakti. A Framework for Formalization and Strictness Analysis of Simulation Event Orderings. Simulation, (81):325-335, 2005.

Thiele, L., E. Wandeler and S. Chakraborty. A Stream-oriented Component Model for Performance Analysis of Multiprocessor DSPs. IEEE Signal Processing Magazine, 22(3):38-46, 2005.

Tok, W.H., S. Bressan and M.L. Lee. Progressive Spatial Join. International Conference on Scientific and Statistical Database Management (SSDBM), Vienna, Austria, July 2006.

Tran, D.N., W.T. Ooi and Y.C. Tay. SAX: A Tool for Studying Congestion-induced Surfer Behaviour. Passive and Active Measurement Conference (PAM), Adelaide, Australia, March 2006.

Trinh, H., W. Hon, T. Lam and W.K. Sung. Approximate String Matching using Compressed Suffix Arrays. Theoretical Computer Science, 352(1-3):240-249, 2006.

Tung, A.K.H., R. Zhang, N. Koudas and B.C. Ooi. Similarity Search: A Matching based Approach. International Conference on Very Large Databases (VLDB), Seoul, South Korea, August 2006.

Tung, A.K.H., X. Xin and B.C. Ooi. CURLER: Finding and Visualizing Nonlinear Correlated Clusters. ACM SIGMOD/PODS International Conference on Management of Data, Baltimore, Maryland, USA, June 2005.

Vaiapury, K., P.K. Atrey, M.S. Kankanhalli and K.R. Ramakrishnan. Non-identical Duplicate Video Detection using the SIFT Method. International Conference on Visual Information Engineering (VIE), Bangalore, India, September 2006.

Venkatesh, S.O., Lillykutty, J. and A.L. Ananda. Secure Performance Enhancing Proxy: To Ensure End-to-end Security and Enhance TCP Performance over IPv6 Wireless Networks. Computer Networks, 50(13):2225-2238, 2006.

Verma, S. and W.T. Ooi. Controlling Gossip Protocol Infection Pattern using Adaptive Fanout. International Conference on Distributed Computing Systems (ICDCS), Columbus, Ohio, USA, June 2005.

Vikram, S., M. Motani and W.T. Ooi. Analysis and Implications of Student Contact Patterns Derived from Campus Schedules. International Conference on Mobile Computing and Networking, Los Angeles, California, USA, September 2006.

Vivy, S., R. Chandrashekar and T. Mitra. Integrated Scratchpad Memory Optimization and Task Scheduling for MPSoC Architectures. ACM/IEEE International Conference on Compilers, Architecture and Synthesis for Embedded Systems, Seoul, South Korea, October 2006.

Wan, Z., B. Zhu, R. Deng, F. Bao and A.L. Ananda. Efficient Key Tree Construction for Group Key Agreement in Ad hoc Networks. IEEE Wireless Communications and Networking Conference (WCNC), Las Vegas, USA, April 2006.

Wan, Z., F. Bao, R.H. Deng and A.L. Ananda. Security Analysis on a Conference Scheme for Mobile Communications. IEEE Transactions on Wireless Communications, 5(6):1238-1240, 2006.

Wan, Z., R. Deng, F. Bao and A.L. Ananda. Anonymous DoS-resistant Access Control Protocol using Passwords for Wireless Networks. IEEE Conference on Local Computer Networks (LCN), Sydney, Australia, November 2005.

Wan, Z., R.H. Deng, F. Bao and A.L. Ananda. Access Control Protocols with Two-layer Architecture for Wireless Networks. Computer Networks, 51(3):655-670, 2007.

Wang, H., J.S. Dong and J. Sun. Reasoning Support for Semantic Web Ontology Family Languages using Alloy. International Journal of Multi-agent and Grid Systems, 2(4):455-471, 2006.

Wang , Y. Efficient Partial Spectrum Reconstruction using an Asymmetric PQMF Algorithm for MPEG-coded Stereo Audio. IEEE International Conference on Multimedia and Expo (ICME), Toronto, Canada, July 2006.

Wang, F. and M. Kan. NPIC: Hierarchical Synthetic Image Classification using Image Search and Generic Features. Conference on Image and Video Retrieval (CIVR), Tempe, Arizona, USA, July 2006.

Wang, H., J.S. Dong and J. Sun. Reasoning Support for SWRL-FOL using Alloy. International Conference on Software Engineering and Knowledge Engineering (SEKE), Taipei, Taiwan, July 2005.

Wang, J., W. Hsu and M.L. Lee. A Framework for Mining Topological Patterns in Spatio-temporal Data. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, November 2005.

Wang, J., W. Hsu and M.L. Lee. A Partition-based Approach to Graph Mining. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Wang, J., W. Hsu and M.L. Lee. Mining Generalized Spatio-temporal Patterns. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Wang, M., K. Chen and S.C. Khoo. On the Pursuit of Static and Coherent Weaving. Foundations of Aspect-oriented Languages Workshop (FOAL), Bonn, Germany, March 2006.

Wang, M., K. Chen and S.C. Khoo. Type-directed Weaving of Aspects for Higher-order Functional Languages. ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation (PEPM), Charleston, South Carolina, USA, January 2006.

Wang, R. and W.K. Leow. Posture Analysis under Partial Self-occlusion. International Conference on Image Analysis and Recognition (ICIAR), Povoa de Varzim, Portugal, September 2006.

Wang, T. and A. Roychoudhury. Automated Path Generation for Software Fault Localization. IEEE/ACM International Conference on Automated Software Engineering (ASE), California, USA, November 2005.

Wang, Y. A Violin Music Transcriber for Personalized Learning. IEEE International Conference on Multimedia and Expo (ICME), Toronto, Canada, July 2006.

Wang, Y. Low Level Descriptors for Automatic Violin Transcription. International Conference on Music Information Retrieval (ISMIR), Victoria, Canada, October 2006.

Wang, Y. Syllabic Level Automatic Synchronization of Music Signals and Text Lyrics. ACM Multimedia, Santa Barbara, California, USA, October 2006.

Wang, Y., K.L. Tan, J. Ren and X. Pang. Towards Autonomous and Automatic Evaluation and Negotiations in Agent-mediated Internet Marketplaces. Electronic Commerce Research, 5(3):343-365, 2005.

Wang, Z., C.K. Chui, C.H. Ang and S.H. Teoh. Dynamic Linear Level Octree-based Volume Rendering Methods for Interactive Microsurgical Simulation. International Journal of Image and Graphics, 6(2):155-173, 2006.

Wee, H.T., S. Bressan, P. Kalnis and B. Zheng. Spatial Data on the Move. Handbook of Research on Mobile Multimedia. Idea-group, 2005.

Welch, G., R. Yang, S. Becker, A. Ilie, D. Russo, J. Funaro, A. State, K.L. Low, A. Lastra, H. Towles, B. Cairns, H. Fuchs and A. Dam. Immersive Electronic Books for Surgical Training. IEEE Multimedia, 12(3):22-35, 2005.

Wijaya, D. and S. Bressan. Clustering Web Documents using Co-citation, Coupling, Incoming and Outgoing Hyperlinks: A Comparative Performance Analysis of Algorithms. International Journal of Web Information Systems, 2(2), 2006.

Wong, K.H., X. Ouyang, C.W. Lim, T.S. Tan and J. Nievergelt. Rendering Anti-aliased Line Segments. Computer Graphics International (CGI), New York, USA, June 2005.

Wong, W.C., L.Y. Lau, H.K. Pung and B.S. Lee. (eds.) Computer Communications, 29(9), 2006.

Wong, W.F. Targeted Data Prefetching. Advances in Computer Systems Architecture. Springer Verlag, 2005.

Wong, Y. and H.T. Ng. One Class per Named Entity: Exploiting Unlabeled Text for Named Entity Recognition. International Joint Conference on Artificial Intelligence (IJCAI), Hyderabad, India, January 2007.

Wu, W. and K.L. Tan. Global Cache Management in Non-uniform Mobile Broadcast. International Conference on Mobile Data Management, Nara, Japan, May 2006.

Wu, X., A.L. Ananda and M.C. Chan. PMC: An Energy Efficient Event Transport Service for Wireless Sensor Network. IEEE International Conference on Communications (ICC), Istanbul, Turkey, June 2006.

Wu, X., I. Biswas, M.C. Chan and A.L. Ananda. Utilizing Characteristics of Last Link to Improve TCP Performance. IEEE International Performance Computing and Communications Conference (IPCCC), Phoenix, Arizona, USA, April 2005.

Wu, X., M.C. Chan and A.L. Ananda. TCP Handoff: A Practical TCP Enhancement for Heterogeneous Mobile Environments. IEEE International Conference on Communications (ICC), Glasgow, UK, June 2007.

Wu, Y. and R.H.C. Yap. A User-level Framework for Auditing and Monitoring. Annual Computer Security Applications Conference, Tucson, Arizona, USA, December 2005.

Xia, C., W. Hsu and M.L. Lee. ERkNN: Efficient Reverse k-Nearest Neighbors Retrieval with Local kNN-Distance Estimation. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, October 2005.

Xia, C., W. Hsu and M.L. Lee. ERkNN: Efficient Reverse k-nearest Neighbours Retrieval with Local kNN-distance Estimation. Conference on Information and Knowledge Management (CIKM), Bremen, Germany, November 2005.

Xia, C., W. Hsu, M.L. Lee and B.C. Ooi. BORDER: Efficient Computation of Boundary Points. IEEE Transactions on Knowledge and Data Engineering, 18(2):289-303, 2006.

Xiao, J., J. Su, G. Zhou and C.L. Tan. Protein-protein Interaction Extraction: A Supervised Learning Approach. International Symposium on Semantic Mining in Biomedicine (SMBM), Cambridgeshire, UK, April 2005.

Xiao, W. and E.W. Chionh. Bracket Producing Rows and Columns of the Dixon Determinant. International Symposium on Symbolic and Numeric Algorithm for Scientific Computing (SYNASC), Timisoara, Romania, September 2006.

Xiao, Y., T.S. Tan and S.C. Tay. Utilizing Edge to Extract Roads in High-resolution Satellite Imagery. International Conference on Image Processing (ICIP), Genoa, Italy, September 2005.

Xie, Y., Y.M Teo, W. Cai and S.J. Turner. Service Provisioning for HLA-based Distributed Simulation on the Grid. ACM/IEEE/SCS Workshop on Principles of Advanced and Distributed Simulation (PADS), Monterey, USA, June 2005.

Xie, Z., W. Hsu and M.L. Lee. Enhancing SNNB with Local Accuracy Estimation and Ensemble Techniques. International Conference on Database Systems for Advanced Applications (DASFAA), Beijing, China, April 2005.

Xu, H.X. and T.S. Chua. A Framework using Audio-visual Features and External Information Sources for Event Detection in Broadcast Team Sports Video. ACM Transactions on Multimedia Computing, Communications and Applications, 2(1):44-67, 2006.

Xu, J. and Z.Y. Huang. HOPI: A Novel High Order Parametric Interpolation in 2D. European Association for Computer Graphics (Eurographics), Vienna, Austria, September 2006.

Xu, W., J. Wu and Z.Y. Huang. A Maximum Margin Discriminative Learning Algorithm for Temporal Signals. International Conference on Pattern Recognition (ICPR), Hong Kong, China, August 2006.

Xu, X., Y. Lu, A.K.H. Tung and W. Wang. Mining Shifting-and-scaling Co-regulation Patterns on Gene Expression Profiles. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Xue, J., J. Jaffar and H. Wu. Instruction Scheduling with Release Times and Deadlines on ILP Processors. IEEE International Conference on Embedded and Real-time Computing Systems and Applications (RTCSA), Sydney, Australia, August 2006.

Yan, S., M. Kan, D. Lee and C.L. Giles. Adaptive Sorted Neighborhood Methods for Efficient Record Linkage. ACM IEEE Joint Conference on Digital Libraries (JCDL), Vancouver, Canada, June 2007.

Yan, W.Q. and M.S. Kankanhalli. Multimedia Simplification for Optimized MMS Synthesis. ACM Transactions on Multimedia Computing, Communications and Applications, 3(1), 2007.

Yang, J. and S. Jarzabek. Applying a Generative Technique for Enhanced Reuse on J2EE Platform. International Conference on Generative Programming and Component Engineering (GPCE), Tallinn, Estonia, September 2005.

Yang, L., W. Huang and C.L. Tan. Semi-automatic Ground Truth Generation for Chart Image Recognition. IAPR Workshop on Document Analysis Systems (DAS), Nelson, New Zealand, February 2006.

Yang, L.H., W. Hsu, M.L. Lee and L. Wong. SVM-based Identification of MicroRNA Precursors. Asia-pacific Conference on Bioinformatics (APBC), Taipei, Taiwan, March 2006.

Yang, R., P. Kalnis and A.K.H. Tung. Similarity Evaluation on Tree-structured Data. ACM SIGMOD/PODS International Conference on Management of Data, Baltimore, Maryland, USA, June 2005.

Yang, S. and H.W. Leong. Improved Algorithms for Low Power Multiplexor Decomposition. Journal of Circuits, Systems and Computers, 14(6):1085-1099, 2005.

Yang, X., J. Su and C.L. Tan. A Twin Candidate Modeling for Co-reference Resolution with Non-Anaphor Identification Capability. International Joint Conference on Natural Language Processing (IJCNLP), Jeju Island, South Korea, October 2005.

Yang, X., J. Su and C.L. Tan. Kernel-based Pronoun Resolution with Structured Syntactic Knowledge. Association for Computational Linguistics (Coling/ACL), Sydney, Australia, July 2006.

Yang, X., J. Su, G. Zhou and C.L. Tan. Improving Pronoun Resolution using Statistics-based Semantic Compatibility Information. Annual Meeting of Association of Computational Linguistics (ACL), Michigan, USA, June 2005.

Yang, X., M.L. Lee, T.W. Ling and G. Dobbie. A Semantic Approach to Query Rewriting for Integrated XML Data. International Conference on Conceptual Modeling (ER), Klagenfurt, Austria, October 2005.

Yap, R.H.C. and L. Chavalit. Extracting Microstructure in Binary Constraint Networks, Recent Advances in Constraints. Annual ERCIM International Workshop on Constraint Solving and Constraint Logic Programming (CSCLP), Caparica, Portugal, June 2006.

Ye, S. and T.S. Chua. Learning Object Models from Semi-structured Web Documents. IEEE Transactions on Knowledge and Data Engineering, 18(3):334-349, 2006.

Ye, S., Q. Sun and E.C. Chang. Error Resilient Image Authentication using Feature Statistical and Spatial Properties. International Workshop on Digital Watermarking (IWDW), Jeju Island, South Korea, November 2006.

Yin, H., G. Li, T.Y. Leong, K. Vellaisamy, B. Pang, B. Ang, K. Lee and I. Ng. Experimental Analysis on Severe Head Injury Outcome Prediction – A Preliminary Study. TRD9/06, Singapore, 2006.

Yin, J., T.M.C. Sim, Y. Wang and A. Shenoy. Music Transcription using an Instrument Model. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Philadelphia, USA, March 2005.

Yin, J., Y. Wang and D. Hsu. Digital Violin Tutor: An Integrated System for Beginning Violin Learners. ACM Multimedia, Singapore, November 2005.

Yoong, C. and H.K. Pung. A Framework for Shared Time-slot TDM Wavelength Optical WDM Networks. Journal of Optical Networking – Convergence, 5(7):554-567, 2006.

Yoong, C. and H.K. Pung. A Framework for Shared Time-slot TDM Wavelength Optical WDM Networks. Journal of Optical Networking, 5(7):554-567, 2006.

Yoong, C. and H.K. Pung. A Shared Time-slot Router Architecture for TDM Wavelength Optical WDM Networks. IEEE International Conference on Networks (ICON), Kuala Lumpur, Malaysia, November 2005.

Yoong, C.H. and H.K. Pung. A Mini-slot Router Architecture for TDM Wavelength Optical WDM Networks. IEEE International Conference on Advanced Information Networking and Applications (AINA), Vienna, Austria, April 2006.

Yu, H. and A. Vahdat. The Costs and Limits of Availability for Replicated Services. ACM Transactions on Computer Systems, 24(1), 2006.

Yu, H. Signed Quorum Systems. Distributed Computing, 18(4), 2006.

Yu, H., M. Kaminsky, P. Gibbons and A. Flaxman. SybilGuard: Defending against Sybil Attacks via Social Networks. ACM SIGCOMM Conference, Pisa, Italy, September 2006.

Yu, H., P. Gibbons and S. Nath. Availability of Multi-object Operations. Storage Systems. Symposium on Networked Systems Design and Implementation (NSDI), San Jose, California, USA, May 2006.

Yu, P. and T. Mitra. Satisfying Real-time Constraints with Custom Instructions. International Conference on Hardware/Software Codesign and System Synthesis (CODES/ISSS), New York, USA, September 2005.

Yu, T., T.W. Ling and J. Lu. A Holistic Twig Join Algorithm for Twig Query with Not-predicates on XML Data. International Conference on Database Systems for Advanced Applications (DASFAA), Singapore, April 2006.

Yu, X., H.W. Leong, C. Xu and Q. Tian. Trajectory-based Ball Detection and Tracking in Broadcast Soccer Video. IEEE Transactions on Multimedia, 8(6):1164-1178, 2006.

Yuan, B. and C.L. Tan. A Multi-level Component Grouping Algorithm and its Application. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Yuan, B. and C.L. Tan. Convex Hull-based Skew Estimation. Pattern Recognition, 40(2):456-475, 2007.

Yuan, B. and C.L. Tan. Fiducial Line based Skew Estimation. Pattern Recognition, 38(12):2333-2350, 2005.

Yuan, B. and C.L. Tan. Skew Estimation for Scanned Documents from Noises. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Yuan, B., L.K. Kwoh and C.L. Tan. Finding the Best-fit Bounding-boxes. IAPR Workshop on Document Analysis Systems (DAS), Nelson, New Zealand, February 2006.

Zhang, D. and W.S. Lee. Extracting Key-substring-group Features for Text Classification. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), Philadelphia, USA, August 2006.

Zhang, D. and W.S. Lee. Learning to Separate Text Content and Style for Classification. Asia Information Retrieval Symposium (AIRS), Singapore, October 2006.

Zhang, D., T. Gu and H.K. Pung. A P2P Context Lookup Service for Multiple Smart Spaces. International Conference on Mobile Systems, Applications and Services, Uppsala, Sweden, June 2006.

Zhang, H. and S. Jarzabek. A Bayesian Network Approach to Rational Architectural Design. International Journal of Software Engineering and Knowledge Engineering, 15(4):695-719, 2005.

Zhang, H., W. Huang, Z.Y. Huang and B. Zhang. A Kernel Autoassociator Approach to Pattern Classification. IEEE Transactions on Systems, Man and Cybernetics, 35(3):593-606, 2005.

Zhang, J., H. Liu, T.W. Ling, R.M. Bruckner and A.M. Tjoa. A Framework for Efficient Association Rule Mining in XML Data. Journal of Database Management, 17(3):19-40, 2006.

Zhang, L. and C.L. Tan. Restoring Warped Document Images using Shape-from-shading and Surface Interpolation. International Conference on Pattern Recognition (ICPR), Hong Kong, China, August 2006.

Zhang, L. and C.L. Tan. Warped Image Restoration with Applications to Digital Libraries. International Conference on Document Analysis and Recognition (ICDAR), Seoul, South Korea, August 2005.

Zhang, L., Z. Zhang, C.L. Tan and T. Xia. 3D Geometric and Optical Modeling of Warped Document Images from Scanners. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), San Diego, California, USA, June 2005.

Zhang, M., W. Hsu and M.L. Lee. Mining Progressive Confident Rules. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), Philadelphia, USA, August 2006.

Zhang, M., W. Hsu and M.L. Lee. Mining Progressive Confident Rules. ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), Philadelphia, USA, August 2006.

Zhang, R., P. Kalnis, B.C. Ooi and K.L. Tan. Generalized Multi-dimensional Data Mapping and Query Processing. ACM Transactions on Database Systems, 30(3):661-697, 2005.

Zhang, S. and T.M.C. Sim. When Fisher meets Fukunaga-koontz: A New Look at Linear Discriminants. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), New York, USA, June 2006.

Zhang, S., R. Janakiraman, T.M.C. Sim and S. Kumar. Continuous Verification using Multimodal Biometrics. IAPR International Conference on Biometrics (IAPR ICB), Hong Kong, China, January 2006.

Zhang, W. and S. Jarzabek. Reuse without Compromising Performance: Industrial Experience from RPG Software Product Line for Mobile Devices. International Software Product Line Conference, (SPLC-EUROPE), Rennes, France, September 2005.

Zhang, W., S. Jarzabek, H. Zhang, N. Loughran and A. Rashid. Software Evolution with XVCL. Software Evolution with UML and XML. Idea Group Publishing, 2005.

Zhang, X. and W.S. Lee. Hyperparameter Learning for Graph-based Semi-supervised Learning Algorithms. Neural Information Processing, Vancouver, Canada, December 2006.

Zhang, X., H. Li, Y. Qi, W.K. Leow and T.K. Ng. Rain Removal in Video by Combining Temporal and Chromatic Properties. IEEE International Conference on Multimedia and Expo, Toronto, Ontario, Canada, July 2006.

Zhang, X., J. Sun, J.S. Dong and P. Hao. Reasoning about Timed CSP Models. International Symposium on Formal Methods (FM), Hamilton, Ontario, Canada, August 2006.

Zhang, Y. and R.H.C. Yap. Set Intersection and Consistency in Constraint Networks. Journal of Artificial Intelligence Research, 27:441-464, 2006.

Zhang, Y. and T.M.C. Sim. From Range Data to Animated Anatomy-based Faces: A Model Adaptation Method. International Conference on 3-D Digital Imaging and Modeling (3DIM), Ottawa, Canada, June 2005.

Zhang, Y. and T.M.C. Sim. Realistic and Efficient Wrinkle Simulation using an Anatomy-based Face Model with Adaptive Refinement. Computer Graphics International (CGI), New York, USA, June 2005.

Zhang, Y., T.M.C. Sim and C.L. Tan. Faces Alive: Reconstruction of Animated 3D Human Faces. International Conference on Computational Science and its Applications (ICCSA), Singapore, May 2005.

Zhang, Y., T.M.C. Sim and C.L. Tan. Simulating Wrinkles in Facial Expressions on an Anatomy-based Face. International Workshop on Computer Graphics and Geometric Modeling (CGGM), Atlanta, USA, May 2005.

Zhang, Y., T.M.C. Sim, C.L. Tan and E. Sung. Anatomy-based Face Reconstruction for Animation using Multi-layer Deformation. Journal of Visual Languages and Computing, 17:126-160, 2006.

Zhang, Y., T.M.C. Sim, C.L. Tan and E. Sung. Anatomy-based Face Reconstruction for Animation using Multi-layer Deformation. Visual Language Computing, 17(2):126-160, 2006.

Zhao, M., T.S. Chua and T.M.C. Sim. Morphable Face Reconstruction with Multiple Images. IEEE International Conference on Automatic Face and Gesture Recognition (FG), Southampton, UK, April 2006.

Zhao, M., Y. Teo, S. Liu, T.S. Chua and R. Jain. Automatic Person Annotation of Family Photo Album. Conference on Image and Video Retrieval (CIVR), Tempe, Arizona, USA, July 2006.

Zhao, Q., J.E. Sim, W.F. Wong and L. Rudolph. DEP: Detailed Execution Profile. International Conference on Parallel Architectures and Compilation Techniques (PACT), Seattle, Washington, USA, September 2006.

Zheng, Y., W. Hsu, M.L. Lee and L. Wong. Exploring Essential Attributes for Detecting MicroRNA Precursors from Background Sequences. VLDB Workshop on Data Mining in Bioinformatics, Seoul, South Korea, September 2006.

Zhou, F., W. Hsu and M.L. Lee. Efficient Pattern Discovery for Semi-structured Data. IEEE International Conference on Tools with Artificial Intelligence (ICTAI), Hong Kong, China, November 2005.

Zhou, L., H.K. Pung and L.H. Ngoh. Towards Semantic Modeling for QoS Specification. IEEE International Conference on Local Computer Networks (LCN), Tampa, Florida, USA, November 2006.

Zhou, L., H.K. Pung, T. Gu and L.H. Ngoh. Ontology Modeling of a Dynamic Protocol Stack. IEEE International Conference on Local Computer Networks (LCN), Tampa, Florida, USA, November 2006.

Zhou, L., Y. Lu and C.L. Tan. Bangla/English Script Identification based on Analysis of Connected Component Profiles. IAPR Workshop on Document Analysis Systems (DAS), Nelson, New Zealand, February 2006.

Zhou, X., H. Pang and K.L. Tan. WmXML: A System for Watermarking XML Data. International Conference on Very Large Data Bases (VLDB), Trondheim, Norway, August 2005.

Zhou, X.M., C.H. Ang and T.W. Ling. Dynamic Interactive Spatial Similarity Retrieval in Iconic Image Databases using Enhanced Digraph. ACM Symposium on Applied Computing (SAC), Dijon, France, April 2006.

Zhou, Y., B.C. Ooi and K.L. Tan. Dynamic Load Management for Distributed Continuous Query Systems. IEEE International Conference on Data Engineering (ICDE), Tokyo, Japan, April 2005.

Zhou, Y., B.C. Ooi, K.L. Tan and F. Yu. Adaptive Reorganization of Coherency-preserving Dissemination Tree for Streaming Data. IEEE International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, April 2006.

Zhou, Y., B.C. Ooi, K.L. Tan and J. Wu. Efficient Dynamic Operator Placement in a Locally Distributed Continuous Query System. International Conference on Cooperative Information Systems (CoopIS), Montpellier, France, November 2006.

Zhou, Y., B.C. Ooi, K.L. Tan and W.H. Tok. An Adaptable Distributed Query Processing Architecture. Data and Knowledge Engineering, 53(3):283-309, 2005.

Zhu, B., J.K. Wu and M.S. Kankanhalli. Render Sequence Encoding for Electronic Document Authentication. IEEE Transactions on Multimedia, 9(1):16-24, 2006.

Zhu, B., S. Jajodia, M.S. Kankanhalli, F. Bao and R.H. Deng. An Anonymous Routing Protocol with the Local-repair Mechanism for Mobile Ad Hoc Networks. IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), Reston, USA, September 2006.

Zhu, P. and S.C. Khoo. Profitability-oriented Component Specialization. International Workshop on Component-oriented Programming (WCOP), Nantes, France, July 2006.

Zhu, Y., W.F. Wong and C.K. Koh. A Performance and Power Co-optimization Approach for Modern Processors. International Conference on Computer and Information Technology (ICCIT), Shanghai, China, September 2005.

Zhu, Y., W.F. Wong and S. Andrei. Co-optimization of Performance and Power in Superscalar Processor Design. International Workshop on Embedded Software Optimization (ESO), Seoul, South Korea, August 2006.

Zhu, Y., Z. Sun, A. Maxiaguine and W.F. Wong. Using UML 2.0 for System Level Design of Real-time SoC Platforms for Stream Processing. IEEE International Conference on Embedded and Real-time Computing Systems and Applications (RTCSA), Hong Kong, China, August 2005.

Publications

(Department of Information Systems)

Anand, M.R., P.R. Devadoss and S.L. Pan. The Impacts of Ubiquitous Computing Technologies on Business Process Design and Management: The Case of Singapore's National Library Board. IFIP 8.2, Cleveland, Ohio, USA, August 2005.

Azcarraga, A., M.H. Hsieh and R. Setiono. Car Market Segmentation using SOM and Decision Trees. Decision Sciences Institute International Conference, Barcelona, Spain, July 2005.

Bhandar, M., S.L. Pan and B.C.Y. Tan. Roles of Social Capital in Collaborative IS Projects. European Conference on Information Systems (ECIS), Regensburg, Germany, May 2005.

Bhandar, M., S.L. Pan, B.C.Y. Tan and P. Goh. Integrating Knowledge across Organizations: The Role of Social Capital. Information Resources Management Association (IRMA) Conference, San Diego, USA, May 2005.

Bock, G.W., A.M. Kankanhalli and S. Sharma. Are Norms Enough? The Role of Collaborative Norms in Promoting Organizational Knowledge Seeking. European Journal of Information Systems, 15(4):357-367, 2006.

Cai, S. and Y. Xu. Effects of Outcome, Process and Shopping Enjoyment on Online Consumer Behaviour. Electronic Commerce Research and Application, 5(4):272-281, 2006.

Cai, S. and Y. Xu. Order Effects on Consumer Product Choices in Online Retailing. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Chan, H.C. and K. Siau. Introduction to the Special Issue on Communication Issues in User-database Interaction. IEEE Transactions on Professional Communication, 49(2):93-95, 2006.

Chan, H.C., H.W. Kim and W.C. Tan. Information Systems Citation Patterns from International Conference on Information Systems Articles. Journal of the American Society for Information Science and Technology, 57(9):1263-1274, 2006.

Chan, M.L. and S.L. Pan. Intertwining Offline and Online in Multi-channel Public Service Delivery: A Case Study. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Chan, M.L. and S.L. Pan. Resource Enactment in the e-Government Systems Implementation: A Case Study in the e-File Systems. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Chan, M.T.L., I.M.Y. Woon and A.M. Kankanhalli. Perceptions of Information Security at the Workplace: Linking Information Security Climate to Compliant Behaviour. Journal of Information Privacy and Security, 1(3):18-41, 2006.

Chang, K.T.T. and L.H. Lim. The Role of Interface Elements in Web-based Interaction and Group Learning: Theoretical and Empirical Analysis. Internal Journal of Web-based Learning and Teaching Technologies, 1(1):1-28, 2006.

Chen, T., I.M.Y. Woon and A.M. Kankanhalli. Impact of Security Measures on the Usefulness of Knowledge Management Systems. Pacific Asia Conference on Information Systems (PACIS), Bangkok, Thailand, July 2005.

Chintagunta, P.K., J.P. Dube and K.Y. Goh. Beyond the Endogeneity Bias: The Effect of Unmeasured Brand Characteristics on Household-level Brand Choice Models. Management Science, 51(5):832-849, 2005.

Chou, T., J. Chen and S.L. Pan. The Impact of Social Capital on Information Technology Outsourcing Decisions: A Case Study of a Taiwanese Firm. International Journal of Information Management, 26(3):249-256, 2006.

Chua, A.L. and S.L. Pan. Knowledge Transfer in Offshore Insourcing. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Falkenberg, A., C.E. Hull, H.A. Glamheden and Y. Hung. Opening the Black Box – The Relationships between Communication Technologies, Virtual Team Processes and Performance of Virtual Organizations. Hawaii International Conference of System Sciences (HICSS), Hawaii, USA, January 2007.

Gao, X., C.S. Hsu, D.S.Q. Koh, H.B. Hwang, W.O. Lee and Y. Xu. Development and Validation of Caries Risk Assessment Models for Children. Annual General Session and Exhibition of the International Association for Dental Research, New Orleans, USA, March 2007.

Gao, X., D.S.Q. Koh, H.B. Hwang, W.O. Lee, Y. Xu and C.S. Hsu. Caries Status and Risk Assessment for Pre-schoolers in Singapore. FDI World Dental Congress, Shenzhen, China, September 2006.

Gholami, R., L.H. Lim and T.S. Lee. A Survey on the Post-adoption of Broadband Internet. European Conference on Management of Technology (EuroMOT), Birmingham, UK, September 2006.

Goh, K.Y., J. Chu and S.D. Tuan. Market Mavens and Online Word-of-mouth: Evaluating the Impacts on Consumer Purchase Behaviour. INFORMS Marketing Science Conference, Singapore, June 2007.

Goswami, S., H.C. Chan and A.L. Chua. Intranets and Organizational Learning: Impact of Metadata Filters on Information Quality, User Satisfaction and Intention to Use. Pacific Asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Goswami, S., H.C. Chan and H.W. Kim. Spreadsheet Error Correction using an Activity Framework and a Cognitive Fit Perspective. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Guo, R. and Y. Xu. The Adoption of Internet-based B2B e-Marketplaces among Small. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Gupta, S. and H.W. Kim. Developing the Commitment to Virtual Community: The Balanced Effects of Cognition and Affect. Information Resources Management Journal, 20(1):28-45, 2007.

Gupta, S. and H.W. Kim. The Moderating Effect of Transaction Experience on Value-driven Internet Shopping. European Conference on Information Systems (ECIS), Goteborg, Sweden, May 2006.

Han, J., J. Zheng and Y. Xu. The Effect of Individual Needs and Social Capital in Explaining Participation Intentions in Virtual Community. Hawaii International Conference on System Sciences (HICSS), Hawaii, USA, January 2007.

Hann, I.H., K.L. Hui, S.Y.T. Lee and I. Png. Analyzing Online Information Privacy Concerns: An Information Processing Theory Approach. Hawaii International Conference on System Sciences (HICSS), Hawaii, USA, January 2007.

Hann, I.H., K.L. Hui, Y.L. Lai, T.S. Lee and I. Png. Who Gets Spammed? Communications of the ACM, 49(10):83-87, 2006.

Hayashi, Y., K. Odajima and R. Setiono. Greedy Rule Generation from Discrete Data and its Use in Neural Network Rule Extraction. International Joint Conference on Neural Networks (IJCNN), Vancouver, Canada, July 2006.

Hui, K.L. and I. Png. Economics of Privacy. Handbook of Economics and Information Systems. Elsevier, 2006.

Hui, K.L., B.C.Y. Tan and C.Y. Goh. Online Information Disclosure: Motivators and Measurements. ACM Transactions on Internet Technology, 6(4):415-441, 2006.

Hui, K.L., H.H. Teo and T.S. Lee. The Value of Privacy Assurance: An Exploratory Field Experiment. MIS Quarterly, 31(1):19-33, 2007.

Hull, C.E., Y. Hung, N. Nair, V. Perotti and R. DeMartino. Digital Entrepreneurship. Enterprise Development Growth and Expansion (EDGE), Singapore, July 2006.

Hung, Y., W.C. Kong, A.L. Chua and C.E. Hull. Re-examining Media Capacity Theories using Workplace Instant Messaging. Hawaii International Conference of Systems Sciences (HICSS), Hawaii, USA, January 2006.

Huynh, T.Q. and R. Setiono. Effective Neural Network Pruning using Cross Validation. International Joint Conference on Neural Networks (IJCNN), Montreal, Canada, August 2005.

Jiang, Z. Effects of Anonymity, Media Richness and Chat-room Activeness on Online Chatting. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Jiang, Z. Investigating the Role of Presence in Collaborative Online Shopping. Americas Conference on Information Systems (AMCIS), Acapulco, Mexico, August 2006.

Jiang, Z. Real Experience in a Virtual Store: Designing for Presence in Online Shopping. Pacific Asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Kan, M. and C.C.D. Poo. Detecting and Supporting Known Item Queries in Online Public Access Catalogs. ACM IEEE Joint Conference on Digital Libraries (JCDL), Denver, Colorado, USA, June 2005.

Kankanhalli, A.M. and B.C.Y. Tan. Knowledge Management Metrics: A Review and Directions for Future Research. International Journal of Knowledge Management, 1(2):20-32, 2005.

Kankanhalli, A.M., B.C.Y. Tan and K.K. Wei. Communication Media and Knowledge Sharing in Global Virtual Teams. The Global Enterprise: Entrepreneurship and Value Creation. Haworth Press, 2007.

Kankanhalli, A.M., B.C.Y. Tan and K.K. Wei. Conflict and Performance in Global Virtual Teams. Journal of Management Information Systems, JMIS, 23(3):237-274, 2006.

Kankanhalli, A.M., B.C.Y. Tan and K.K. Wei. Knowledge Producers and Consumers. Encyclopedia of Knowledge Management. Idea Group Publishing, 2005.

Kankanhalli, A.M., L.G. Pee and B.C.Y. Tan. Evaluation of Knowledge Management: A Review and Agenda for Future Research. Knowledge Management in Modern Organizations. Idea Group Publishing, 2007.

Khek, C., L.H. Lim and Y. Zhong. Facilitating Students with Special Needs in Mainstream Schools: An Exploratory Study of Assistive Learning Technologies (ALT). International Journal of Web-based Learning and Teaching Technologies, 1(3):56-74, 2006.

Kim, H.W. and S. Gupta. Different Effects of Perceived Price and Risk on Purchase Intention. Pacific Asia Conference on Information Systems (PACIS), Bangkok, Thailand, July 2005.

Kim, H.W. and S.L. Pan. Towards A Process Model of Information Systems Implementation. Database for Advances in Information Systems, 37(1):59-76, 2006.

Kim, H.W. Customer Retention in Electronic Commerce. Korean Management Information Systems Conference, Jeju Island, South Korea, November 2005.

Kim, H.W. Moderating the Price Sensitivity of Online Customers. IEEE Joint Conference on E-commerce Technology and Enterprise Computing, E-commerce and E-services (CEC/EEE), San Francisco, California, USA, June 2006.

Kim, H.W. Presentation Desire of Digital Identity in Virtual Community. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Kim, H.W., H.C. Chan and S. Gupta. Value-based Adoption of Mobile Internet. Decision Support Systems, 43(1):111-126, 2007.

Kim, H.W., H.C. Chan and Y.P. Chan. A Balanced Thinking-feelings Model of Information Systems Continuance. International Journal of Human-computer Studies, 65(6):511-525, 2007.

Koh, E. and L.H. Lim. A Review of the Development of Information Technology and Education: The Role of Culture. Pacific-asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Koh, R.E. and L.H. Lim. The Effectiveness of Educational Technology: A Preliminary Study of Learners from Small and Large Power Distance Cultures. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Kong, W.C. and Y. Hung. Modeling Initial and Repeat Online Trust in B2C e-Commerce. Hawaii International Conference of Systems Sciences (HICSS), Hawaii, USA, January 2006.

Lai, Y.L. and K.L. Hui. Does Opt-in and Opt-out Really Matter? Investigating the Roles of Frame, Defaults and Privacy Concerns. ACM SIGCPR International Conference on Computer Personnel Research, Claremont, California, USA, April 2006.

Lai, Y.L. and K.L. Hui. Luring the Prey: Attracting Online Consumer Participation through Choice Configurations. American Marketing Association (AMA) Marketing and Public Policy Conference, Washington, USA, May 2005.

Lai, Y.L. and K.L. Hui. The Blogging Phenomenon: An Empirical Study of Factors Affecting Weblog Traffic. Workshop on E-business (WEB), Milwaukee, USA, December 2006.

Lai, Y.L. and K.L. Hui. The Opt-in and Opt-out Debate: Is It Really Necessary? CHI Workshop on Privacy-enhanced Personalization, Montreal, Canada, April 2006.

Lai, Y.L. and K.L. Hui. To Animate or Not to Animate? The Effects of Animation on Recall, Product Perceptions and Attitude. Workshop on E-business (WEB), Milwaukee, USA, December 2006.

Lee, M.S., J. Sutanto, A.M. Kankanhalli and B.C.Y. Tan. Converting Online Community Visitors into Online Consumers. Encyclopedia of Virtual Communities and Technologies. Idea Group Publishing, 2005.

Lee, M.S., J. Sutanto, A.M. Kankanhalli and B.C.Y. Tan. Virtual Community Models in Relation to e-Business Models: Creating Value. Encyclopedia of Virtual Communities and Technologies. Idea Group, 2005.

Li, H., L.H. Lim, K.S. Raman and Y.P. Yang. Critical Success Factors for IS Implementation in China: A Multiple-case Study. Information Resources Management: Global Challenges, 2006.

Lim, C.Y., A.M. Kankanhalli and L. Land. Investigating Knowledge Reuse in IS Development: An Empirical Study in the Singapore Context. IS/IT in Asia Pacific Conference, Venetian, Las Vegas, USA, December 2006.

Lim, J. and Yang, Y. Enhancing Negotiators' Performance with Computer Support for Pre-Negotiation Preparation and Negotiation: An Experimental Investigation in an East Asian Context. Journal of Global Information Management, 15(1):18-42, 2007.

Lim, L.H. and X. Guo. The Intergroup Aspect of Organizational Workgroups: The Role of Group Support Systems. Pacific-asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Lim, L.H. and Y. Liu. The Role of Cultural Diversity and Leadership in Computer-supported Collaborative Learning: A Content Analysis. Information and Software Technology, 48(3):142-153, 2006.

Lim, L.H. and Y. Zhong. The Interaction and Effects of Perceived Cultural Diversity, Group Size, Leadership and Collaborative Learning Systems: An Experimental Study. Information Resources Management Journal, 19(4):56-71, 2006.

Lim, L.H. and Y.P. Yang. The Mediator Role of Negotiation Support Systems: Concepts, Design and Empirical Investigations. International Conference on Creativity and Innovation in Decision Making and Decision Support (CIDMDS), London, UK, June 2006.

Lim, L.K., S.L. Pan and C.W. Tan. Enterprise Systems Adoption: A Proposed Contingency Perspective. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Lim, T., S.L. Pan and C. Tan. Managing User Acceptance of Enterprise Resource Planning (ERP) Systems - Understanding the Dissonance between User Expectations and Managerial Policies. European Journal of Information Systems, 14(2):135-149, 2005.

Lim, Y. and L.H. Lim. Gender and Communication Styles in Online Learning Groups. Encyclopedia of Gender and Information Technology, 2006.

Lim, Y. and L.H. Lim. Leadership Fit on Team Efficacy in Diverse Teams: The Effects of Organizational Culture and Communication Media. Group Decision and Negotiation Meeting (GDN), Karlsruhe, Germany, June 2006.

Lin, J., H.C. Chan and K.K. Wei. Understanding Competing Application Usage with Theory of Planned Behaviour. Journal of the American Society for Information Science and Technology, 57(10):1338-1349, 2006.

Lin, J., K.K. Wei and H.C. Chan. Applying Group Research Framework to Knowledge Management. Information Resources Management Association (IRMA) Conference, Washington, USA, May 2006.

Manchanda, P., J.P. Dube, K.Y. Goh and P.K. Chintagunta. The Effect of Banner Advertising on Internet Purchasing. Journal of Marketing Research, 43(1):98-108, 2006.

Mayasandra, R.N. and S.L. Pan. The Role of Subcultural Diversity in Organizational Knowledge Management. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Naresh, K.A. and C.C.D. Poo. Development of MILLS: Use of Web-services in an Inter-library Loan Software System. IEEE Conference on Computer Communications (IEEE INFOCOM), Anchorage, Alaska, USA, May 2007.

Naresh, K.A. and C.C.D. Poo. Making Sense of an Electronic Document – Visualization Strategies for Concept Presentation. IEEE International EDM Workshop (EDM), Hong Kong, China, October 2006.

Naresh, K.A. and C.C.D. Poo. Managing Quality of Information Retrieval for Effective Knowledge Management. World Conference for Software Quality (3WCSQ), Munich, Germany, September 2005.

Naresh, K.A. and C.C.D. Poo. Meeting Knowledge Management Challenges through Effective Search. International Journal of Business Information Systems, 1(3):292-309, 2006.

Ng, B.Y. and A.E. Feng. An Exploratory Study on Managerial Security Concerns in Technology Start-ups. Pacific Asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Ng, B.Y. and M.A. Rahim. A Socio-behavioral Study of Home Computer Users' Intention to Practise Security. Pacific Asia Conference on Information Systems (PACIS), Bangkok, Thailand, July 2005.

Nguyen, T.L., A.M. Kankanhalli, L.G. Pee and G.W. Tan. Managing Organizational Forgetting: Lessons from an Information System Implementation. Organizations and Society in Information Systems (OASIS) Workshop, Milwaukee, USA, December 2006.

Oh, L.B. and H.H. Teo. A Value-based Approach to Developing a Multi-channel Shopper Typology. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Oh, L.B. and H.H. Teo. Building Ambidextrous Competences through Resource Integration: A Fitness Landscape Approach. Academy of Management, Atlanta, Georgia, USA, August 2006.

Oh, L.B. and H.H. Teo. Creating e-Business Value through Retail Channel Integration: A Resource-based Perspective of Hybrid Commerce. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Oh, L.B. and H.H. Teo. Realizing IT Business Value from Retail Channel Integration: A Configurational Structure-strategy Fit Assessment. European Conference on Information Systems (ECIS), St. Gallen, Switzerland, June 2007.

Oh, L.B. and H.H. Teo. The Impacts of Information Technology and Managerial Pro-activeness in Building Net-enabled Organizational Resilience. IFIP8.6 Working Conference, Galway, Ireland, November 2006.

Oh, L.B. and H.H. Teo. The Impacts of Information Technology and Managerial Pro-activeness in Building Net-enabled Organizational Resilience. The Transfer and Diffusion of IT for Organizational Resilience. Springer Verlag, 2006.

Oh, L.B. and H.H. Teo. To Blow or Not to Blow: A Study of Whistle-blowing Behaviour in Reporting Software Piracy. IFIP TC8/WG8.2, Wisconsin, USA, December 2006.

Oh, L.B. and H.H. Teo. Towards Understanding and Measuring Value Creation for Hybrid Commerce Consumers. Workshop on e-Business (WEB), Las Vegas, Nevada, USA, December 2005.

Oh, L.B. and T.W. Phua. A Framework for Building Organizational Resilience through IT-enabled Enterprise Risk Management. Academy of Management, Philadelphia, Pennsylvania, USA, August 2007.

Oh, L.B., B.L.T. Ng and H.H. Teo. IT Portfolio Management: A Framework for Making Strategic IT Investment Decisions. European Conference on Information Systems (ECIS), St. Gallen, Switzerland, June 2007.

Oh, L.B., H.H. Teo and V. Sambamurthy. A Strategic Group Analysis of Hybrid Commerce Firms: Implications for Managing Technological Change. Academy of Management, Atlanta, Georgia, USA, August 2006.

Oh, L.B., T.W. Phua and H.H. Teo. A Conceptual Model for IT-enabled Enterprise Risk Management in Financial Organisations. European Conference on Information Systems (ECIS), St. Gallen, Switzerland, June 2007.

Ong, A., G.W. Tan and A.M. Kankanhalli. Team Expertise and Performance in Information Systems Development Projects. Pacific Asia Conference on Information Systems (PACIS), Bangkok, Thailand, July 2005.

Oshri, I., S.L. Pan and S. Newell. Managing Trade-offs and Tensions between Knowledge Management Initiatives and Expertise and Development Practices. Management Learning, 37(1):63-82, 2006.

Pan, G. and S.L. Pan. Escalation and De-escalation of Commitment to Information Systems Projects: Insights from an Approach-avoidance Process Model. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Pan, G., S.L. Pan, D. Flynn and M. Newman. Escalation and De-escalation of Commitment Transformation Analysis of an e-Government Project. Information Systems Journal, 16(1):3-12, 2006.

Pan, S.L. and G. Pan. Examining the Coalition Dynamics Affecting IS Abandonment Decision Making. Decision Support Systems, 42:639-655, 2006.

Pan, S.L. and G. Pan. Gathering and Segmenting Customer-centric Attributes during the Design Stage of an IS Application Development. Communications of the AIS, 19, 352-385, 2007.

Pan, S.L. Customer Perspective of Customer Relationship Management (CRM) Systems: A Focus Group Study. International Journal of Enterprise Information Systems, 1(1):65-88, 2005.

Pan, S.L. KM Project Failure, A Tug of War - A Strategic Renewal Perspective. American Conference on Information Systems (AMCIS), Acapulco, Mexico, August 2006.

Pan, S.L. Misalignment and Knowledge Management Project Failure: An Institutional Perspective. Academy of Management, Atlanta, Georgia, USA, August 2006.

Pan, S.L. The Use of Enterprise Systems in a Malaysian Company: A Social Integration Perspective. Pacific Asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Pan, S.L., G. Pan and P. Devadoss. E-government Capabilities and Crisis Management: Lessons from Combating SARS in Singapore in Singapore. Management Information Systems Quarterly Executive, 4(4):385-397, 2005.

Pan, S.L., S. Singh and P.R. Devadoss. Managing Knowledge Integration in a National Healthcare Crisis: Lessons Learned From Combating SARS in Singapore. IEEE Transactions on Information Technology in BioMedicine, 9(2):266-275, 2005.

Pan, S.L., S.C. Pan, M. Newman and D. Flynn. Escalation and De-escalation of Commitment to Information Technology Projects: Insights from an Approach-avoidance Punctuated Equilibrium Model. European Journal of Operational Research, 173(3):1139-1160, 2006.

Pee, L.G., H.Y. Teah and A.M. Kankanhalli. Development and Application of a General Knowledge Management Maturity Model. Pacific Asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Phang, C.W. and A.M. Kankanhalli. A Research Framework for Citizen Participation via e-Consultation. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Phang, C.W. and A.M. Kankanhalli. Current State and Future of e-Participation Research. Handbook of Research on Public Information Technology. Idea Group Publishing, 2006.

Phang, C.W. and A.M. Kankanhalli. Engaging Youths via E-participation Initiatives: An Investigation in the Context of Online Policy Discussion Forum. IFIP 8.2, Limerick, Ireland, July 2006.

Phang, C.W. and A.M. Kankanhalli. Motivations for Individual's e-Participation. International Research Workshop on Understanding e-Participation, San Diego, California, USA, May 2006.

Phang, C.W. and A.M. Kankanhalli. Organizational Culture, Learning, Politics and Institutions: A Structurational Framework of IT-induced Organizational Change. International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Phang, C.W. and A.M. Kankanhalli. Promoting Citizen Participation via Digital Government. Encyclopedia of Digital Government. Idea Group Publishing, 2006.

Phang, C.W. and A.M. Kankanhalli. Success Factors for Electronic Tax Filing in Singapore. E-taxation: State and Perspectives. University of Linz, 2007.

Phang, C.W., Ang, C. and A.M. Kankanhalli. A Structurational Analysis of IT-induced Organizational Change in a Public Organization. Academy of Management, Atlanta, Georgia, USA, August 2006.

Phang, C.W., J. Sutanto, A.M. Kankanhalli, L. Yan, B.C.Y. Tan and H.H. Teo. Senior Citizens' Acceptance of Information Systems: A Study in the Context of E-government Services. IEEE Transactions on Engineering Management, 53(4):555-569, 2006.

Png, I. and D. Lehman. Managerial Economics, 2007.

Png, I. and Q.H. Wang. Copyright Duration and the Supply of Creative Work: Evidence from the Movies. American Economic Association (AEA), Chicago, USA, January 2007.

Png, I. Copyright: A Plea for Empirical Research. Review of Economic Research on Copyright Issues, 3(2):3-13, 2006.

Png, I. Managerial Economics, 2005.

Poo, C.C.D. and C.S. Tan. Learn to Program Java User Interface. Thomson Learning, 2006.

Poo, C.C.D. and C.S. Tan. Learn to Program Java. Thomson Learning, 2005.

Poo, C.C.D. and C.S. Tan. Learn to Program Java. Thomson Learning, 2006.

Poo, C.C.D. and K.A. Naresh. Component-based Development of MILLS: A Case Study in the Development of an Inter-library Loan Software System. Asia Pacific Software Engineering Conference (APSEC), Bangalore, India, December 2006.

Poo, C.C.D. and K.A. Naresh. Developing Buddy: Towards Greater Dependability and Maintainability in Meta-search. Information Resources Management Association Conference (IRMA), Vancouver, Canada, May 2007.

Poo, C.C.D. and K.A. Naresh. HCI and Information Search: Capturing Task and Searcher Characteristics through User Ability to Specify Information Need. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Poo, C.C.D. and K.A. Naresh. Information Searcher-provider Fit through Information Presentation and Visualization Techniques. International Conference on Multidisciplinary Information Sciences and Technology (INSCIT), Merida, Spain, October 2006.

Poo, C.C.D. and K.A. Naresh. Organizing a Data Collection: Automatic Taxonomy Generation by Hierarchical Monothetic Clustering. IEEE International Conference on Data Engineering (ICDE), Istanbul, Turkey, April 2007.

Poo, C.C.D. Learn to Program Enterprise JavaBeans 3.0. Thomson Learning, 2007.

Poo, C.C.D. Learn to Program Enterprise JavaBeans Supplementary Text. Thomson Learning, 2006.

Poo, C.C.D. Learn to Program Enterprise JavaBeans. Thomson Learning, 2005.

Rangamani, B., J. Fountain, S.L. Pan, H.W. Kim, K.S. Raman and A.M. Kankanhalli. Structurational Analysis of e-Government. International Conference on e-Government (ICEG), Ottawa, Canada, October 2005.

Ravishakar, M.N., S.L. Pan and M. Myers. Viewing Information Technology (IT) Outsourcing Organizations through Postcolonial Lens. Social Inclusion: Societal and Organizational Implications for Information Systems, IFIP 8.2 Working Conference, Limerick, Ireland, July 2006.

Ravishankar, M.N., S.L. Pan and M.D. Myers. Viewing Information Technology (IT) Outsourcing Organizations through Postcolonial Lens. Social Inclusion: Societal and Organizational Implications for Information Systems. IFIP 8.2, Limerick, Ireland, July 2006.

Santosa, P.I., K.K. Wei and H.C. Chan. User Involvement and User Satisfaction with Information Seeking Activity. European Journal of Information Systems, 14(4):361-370, 2005.

Sathish, S. and S.L. Pan. A Process View of Stakeholder Management during Enterprise Systems Implementations. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Setiono, R, C. Mues and B. Baesens. Risk Management and Regulatory Compliance: A Data Mining Framework based on Neural Network Rule Extraction. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Setiono, R., S.L. Pan, M.H. Hsieh and A. Azcarraga. Separating Core and Non-core Knowledge: An Application of Neural Network Rule Extraction to a Cross-national Study of Brand Image Perception. IEEE Transactions on Systems, Man and Cybernetics Part C - Applications and Reviews, 35(4):465-475, 2005.

Setiono, R., S.L. Pan, M.H. Hsieh and A.P. Azcarraga. Knowledge Acquisition and Revision using Neural Networks: An Application to a Cross-national Study of Brand Image Perception. Journal of the Operational Research Society, 57(3):231-240, 2005.

Sutanto, J. and A.M. Kankanhalli. Investigating ICT-mediated Task Coordination Modes in Global Virtual Teams. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Sutanto, J., A.M. Kankanhalli and B.C.Y. Tan. Assessing and Resolving Suboptimal Outcomes in Global Virtual Team Task Coordination. International Conference on Management of Globally Distributed Work, Bangalore, India, December 2005.

Sutanto, J., A.M. Kankanhalli and B.C.Y. Tan. Investigating Task Coordination Effectiveness in Global Virtual Teams. International Symposium of Information Systems (ISIS), Hyderabad, India, December 2006.

Sutanto, J., A.M. Kankanhalli and B.C.Y. Tan. Task Coordination in Global Virtual Teams: A Study in the Context of Software Development. Organizations and Society in Information Systems (OASIS) Workshop, Las Vegas, USA, December 2005.

Sutanto, J., C.W. Phang, A.M. Kankanhalli and B.C.Y. Tan. Towards a Process Model of Media Usage in Global Virtual Teams. Collaborating Virtually: Concepts and Applications. ICFAI University Press, 2006.

Tan, C. and S.L. Pan. The Role of Enterprise Systems in an E-initiative Implementation. International Journal of Information Management, 25(3):241-251, 2006.

Tan, C.C. and G.W. Tan. Hardware Zone: A Singaporean Success Story. International Journal of Cases on Electronic Commerce, 1(3):37-53, 2005.

Tan, C.H., K.Y. Goh and H.H. Teo. An Investigation of Online Group-buying Institution and Buyer Behaviour. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Tan, C.H., K.Y. Goh, H.H. Teo and K.S. Sim. Buyout Option and Reserve Price in Online Auctions: Should I Bid or Buy Out? International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Tan, C.H., S. Goswami, Y. Zhong and Y.P. Chan. Conceptual Evaluation of Weblog as a Computer-mediated Communication Application. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Tan, C.H., X. Yang and H.H. Teo. When Counterfactual Thinking Meets Technology Acceptance Model: An Investigation. IFIP WG 8.6, Manchester, UK, June 2007.

Tan, C.H., X. Yang, H.H. Teo and G. Lin. An Empirical Investigation of the Auction Buyer's Choice to Buy Out or Bid: Cry of Regret or Laugh of Satisfaction? International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Tan, C.H., X. Yang, Y.P. Chan and H.H. Teo. An Investigation of Book Market Aggregation in Amazon. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Tan, C.W., S.L. Pan and E.T.K Lim. Towards the Restoration of Public Trust in Electronic Governments: A Case Study of the e-filing System in Singapore. Hawaii International Conference of System Sciences (HICSS), Hawaii, USA, September 2005.

Tan, C.W., S.L. Pan and E.T.K. Lim. Managing Stakeholder Interests in e-Government Implementation: Lessons Learned from a Singapore e-Government Project. Journal of Global Information Management, 13(1):31-53, 2005.

Tan, C.W., S.L. Pan, T.K. Lim and C.M.L. Chan. Managing Knowledge Conflicts in an Inter-organizational Project: A Case Study of IDA Singapore. Journal of the American Society for Information Science and Technology, 56(11):1187-1199, 2005.

Tan, G.W. and E.B.C. Lee. Using Protocol Analysis to understand the Effects of Website Design on Consumer Purchase Behaviour. International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Tan, H.P. and V.A. Chew. Lessons from an IS Implementation: A Social Network Perspective. Academy of Management, Philadelphia, Pennsylvania, USA, August 2007.

Tan, H.P., M.T.K. Tan and K.S. Raman. Business Value of IT: The Case of e-Justice in Singapore. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Tan, H.P., M.T.K. Tan, X. Wang and K.S. Raman. Competitive Advantage of Nations: Lessons from Government-initiated Industry-wide IT Projects in Singapore. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Tan, H.P., M.T.K. Tan, X. Wang and K.S. Raman. Implementing CoreNet to Reach Out to Businesses - A Case Study of the Singapore Government's IT Initiatives. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Tan, M.T.K. and H.P. Tan. Did I Make All the Right Choices? The Long Road to being an IS Professional. Academy of Management, Honolulu, Hawaii, USA, August 2005.

Tan, M.T.K., H.P. Tan, E.R. Koh and E.S. Kong. Evolving Team Dynamics in IS Implementation. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Tan, M.T.K., H.P. Tan, K.S. Raman and K.K. Wei. A Value-flow Perspective of Inter-organizational Systems: Initial Conditions vs Sustained Interactions. Workshop on e-Business (WEB), Las Vegas, Nevada, USA, December 2005.

Tan, S.L.S. Effectiveness of Knowledge Acquisition for Newcomers: The Relationship between Acquisition Channels and Knowledge Types. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Tang, Q., B.Y. Ng and A.M. Kankanhalli. Individual's Response to Security Messages: A Decision-making Perspective. International Conference on Decision Support Systems (ICDSS), Kolkata, India, January 2007.

Tang, Q., B.Y. Ng and A.M. Kankanhalli. Individuals? Response to Security Messages: A Decision Making Perspective. Decision Support for Global Enterprises. Annals of Information Systems, 2:177-191, 2007.

Teo, H.H., H.C. Chan and K.K. Wei. Performance Effects of Formal Modeling Language Differences: A Combined Abstraction Level and Construct Complexity Analysis. IEEE Transactions on Professional Communication, 49(2):160-175, 2006.

Teo, H.H., W. Wan and E. Xie. Volunteering Personal Information on the Internet: Effects of Reputation, Privacy Notices and Rewards on Online Consumer Behaviour. Marketing Letters, 17(1):61-74, 2006.

Teo, H.H., X. Wang, K.K. Wei, C.L. Sia and M. Lee. Organizational Learning Capacity and Attitude towards Complex Technological Innovations: An Empirical Study. Journal of the American Society for Information Science and Technology, 57(2):264-279, 2006.

Teo, T.S.H., P. Devadoss and S.L. Pan. Towards a Holistic Perspective of Customer Relationship Management (CRM) Implementation: A Case Study of the Housing and Development Board. Decision Support Systems, 42(3):1613-1627, 2006.

Teoh, S.Y. and S.L. Pan. The Process of Social Integration: The Key to Making Enterprise Systems-enabled Change. European Conference on Information Systems (ECIS), Goteborg, Sweden, June 2006.

Tong, Y., X. Wang and H.H. Teo. Understanding the Intention of Information Contribution to Online Feedback Systems from Social Exchange and Motivation Crowding Perspectives. Hawaii International Conference on System Sciences (HICSS), Hawaii, USA, January 2007.

Wang, Q.H. and K.L. Hui. Delayed Product Introduction. INFORMS Marketing Science Conference, Atlanta, Georgia, USA, June 2005.

Wang, X. and K.K. Wei. "Consumers" Acceptance of Electronic Word-of-mouth Recommendations: Effects of Multiple Communications Elements and Processing Motivation. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Wang, X., H.H. Teo and K.K. Wei. Promoting Consumption Information Contribution to Online Feedback Systems: An Analysis from the Cognition Enhancement Perspective. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Wang, X., H.H. Teo, K.K. Wei. What Mobilizes Information Contribution to Electronic Word-of-mouth System? Explanations from a Dual-process Goal Pursuit Model. Annual SIG IS Cognitive Research Exchange Workshop, Las Vegas, USA, December 2005.

Wang, Z. and L.H. Lim. Effect of Gender Composition and Negotiation Support Systems in Dyadic Setting. Hawaii International Conference on Systems Sciences (HICSS), Hawaii, USA, January 2007.

Wei, K.K., J. Lin and H.C. Chan. The Effects of Goal Orientation on Knowledge Sourcing, Knowledge Management System Usage and Learning Outcome. European Conference on Information Systems (ECIS), Gothenburg, Sweden, June 2006.

Woon, I.M.Y. and A.M. Kankanhalli. Investigation of IS Professionals' Intention to Practise Secure Development of Applications. International Journal of Human-computer Studies, 65(1):29-41, 2007.

Woon, I.M.Y., G.W. Tan and R.T. Low. A Protection Motivation Theory Approach to Home Wireless Security. International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Xie, E., Y. Li and H.H. Teo. The Determinants of Inter-firm Trust in Sino-foreign Cooperation. Academy of Management, Atlanta, Georgia, USA, August 2006.

Xu, H. and H.H. Teo. Consumers? Privacy Concerns towards using Location-based Services: An Exploratory Framework and Research Proposal. European Conference on Information Systems (ECIS), Regensburg, Germany, May 2005.

Xu, H. and H.H. Teo. Privacy Considerations in Location-based Advertising. Designing Ubiquitous Information Environments: Socio-technical Issues and Challenges. IFIP 8.2, Cleveland, Ohio, USA, August 2005.

Xu, H., H.H. Teo and B.C.Y. Tan. Predicting the Adoption of Location-based Services: The Roles of Trust and Privacy Risk. International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Xu, Y. and C. Liu. The Dynamics of Interactive Information Retrieval Part II: An Empirical Study from the Activity Theory Perspective. Journal of the American Society for Information Science and Technology, 58(7):987-998, 2007.

Xu, Y. and H.W. Kim. Task Performance and Social Information Seeking. International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Xu, Y. and H.W. Kim. Task Performance Information Seeking. Korea Knowledge Management Society Conference, Seoul, South Korea, April 2006.

Xu, Y. and M. Benaroch. Information Retrieval with a Hybrid Automatic Query Expansion and Data Fusion Procedure. Information Retrieval, 8(1):41-65, 2005.

Xu, Y. and Z. Chen. Relevance Judgment? What Do Information Consumers Consider beyond Topicality? Journal of the American Society for Information Science and Technology, 57(7):961-973, 2006.

Xu, Y. Build to Succeed: The Effect of Store Design Factors on Online Trust and Store Usefulness. Pacific Asia Conference on Information Systems (PACIS), Bangkok, Thailand, July 2005.

Xu, Y. Order Effect in Comparison Shopping Environment. Pacific-asia Conference on Information Systems (PACIS), Kuala Lumpur, Malaysia, July 2006.

Xu, Y. Relevance Judgment in Epistemic and Hedonic Information Searching. Journal of the American Society for Information Science and Technology, 58(2):179-189, 2006.

Xu, Y. The Dynamics of Interactive Information Retrieval Behaviour Part I: An Activity Theory Perspective. Journal of the American Society for Information Science and Technology, 58(7):958-970, 2007.

Xu, Y., B.C.Y. Tan and L. Yang. Who Will You Ask? An Empirical Study of Interpersonal Task Information Seeking. Journal of the American Society for Information Science and Technology, 57(12):1666-1677, 2006.

Yan, L., C.H. Tan and H.H. Teo. A Discriminant Analysis of Organizations' Adoption of Open Source Software: A Human Capital Perspective. World Congress on Intellectual Capital (WCIC), Seoul, South Korea, September 2006.

Yan, L., C.H. Tan, H.H. Teo and A. Mattar. Motivating Open Source Software Developers: Influence of Transformational and Transactional Leaderships. ACM SIGCPR International Conference on Computer Personnel Research, Claremont, California, USA, April 2006.

Yan, L., C.H. Tan, H.H. Teo and A.Y.K. Siow. A Human Capital Perspective of Organizational Intention to Adopt Open Source Software. International Conference on Information Systems (ICIS), Las Vegas, USA, December 2005.

Yan, L., C.H. Tan, H.H. Teo and B.C.Y. Tan. Innovative Usage of Information Technology in Organizations: Do CIO Characteristics Make a Difference? IEEE Transactions on Engineering Management , 53(2):177-190, 2006.

Yan, L., C.H. Tan, H.H. Teo and T. Watson. An Institutional Perspective of Open Source Software Adoption in Organizations: A Cross-country Investigation. Annual Workshop on Information Technologies and Systems (WITS), Milwaukee, Wisconsin, USA, December 2006.

Yang, X., C.H. Tan and H.H. Teo. User Response to Free Trial Restrictions: A Coping Perspective. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Yang, X., H.H. Teo and C.H. Tan. A Psychological Reactance Perspective on Time and Functionality Restrictions of Free Trial Software: Are You Willing to Evaluate the Software? International Conference on Information Systems (ICIS), Milwaukee, Wisconsin, USA, December 2006.

Yang, X., L. Yan, C.H. Tan and H.H. Teo. The Motivators of Students' Behavioral Intention towards Online Discussion Forum Participation. Americas Conference on Information Systems (AMCIS), Omaha, Nebraska, USA, August 2005.

Yang, Y.P., L.H. Lim, Y. Zhong, X. Guo and X. Li. Who is taking over Control? A Psychological Perspective in Examining Effects of Agent-based Negotiation Support Technologies. International Conference on Human-computer Interaction (HCI), Beijing, China, July 2007.

Yeo, G.K. and L.B. Oh. ICT and Our Society. McGraw-Hill Education (Asia), 2005.

Yeo, G.K. and Y.Y. Guo. Learning Objects in Simulation Games. Annual Conference of International Association of Simulation and Gaming (ISAGA), Atlanta, USA, June 2005.

Yeo, G.K. Knowledge-based Support in Simulation Games. Annual Conference of the International Simulation and Gaming Association (ISAGA), St Petersburg, Russia, July 2006.

Yeo, G.K. Understanding Students' Online Forum Usage. International Conference on Computers in Education (ICCE), Singapore, November 2005.

Yeo, G.K., P.I. Santosa, J.B. Foo and P.C. Low. First Observations from Reflective Learning on a Knowledge Repository. International Conference on Computers in Education (ICCE), Singapore, November 2005.

Yeo, G.K., W.W.K. Lim and Z.Y. Leow. Administrative Scenario Generation for a Simulation Game. Annual Conference of International Association of Simulation and Gaming (ISAGA), Atlanta, USA, June 2005.

Yu, J., Z. Jiang and H.C. Chan. The Influence of Various Mechanisms on Knowledge Contribution in Problem Solving Virtual Communities: The Mediating Role of Individual Motivations. SIGMIS CPR, St Louis, Missouri, USA, April 2007.

Zhang, D., L.B. Oh and H.H. Teo. An Experimental Study of the Factors Influencing Non-work Related Use of IT Resources at Workplace. Hawaii International Conference of Systems Sciences (HICSS), Hawaii, USA, January 2006.

Zhong, Y. and L.H. Lim. Cultural Diversity in e-Learning: A Collective Learning Paradigm. Encyclopedia of Information Science and Technology. Idea Group Publishing, 2005.

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