To create and disseminate knowledge and technologies of systems engineering and engineering management for the ever-changing society – by extracting intelligence from massive data and modelling human behaviour to derive managerial insights and make optimal decisions in complex environments.
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Welcome to the Department of Systems Engineering and Engineering Management (SEEM) at The Chinese University of Hong Kong (CUHK)!

The SEEM department was established in 1991 and is the first of its kind among tertiary institutions in Hong Kong. Our programmes combine technology with management, with the mission to educate a new generation of technologically skilled and managerially adept engineers who can solve real-world problems in smart ways.

The SEEM discipline is modern – we take a systematic approach in designing and engineering systems to analyse massive amounts of data, derive intelligence from information and make evidence-based, optimized and insightful decisions. This discipline maximizes the efficiencies of human operations, minimizes wastage of resources, and enables us to respond quickly and effectively to changes and challenges. Possible applications are diverse – ranging across business, education, energy usage, environmental preservation, finance, healthcare, logistics, etc. – our imagination is the limit. These applications are vital for the future development of Hong Kong, Greater China and the world, which lead to bright job prospects for our graduates. Our alumni are pursuing careers in banking, education, financial engineering, information technologies, logistics, management, etc., in leading corporations and making significant contributions to our society.
The SEEM educational objectives are to produce graduates who have:
1. the knowledge grounded in mathematics and computing to provide a solid engineering background;
2. the ability to apply a systems (or systematized) approach to solving complex problems;
3. the ability to think with depth (i.e. analytical thinking in specialized areas) and breadth (i.e. lateral thinking across areas);
4. the ability to work effectively in teams as a leader or member;
5. the ability to learn independently to stay abreast of new developments; and
6. the realisation of the significance in upholding professional ethics at the highest standards.

The SEEM undergraduate and postgraduate programmes are led by a team of active, energetic and dynamic faculty members, many of whom are world-class researchers who are leaders in their fields. Our education and research activities are supported by state-of-the-art computing facilities. Our laboratories are the cradle of new technologies, innovative systems and smart solutions that have been adopted for use in academia, government and industry. These research outputs from our faculty and students have also won numerous international and regional awards and honours. Our department also offers numerous scholarships to our best students.

The SEEM enrichment programmes include international exchanges, industrial internships and company visits. International exchanges with reputed universities around the world can broaden our students’ horizons globally. Internships provide the opportunity for our students to work in professional engineering teams and solve engineering problems in the real world. These opportunities can sharpen our students’ skills in applying their knowledge to practical situations, as well as communicate and collaborate effectively in a team. In addition, company visits involving exchanges with leading CEOs offer insightful information for our students.

Notable recent developments include our department’s active contribution towards the University’s strategic effort in establishing the Big Data Decision Analytics Research Center, with a generous donation from the Dr. Stanley Ho Medical Development Foundation. We are embarking on data-intensive scientific research, and engage in deep collaborations across disciplines to aim for richer discoveries and faster breakthroughs. Our effort will uphold the leadership of SEEM and CUHK in our research arena and benefit Hong Kong, Greater China and other regions. Another impressive effort is the launch of our new stream of specialization in Service Engineering. We are partnering with one of the industry leaders – IBM Global Business Services, to develop a new course in Technology Consulting and Analytics in Practice. We believe this new stream will facilitate the education of graduates who are well versed in technology and management, to fulfill the high demand for talents in the service-based economy of our society.

You may learn about various aspects of SEEM in the following pages. We welcome your questions and suggestions. Thank you!

**Helen Meng**  
Chairman  
Department of Systems Engineering and Engineering Management  
Email: seem-chairman@se.cuhk.edu.hk
The scope of our work covers:

- **Financial Engineering**: modelling, data analysis and decision making for financial services, risk management and financial regulations

- **Information Systems**: data-intensive computing for information exchange and intelligence extraction to enable better decision-making and execution for complex systems in our changing society

- **Logistics and Supply Chain Management**: develop models and methodologies to manage material, financial and information flow for improving efficiency and sustainability of supply chain operations

- **Operations Research**: develop cutting-edge tools and methodologies that underpin intelligent decisions in complex systems and modern services

- **Service Engineering and Management**: develop quantitative decision-making tools and methodologies for smooth, agile and resilient operations in data-intensive service systems such as finance, healthcare and logistics
Our faculty members are leaders in their respective fields. In recognition of their leadership and contributions to research and innovations, they are invited or elected to serve as editors of top-tier professional journals, including:

- ACM Transactions on Asian Language Information Processing
- Computer Speech and Language
- Computers & Operations Research
- EURO Journal on Computational Optimization
- EURO Journal on Transportation and Logistics
- Fuzzy Decision Making and Optimization
- IEEE Transactions on Audio, Speech and Language Processing
- IEEE Transactions on Automatic Control
- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on Signal Processing
- IIE Transactions on Operations Engineering
- IIE Transactions on Scheduling and Logistics
- Information and Decision Technologies
- International Journal of Computational Linguistics and Chinese Language Processing
- International Journal of Cooperative Information Systems
- International Journal on Computational Linguistics
- International Journal on Computer Processing of Oriental Languages
- Journal of Computing Science and Engineering
- Journal of Global Optimization
- Journal of Information Processing
- Journal of Scheduling
- Journal on Distributed and Parallel Databases
- Journal on Health Information Science and Systems
- Mathematical Finance
- Mathematics of Operations Research
- Naval Research Logistics
- Operations Research
- Optimization Methods and Software
- Quantitative Finance
- Reliability Engineering and System Safety
- SIAM Journal on Control and Optimization
- SIAM Journal on Financial Mathematics
- Speech Communication
- The VLDB Journal
- Transportation Science
- World Wide Web Journal
Our programmes are led by a team of active, energetic and dynamic faculty members. Research outputs from our faculty and students have also won numerous international and regional awards and honours, including:

- Appointed member of the Hong Kong Logistics Development Council (LOGSCOUNCIL) 2014-16.
- Alexander von Humboldt Research Fellowship 1993
- Best Oral Paper Award in the Asia-Pacific Signal and Information Processing Association Annual Summit and Conference 2010
- Best Paper of the 10th Asia Pacific Web Conference (APWeb'08) 2008
- Best Paper of the 15th International Conference on Database Systems for Advanced Applications (DASFAA'10) 2010
- Best Paper of the 19th Australasian Database Conference (ADC'08) 2008
- Best Paper of the 21th Australasian Database Conference (ADC’10) 2010
- Croucher Senior Research Fellowship 2005
- Elected Fellow of the Chartered Institute of Logistics and Transport (2014)
- Elected Member of IEEE Board of Governors
- Elected Member of IEEE Speech and Language Processing Technical Committee
- Fellow of HKIE
- Fellow, CILTHK
- Fellow of IEEE
- Humboldt Distinguished Lecture 2013
- Higher Education Outstanding Scientific Research Output Awards in Technological Advancements 2009
- Inaugural Distinguished Lecturer of APSIPA (Asia-Pacific Signal and Information Processing Association) 2012-2014
- INFORMS Meritorious Service Award 2001
- INFORMS Optimization Society Young Researcher Prize 2010
- Invited Speaker of Okawa Prize 2012 Commemorative Symposium
- Ministry of Education of China (MoE) Technological Advancement Award 2009
- Overview Speaker of IEEE Workshop on Multimedia Signal Processing 2011
- Plenary Speaker of CogInfoComm 2013
- Shenzhen Municipal Government "Peng Cheng" Visiting Professorship 2010 - Present
- SIAM Outstanding Paper Prize 2003
- Yahiko Kambayashi Best Paper Award of the 8th International Conference on Web Information Systems Engineering (WISE’07) 2007
Our faculty members have been active in serving professional and societal roles that are related to their expertise:

- Academic Committee, The Chinese National Research Center of Mathematics and Cross-Disciplinary Science, Department of Finance and Economics
- Associate Editor, Operations Research Letters, 2007-2008
- Chinese Language Interface Advisory Committee, appointed by the Deputy Government Chief Information Officer
- Convenor, Engineering Panel, University Grants Council’s Competitive Research Funding for the Local Self-financing Degree Sector
- Convenor, Working Party on 2014 Manpower Survey of the Information Technology Sector, Committee on Information Technology Training and Development of the Vocational Training Council
- Council Member, Hong Kong Productivity Council, appointed by the Secretary for Commerce and Economic Development
- Council Member, The Open University of Hong Kong
- Digital 21 Strategy Advisory Committee, appointed by the Secretary for Commerce, Industry and Technology
- Elected Board Member, International Speech Communication Association
- Elected Vice-President of Professional Development, Hong Kong Computer Society
- Engineering Panel Member, Research Grants Council
- General Chair, International Symposium on Chinese Spoken Language Processing
- HKIE Accreditation Committee for Computer Science Programs, The Hong Kong Institution of Engineers
- IEEE Speech and Language Technical Committee
- Joint Committee on Information Technology for the Social Welfare Sector, appointed by the Director of Social Welfare
- Keynote Speaker of the International Symposium on Scheduling (2013), Tokyo, Japan
- Member of the Lottery Funds Advisory Committee, appointed by the Secretary for Labour and Welfare
- Member of the Research Grants Council, The Hong Kong SAR Government
- Member of the Steering Committee in eHR (electronic Health Record) Sharing, appointed by the Secretary of Food and Health, The Hong Kong SAR Government
- Member of the Working Group on Competitive Research Funding for Local Self-financing Degree Sector, appointed by the RGC Chairman
- Panel of Assessors, The Innovation and Technology Support Programme, appointed by the Commissioner of Innovation and Technology
- Panel of Assessors, The Small Entrepreneur Research Assistance Programme, appointed by the Commissioner of Innovation and Technology
- President, Hong Kong Information Technology Joint Council
- Review Panel, National Centres of Competence in Research, Swiss National Science Foundation
- Review Panel, National Natural Science Foundation of China
- Review Panel, Natural Sciences and Engineering Research Council of Canada
- Review Panel, Swedish Research Council European Research Infrastructure Initiative
- Risk Analysis Track Coordinator, The 2009 Winter Simulation Conference
- Scientific Programme Chair, 19th Triennial Conference of the International Federation of Operational Research Societies, 2011, Melbourne, Australia
- Task Force on Facilitating the Adoption of Wireless and Mobile Services and Technology (FAWMST), appointed by the Government Chief Information Officer
- Technical Chair, Oriental Chapter of the International Committee for the Co-ordination and Standardization of Speech Databases and Assessment Techniques
- Technical Program Co-Chair, Interspeech
- Technology Consultant, Technology Services Division, The Hong Kong SAR Government
- The Central Committee on Information Technology for Rehabilitation Services, appointed by the Director of Social Welfare
Our students are a new generation of engineers who can solve real-world problems in innovative ways. They have received a variety of awards and recognitions from many international associations and competitions.

- Best Poster Award of the 9th ACM-HK Student Research and Career Day 2009
- Best Student Paper Award in the 5th Beijing-Hong Kong International Doctoral Forum 2010
- Best Student Paper Award in the 6th Beijing-Hong Kong International Doctoral Forum 2011
- Challenge Cup Prizes, over three years
- Championship of the case study competition in the 12th CILTHK Student Day
- Global Scholarship Programme for Research Excellence - CNOOC Grants 2012
- Microsoft Imagine Cup Hong Kong Championship 2004
- Microsoft Research Asia Fellowship, multiple years
- Second-Place Prize of Best Student Research Paper Award Competition of Financial Service Session, INFORMS 2010
- Second Prize Winner of the Poster Session at The INFORMS Annual Conference 2012
- 2nd Runner-up HKIE Manufacturing and Industrial Division Student Project Competition 2013-2014
Selected Publications


MENG, Mei Ling Helen
蒙美玲
Chairman and Professor
SB, SM, PhD (Massachusetts Institute of Technology)

Research Interests

- Multilingual Speech and Language Processing
- Multibiometric Authentication
- Multimedia Content Retrieval
- Multimodal Human-Computer Interactions

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Helen Meng received the S.B., S.M., and Ph.D. degrees, all in electrical engineering, from the Massachusetts Institute of Technology, Cambridge. She joined The Chinese University of Hong Kong in 1998, where she is currently Professor and Chairman in the Department of Systems Engineering and Engineering Management. In 1999, she established the Human–Computer Communications Laboratory and serves as Director. In 2005, she established the Microsoft-CUHK Joint Laboratory for Human-Centric Computing and Interface Technologies and serves as Co-Director. This laboratory was recognized as a Ministry of Education of China (MoE) Key Laboratory in 2008. In 2013, she helped the University establish the Big Data Decision Analytics Research Center, with a generous donation from the Dr. Stanley Ho Medical Development Foundation. Helen served as Associate Dean (Research) of the Faculty of Engineering from 2006 to 2010. She received the MoE Higher Education Outstanding Scientific Research Output Awards in Technological Advancements, for the area of “Multimodal User Interactions with Multilingual Speech and Language Technologies” in 2009. In previous years, she has also received the CUHK Exemplary Teaching Award, Young Researcher Award and Service Award of the Faculty of Engineering. She has also been awarded the Peng Cheng Visiting Professorship of Tsinghua Graduate School of Shenzhen, and is a Visiting Professor of Tsinghua University, Fudan University and the Northwestern Polytechnical University. Her research interests lie in the areas of human–computer interaction via multimodal and multilingual spoken language systems, computer-aided language learning systems, as well as translational speech retrieval technologies. She has been Editor-in-Chief of the IEEE Transactions on Audio, Speech and Language Processing. She is also an elected board member of the International Speech Communication Association. She was General Chair of the International Symposium on Chinese Spoken Language Processing 2012 and Technical Chair of Interspeech 2014. Her international and local professional services include Steering Committee member on eHealth Record Sharing of the HKSSG Government, and Council Membership of the Research Grants Council, Hong Kong Productivity Council and Open University of Hong Kong. She also serves on the review panels of various agencies, including the Hong Kong SAR Government’s Innovation and Technology Commission, Swedish Research Council European Research Infrastructure Initiative, and the National Centres of Competence in Research, Swiss National Science Foundation. She is the Convenor of the Engineering Panel of the HKSSG Government University Grants Council’s Competitive Research Funding for the Local Self-financing Degree Sector. Helen is elected into the IEEE Signal Processing Society Board of Governors in 2013. She is also a Fellow of HKCS, HKIE and IEEE.
Selected Publications


Duan Li graduated from Fudan University, received his M.E. degree in automatic control from Shanghai Jiaotong University, and received his Ph.D. degree in systems engineering from Case Western Reserve University. From 1987 to 1994, he was a faculty member at the University of Virginia, where he was an Associate Professor in the Department of Systems Engineering and the Associate Director of the Center for Risk Management of Engineering Systems. He joined The Chinese University of Hong Kong in December 1994, where he is currently Patrick Huen Wing Ming Professor of Systems Engineering and Engineering Management and where he served as the Department Chairman from 2003 to 2012.

Duan Li’s research interests include optimization, optimal control, financial engineering, and decision-making methodologies. He has authored and coauthored over 200 technical papers in these areas. He is a coauthor of the book Nonlinear Integer Programming published by Springer in 2006. He was an Associate Editor of IEEE Transactions on Automatic Control, and has been an editorial board member or a guest editor for many other journals, including Journal of Global Optimization and IIE Transactions on Operations Engineering. He organised many international conferences as a co-chair, including the 8th International Conference on Optimization Techniques and Applications (ICOTA8). He is currently the Vice President, the Chinese Society of Financial Systems Engineering, and a member of Academic Committee, the Chinese National Research Center of Mathematics and Cross-Disciplinary Science, Department of Finance and Economics.
Selected Publications


Xiaoqiang Cai is Professor at the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong. He is also Dean of General Education of Lee Woo Sing College, Director of the Center for Logistics Technologies & Supply Chain Optimization, and Director of the CUHK/Tsinghua Joint Executive M.Sc. Program in Logistics and Supply Chain Management. He received his Ph.D. from Tsinghua University, Beijing, in 1988. During 1989 to 1991, he conducted postdoctoral research at The University of Cambridge and The Queen’s University of Belfast. He was Lecturer at The University of Western Australia in 1991 to 1992, before joining CUHK in 1993. He served as the Chairman of Department of SEEM during 1996 to 2003, and has been Professor since October 2000. His current research is focused on scheduling theory and applications, logistics and supply chain management, and portfolio optimization. He has published over 100 papers in leading journals in these areas, including Operations Research, Management Science, Production and Operations Management, Naval Research Logistics, IIE Transactions, and IEEE Transactions. He has been on the editorial boards of several international journals, including IIE Transactions on Scheduling and Logistics, Journal of Scheduling, and Fuzzy Decision Making and Optimization.

He also serves as, concurrently, Dean of Science and Engineering of The Chinese University of Hong Kong, Shenzhen.
Selected Publications


CHEN, Nan
陳南
Associate Professor
BSc, MSc (Peking University)
MPhil, PhD (Columbia University)
Research Interests
> Financial Engineering
> Monte Carlo Simulation
> Applied Probability

Professor Chen Nan graduated from the Department of Probability and Statistics at Peking University in 1998, and he received his M.Sc. degree in Probability and Statistics in 2001 at Peking University, his M.Phil. and Ph.D. degrees in 2006 at Columbia University, USA. He joined the Department of Systems Engineering and Engineering Management at The Chinese University of Hong Kong in 2006.

Awards and Grants

• Best Student Research Paper Award (Second Place), Financial Services Section, INFORMS, 2006
• Exemplary Teaching Award, Faculty of Engineering, The Chinese University of Hong Kong, 2009.

Awards Received by His Students

• Xiangwei Wan, Second Place, Best Student Research Award, Financial Services Section, INFORMS, 2010
• Xiangwei Wan, Outstanding Thesis Competition Award, Faculty of Engineering, The Chinese University of Hong Kong

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CHENG, Chun Hung 鄭進雄

Associate Professor
BSc (The Chinese University of Hong Kong)
MSc, MBA, PhD (The University of Iowa)

Research Interests
> Information Systems
> Operations Management
> Facility Location and Layout
> Logistics & Transport
> RFID Systems Deployment

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Selected Publications


After he graduated from The Chinese University of Hong Kong, Professor C.H. Cheng furthered his education in the U.S.A. He obtained his M.Sc. in Computer Science, M.B.A. and Ph.D. from the University of Iowa. While he was a graduate student, he worked at the University of Iowa Hospital & Clinics as a programming analyst. He started his teaching career in the USA but later he returned to Hong Kong and joined CUHK.


His research interests lies in computer and information technology, and logistics and operations management. He has supervised 4 Ph.D. students and 21 M.Phil. students in their research, and collaborated with both local and overseas researchers.

His recent work contributes to the fields of facility location and layout, transportation logistics, and service operations, etc. These publications obtains H-indices of 17 (Web of Knowledge) and 25 (Google Scholar Citations), respectively. He also serves in 7 international journals as either an associate editor or a member of the editorial boards.

His earlier work (together with Professor WJ Boe) in factory layout was implemented by a third-party developer in Brazil for toys manufacturers. He is leading a project team to design and implement RFID prototype systems for the operations of hospitals, a major air-mail center, and museums in Hong Kong. His work helps these organizations assess the financial, operational and technical feasibility for the technology. In addition, he provides consulting services to local industries. These projects include business process improvement, evaluation of micro-payment systems, MRPII implementation, simulation studies for the medical sector, and RFID system deployment.

At CUHK, he is actively involved in curriculum development, technology advancement, and student admission and counseling. He is the Associate Dean of Students for LWS College and assists the Dean in various student matters in the College. He is also the Deputy Director of the Centre for Innovation and Technology (CINTEC) in Faculty of Engineering and is active in promoting students’ innovation projects. As the Chairman of the Curriculum Committee of his Department, he designed a new 334 curriculum for Bachelor of Engineering in Systems Engineering & Engineering Management and was responsible for getting the accreditation of this programme by the Chartered Institute of Logistics and Transport in Hong Kong (CILTHK) and the Hong Kong Institution of Engineers (HKIE). In the past, he has served as the Chairman of the Admission Committee for CUHK Faculty of Engineering.

In addition to his work in teaching, research, services, and consulting, he is serving as a board member for Hong Kong Society of Transportation Studies, a panel member and a research advisor for the Technology Committee of the Hong Kong R&D Centre for Logistics & Supply Chain Management Enabling Technologies, and an external examiner for Logistics Management Courses of Lingnan Institute of Further Education (LIFE).
Selected Publications


Lu Qin, Jeffrey Xu Yu, Lijun Chang, Hong Cheng, Chengqi Zhang, and Xuemin Lin, “Scalable Big Graph Processing in MapReduce”, Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data (SIGMOD 14), Snowbird, Utah, June 2014.

Shaou Song, Hong Cheng, Jeffrey Xu Yu, and Lei Chen “Repairing Vertex Labels under Neighborhood Constraints”, Proceedings of the VLDB Endowment (PVLDB), 7(11), 2014.


Miao Qiao, Hong Cheng, Lijun Chang and Jeffrey Xu Yu “Approximate Shortest Distance Computing: A Query-Dependent Local Landmark Scheme”, IEEE Transactions on Knowledge and Data Engineering (TKDE), Vol. 26, No. 1, Pages 55-68, 2014.


Xin Huang, Hong Cheng, Rong-Hua Li, Lu Qin, and Jeffrey Xu Yu “Top-K Structural Diversity Search in Large Networks”, Proceedings of the VLDB Endowment (PVLDB), 6(13), 2013.


Hong Cheng, Yang Zhou and Jeffrey Xu Yu “Clustering Large Attributed Graphs: A Balance Between Structural and Attribute Similarities”, ACM Transactions on Knowledge Discovery from Data (TKDD), 5(2), Article 12, Pages 1-33, 2011.

Hong Cheng received her B.S. degree and M.Phil. degree in Computer Science from Zhejiang University and Hong Kong University of Science and Technology in 2001 and 2003, respectively. She then received her Ph.D. in Computer Science from University of Illinois at Urbana-Champaign in 2008. She joined the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong in 2008. Her main research area is data mining and information systems.

She received the Certificate of Recognition for the 2009 SIGKDD Doctoral Dissertation Award, and the 2010 Vice-Chancellor’s Exemplary Teaching Award of The Chinese University of Hong Kong.
Selected Publications


J. G. Dai, A. B. Dieker, and X. Gao, "Validity of heavy-traffic steady-state approximations in many-server queues with abandonment." Accepted to Queueing Systems, 2014.


Xuefeng Gao received his B.S. in Mathematics from Peking University, China in 2008, and his Ph.D. in Operations Research from Georgia Institute of Technology, USA in 2013. His research interests include Algorithmic Trading and Financial Engineering, Queueing Theory, and Stochastic Processes. His work has been selected as Finalist in the 2011 INFORMS Junior Faculty Interest Group (JFIG) paper competition. During summer 2011 and 2012, he worked as a research intern in the Business Analytics and Mathematical Sciences Department of the IBM T.J. Watson Research Center in New York.

GAO, Xuefeng 高雪峰
Assistant Professor
BSc (Peking University)
PhD (Georgia Institute of Technology)

Research Interests
> Algorithmic Trading and Financial Engineering
> Queueing Theory
> Applied Probability

EMAIL: xfgao@se.cuhk.edu.hk
Selected Publications


Dr. Xiting Gong received his B.Sc. in Applied Mathematics in 2004, and his M.A. and Ph.D. in Management Science in 2006 and 2010, all from Peking University. He did his postdoctoral research at the University of Michigan from 2010 to 2013, and joined the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong in July 2013. Dr. Gong’s research area is logistics and supply chain management, and his recent research interests include stochastic inventory control, sustainable operations, and approximation algorithms.
Selected Publications


Selected Publications


LEUNG, Janny M.Y.
梁美兒

Professor
SB (Radcliffe College, Harvard University)
BA (Oxford University),
PhD (Massachusetts Institute of Technology)

Research Interests
> Combinatorial Optimisation / Integer Programming
> Transportation Logistics
> Operations Management

Janny Leung obtained an S.B. degree in Applied Mathematics from Radcliffe College, a B.A. in Mathematics from Oxford University and a Ph.D. in Operations Research from the Massachusetts Institute of Technology. Before returning to Hong Kong, she was a faculty member at Yale University and the University of Arizona.

Her main research interests are combinatorial optimization and logistics; she has investigated problems in public transit scheduling, supplier selection, material handling, routing and distribution planning, facility layout, production scheduling and baseball timetabling. Her work has been published in Mathematical Programming, Management Science, Operations Research, IIE Transactions, Discrete Optimization, Journal of Combinatorial Optimization, INFOR, IEEE Transactions on Robotics and Automation, OR Letters, Discrete Applied Mathematics and other journals. Her research has been supported by the Hong Kong Research Grants Council and the (US) National Science Foundation.

Currently, she serves on the editorial boards of EURO Journal on Transportation and Logistics (since 2011), Transportation Science (since 2009), IIE Transactions (since 2001), Computers & Operations Research (since 2005) and Naval Research Logistics (since 2001). She is an active member of INFORMS, having served as President of the Forum on Women in OR/MS (2002) and Chair of the Student Affairs Committee (2000-2004). She was the Scientific Programme Chair for the 19th triennial conference of the International Federation of Operational Research Societies (IFORS) held in Melbourne in 2011.

In Hong Kong, she has collaborated with several local companies in projects on container management, warehouse inventory systems, mass-transit timetabling and manpower planning. In 2014, she has been elected a Fellow of the Chartered Institute of Logistics and Transport, and appointed to the Hong Kong Logistics Development Council (LOGSCOUNCIL).
Selected Publications


Professor Lingfei Li received his B.S. in Applied Mathematics from Peking University, China in 2007, and his M.S. and Ph.D. in Industrial Engineering and Management Sciences from Northwestern University, USA in 2008 and 2012. He joined the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong in June 2012. His research interests include financial engineering, mathematical and computational finance and applied probability. He worked as a quant in the commodity strategies group at Morgan Stanley in the summer of 2009.

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LONG, Zhuoyu Daniel
龍卓瑜
Assistant Professor
BSc (Tsinghua University), MS (Chinese Academy of Science)
PhD (National University of Singapore)

Research Interests
> Supply Chain Risk Management
> Project Management
> Inventory Control
> Target-based Risk Management
> Robust Optimization

EMAIL: zylong@se.cuhk.edu.hk

Daniel Z. Long received his bachelor degree from Tsinghua University in 2005, the master degree from Chinese Academy of Science in 2008, and the Ph.D. degree from the Department of Decision Sciences, National University of Singapore in 2013. His current research revolves around the aspect of decision criteria for two classical operations research problems—inventory management and project management. His paper "Managing Operational and Financing Decisions to Meet Consumption Targets" received the second prize in the 2013 POMS-HK student paper competition.

Selected Publications


WORK IN PROGRESS

MA, Shiqian
馬士謙

Assistant Professor
BS (Peking University), MS (Chinese Academy of Sciences)
MPhil, PhD (Columbia University)

Research Interests
> Mathematical Programming
> Scientific Computing
> Applications of Optimization in Data Sciences, Machine Learning, Statistics and Information Sciences

EMAIL: sqma@se.cuhk.edu.hk

Shiqian Ma received his B.S. from Peking University in 2003, M.S. from Chinese Academy of Sciences in 2006 and Ph.D. in Industrial Engineering and Operations Research from Columbia University in 2011. He then spent one and half years in the Institute for Mathematics and Its Applications at University of Minnesota as an NSF postdoctoral fellow. Shiqian Ma joined the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong in December 2012. His current research interests include theory and algorithms for large-scale optimization and its applications in statistics, machine learning and signal/image processing.

Shiqian Ma is a recipient of the INFORMS Optimization Society best student paper prize in 2010, honorable mention of INFORMS George Nicholson student paper competition in 2011, and one of the finalists of the 2011 IBM Herman Goldstine fellowship.
Selected Publications


Anthony Man-Choo So received his BSE degree in Computer Science from Princeton University in 2000 with minors in Applied and Computational Mathematics, Engineering and Management Systems, and German Language and Culture. He then received his MSc degree in Computer Science in 2002, and his PhD degree in Computer Science with a PhD minor in Mathematics in 2007, all from Stanford University. Dr. So joined The Chinese University of Hong Kong (CUHK) in 2007. He currently serves as Assistant Dean of the Faculty of Engineering and is an Associate Professor in the Department of Systems Engineering and Engineering Management. He also holds a courtesy appointment as Associate Professor in the CUHK-BGI Innovation Institute of Trans-omics. His recent research focuses on the interplay between optimization theory and various areas of algorithm design, such as computational geometry, signal processing, bioinformatics, stochastic optimization, combinatorial optimization, and algorithmic game theory.

At present, Dr. So serves on the editorial boards of Optimization Methods and Software, Mathematics of Operations Research, IEEE Transactions on Signal Processing, and Journal of Global Optimization. He received the 2010 Optimization Prize for Young Researchers from the Optimization Society of the Institute for Operations Research and the Management Sciences (INFORMS), and the 2010 Young Researcher Award from CUHK. He also received the 2008 Exemplary Teaching Award and the 2011 and 2013 Dean’s Exemplary Teaching Award from the Faculty of Engineering at CUHK, and the 2013 Vice-Chancellor’s Exemplary Teaching Award from CUHK.
Selected Publications

JOURNAL PAPERS (2012-2013)


CONFERENCE PAPERS (2012-2013)


Jun Xu, Ruiying Xu, Yanzhen Zheng, Qin Lu, Kam-Fai Wong, Xiaolong Wang: Chinese Emotion Lexicon Developing via Multi-lingual Lexical Resources Integration. CICLing (2) 2013: 174-182.


Wei Gao, Zhongyu Wei, and Kam-Fai Wong. Microblog Search and Filtering with Time Sensitive Feedback and Thresholding Based on BM25. TREC 2012 (Microblog track).

Yulan He, Hassan Sall, Zhongyu Wei, Kam-Fai Wong: Quantising Opinions for Political Tweets Analysis. LREC 2012: 3901-3906.

K. F. Wong obtained his Ph.D. from Edinburgh University, Scotland, in 1987. He was a post doctoral researcher in Heriot-Watt University (Scotland), UniSys (Scotland) and ECRC (Germany). At present, he is Professor in the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong (CUHK). In parallel, he serves as the Associate Dean (External Affairs) of Engineering, the Director of the Centre for Innovation and Technology (CINTEC), and Associate Director of the Centre for Entrepreneurship (CFE), CUHK. He serves as the Vice President of Asian Federation of Natural Language Processing (AFNLP), President of the Governing Board of COLCS (2006-2008), the President of Hong Kong IT Joint Council (2006-2014) and the Vice President of VLDB School China (2005-2013).

His research interest focuses on Chinese computing, database and information retrieval. He has published over 200 technical papers in these areas in different international journals and conferences and books. He is a member of the ACM, fellows of BCS (UK), IEE (UK) and HKIE. He is the founding Editor-In-Chief of ACM Transactions on Asian Language Processing (TALIP), and International Journal on Computational Linguistics and Chinese Language Processing. He is the Chair of IJCNLP2011, AIRS2008 and ICCPOL2006; the Finance Chair SIGMOD2007; and the PC Co-chair of IJCNLP2006. Also he is a Programme Committee member of many international conferences.
Selected Publications

CONFERENCES & TALKS
Quant Congress USA, New York, NY, Jul., 2013
Modeling High Frequency Data in Finance, Stevens Institute of Technology, Hoboken, NJ, Jul., 2011
Quant Congress USA, New York, NY, Jul., 2010

Dr. Wu’s research centers around mathematical modeling of financial derivatives and quantitative strategies, particularly relevant to interest rates, credit and foreign exchange rate. Prior to joining CUHK, Dr. Wu was first a summer associate with Lehman Brothers Quantitative Credit Research in London fixed income, then an associate director with UBS north America interest rate option trading, and most recently a senior quantitative analyst of interest rate modelling at the Depository Trust & Clearing Corporation in New York. Dr. Wu holds a Ph.D. in Applied Mathematics from Columbia University, a M.S. in Electrical Engineering from Peking University, and a B.S. in Electrical Engineering from Wuhan University. He publishes at Mathematical Finance and International Journal of Applied and Theoretical finance. He presented at Quant Congress USA and SIAM Conference on Financial Mathematics and Engineering.
Selected Publications

Lu Qin, Jeffrey Xu Yu, Lijun Chang, Hong Cheng, Chengqi Zhang, and Xuemin Lin: “Scalable Big Graph Processing in MapReduce”, in Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data (SIGMOD’14), 2014.


Zehao Shang and Jeffrey Xu Yu: “Catch the Wind: Graph Workload Balancing on Cloud”, in Proceedings of the 29th International Conference on Data Engineering (ICDE’13), 2013.


Dr. Jeffrey Xu Yu is a Professor in the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong. His current main research interests include keywords search in relational databases, graph mining, graph query processing, and graph pattern matching. Dr. Yu served/serves in over 280 organization committees and program committees in international conferences/workshops including the PC Co-chair of APWeb’04, WAIM’06, APWeb/WAIM’07, WISE’09, PAKDD’10, DASFAA’11, and ICDM’12. Dr. Yu served as an Information Director and a member in ACM SIGMOD executive committee (2007-2011), an associate editor of IEEE Transactions on Knowledge and Data Engineering (2004-2008), and an associate editor in VLDB Journal (2007-2013). Currently he serves as the chair of the steering committee in Asia Pacific Web Conference, and an associate editor in WWW Journal, the International Journal of Cooperative Information Systems, the Journal of Information Processing, and Journal on Health Information Science and Systems.

Jeffrey Xu Yu is a member of ACM, a senior member of IEEE, and a member of IEEE Computer Society.
Selected Publications
Chi-Kong Ng and Duan Li, "One-Parameter Discrete Global Descent Method for Discrete Global Optimization and Nonlinear Integer Programming," submitted for publication.

NG, Chi Kong
伍志剛

Senior Lecturer
BSc, MSc, MPhil (Hong Kong Baptist University)
PhD (The Chinese University of Hong Kong)

Research Interests
> Global Optimization
> Nonlinear Integer Programming
> Discrete-Time Optimal Control
> Inventory Control and Supply Chain Management

EMAIL: ckng@se.cuhk.edu.hk
Selected Publications


FANG, Shu-Cherng
方述誠

Adjunct Professor
BS (National Tsing Hua University)
MA (Johns Hopkins University)
PhD (Northwestern University)

Research Interests
> Linear and Nonlinear Programming
> Fuzzy Optimization and Decision Making
> Soft Computing and Heuristic Methods
> Logistics and Supply Chain Management
> Telecommunication Networks

Shu-Cherng Fang holds the Walter Clark Chair Professorship and Alumni Distinguished Graduate Professorship at the Industrial and Systems Engineering Department of the North Carolina State University, USA. He has been appointed as the University Chair Professor of Tsinghua University (Beijing), Honorary University Professor of Northeast University (Shenyang), Honorary University Professor of Shanghai University (Shanghai), Honorary University Professor of Fudan University (Shanghai), Graduate University Advisory Professor of the Chinese Academy of Sciences (Beijing), Honorary University Chair Professor of the National Chiao Tung University (Taiwan) and Honorary IEEM Chair Professor of the National Tsinghua University (Taiwan). Before joining NC State, Professor Fang was Senior Member of Research Staff at Western Electric Engineering Research Center, Supervisor at AT&T Labs, and Department Manager at the Corporate Headquarters of AT&T Technologies.


Professor Fang has won many awards and has been listed in several major biographic references. He was elected to Fellow of the Institute of Industrial Engineers in 2002.

Selected Publications


Selected Publications


Dr. Hsiao-Wuen Hon is the Managing Director of Microsoft Research Asia, located in Beijing, China. Founded in 1998, Microsoft Research Asia has since become one of the best research centers in the world that MIT Technology Review called “the hottest computer science research lab in the world,” Dr. Hon oversees the lab’s research activities and collaborations with academia in Asia Pacific.

An IEEE Fellow and a Distinguished Scientist of Microsoft, Dr. Hon is an internationally recognized expert in speech technology. He serves on the editorial board of the international journal of the Communication of the ACM. Dr. Hon has published more than 100 technical papers in international journals and at conferences. He co-authored a book, Spoken Language Processing, which is a graduate-level textbook and reference book in the area of speech technology in many universities all over the world. Dr. Hon holds three dozen patents in several technical areas.

Dr. Hon has been with Microsoft since 1995. He joined Microsoft Research Asia in 2004 as a Deputy Managing Director, responsible for research in Internet search, speech & natural language, system, wireless and networking. In addition, he founded and managed search technology center (STC) from 2005 to 2007, the Microsoft internet Search product (Bing) development in Asia Pacific. Prior to joining Microsoft Research Asia, Dr. Hon was the founding member and architect in Natural Interactive Services Division at Microsoft Corporation. Besides overseeing all architectural and technical aspects of the award winning Microsoft® Speech Server product Frost & Sullivan's 2005 Enterprise Infrastructure Product of the Year Award, Speech Technology Magazine’s 2004 Most Innovative Solutions Awards and VSLive! 2004 Editors Choice Award., Natural User Interface Platform and Microsoft Assistance Platform, he is also responsible for managing and delivering statistical learning technologies and advanced search.

Dr. Hon joined Microsoft Research as a senior researcher at 1995 and has been a key contributor of Microsoft’s API and speech engine technologies. He previously worked at Apple Computer, where he led research and development for Apple’s Chinese Dictation Kit.
Selected Publications

Z Xu, M Hong and ZQ Luo, “Semidefinite Approximation for Mixed Binary Quadratically Constrained Quadratic Programs,” Accepted for publication in SIAM Journal on Optimization, 2014.


Luo Zhi Quan (Tom) received his B.Sc. degree in Applied Mathematics in 1984 from Peking University, Beijing, China. Subsequently, he was selected by a joint committee of American Mathematical Society and the Society of Industrial and Applied Mathematics to pursue Ph.D. study in the United States. After an one-year intensive training in mathematics and English at the Nankai Institute of Mathematics, Tianjin, China, he studied in the Operations Research Center and the Department of Electrical Engineering and Computer Science at MIT, where he received a Ph.D. degree in Operations Research in 1989. From 1989 to 2003, Dr. Luo held a faculty position with the Department of Electrical and Computer Engineering, McMaster University, Hamilton, Canada, where he eventually became the department head and held a Canada Research Chair in Information Processing. Since April of 2003, he has been with the Department of Electrical and Computer Engineering at the University of Minnesota (Twin Cities) as a full professor and holds an endowed ADC Chair in digital technology. He is currently also the Vice President (Academic) of the Chinese University of Hong Kong (Shenzhen). His research interests include optimization algorithms, signal processing and digital communication.

Dr. Luo is a fellow of SIAM, IEEE and the Royal Society of Canada. He has served as the chair/past chair of the IEEE Signal Processing Society Technical Committee on the Signal Processing for Communications (SPCOM). He is a recipient of the 2004, 2009 and 2011 IEEE Signal Processing Society’s Best Paper Awards, the 2010 Farkas Prize from the INFORMS Optimization Society, the 2010 EURASIP Best Paper Award and the 2011 ICC Best Paper Award. He has held editorial positions for several international journals including the Journal of Optimization Theory and Applications, SIAM Journal on Optimization, Mathematics of Computation, and IEEE Transactions on Signal Processing. He currently serves on the editorial boards of several journals including Management Science, IEEE Journal of Special Topics on Signal Processing and Mathematics of Operations Research. He is also the Editor-in-Chief for the journal IEEE Transactions on Signal Processing.
Selected Publications


Frank Soong is a Principal Researcher and Research Manager of the Speech Group. He received his B.S., M.S. and Ph.D., all in EE from the National Taiwan University, the University of Rhode Island and Stanford University, respectively. He joined Bell Labs Research, Murray Hill, NJ, USA in 1982, worked there for 20 years and retired as a Distinguished Member of Technical Staff in 2001. In Bell Labs, he had worked on various aspects of acoustics and speech processing, including: speech coding, speech and speaker recognition, stochastic modeling of speech signals, efficient search algorithms, discriminative training, dereverberation of audio and speech signals, microphone array processing, acoustic echo cancellation, hands-free noisy speech recognition. He was also responsible for transferring recognition technology from research to AT&T voice-activated cell phones which were rated by the Mobile Office Magazine as the best among competing products evaluated. He was the co-recipient of the Bell Labs President Gold Award for developing the Bell Labs Automatic Speech Recognition (BLASR) software package. He visited Japan twice as a visiting researcher: first from 1987 to 1988, to the NTT Electro-Communication Labs, Musashino, Tokyo; then from 2002-2004, to the Spoken Language Translation Labs, ATR, Kyoto. In 2004, he joined Microsoft Research Asia (MSRA), Beijing, China to lead the Speech Research Group. He is a visiting professor of the Chinese University of Hong Kong (CUHK) and the co-director of CUHK-MSRA Joint Research Lab, recently promoted to a National Key Lab of Ministry of Education, China. He was the co-chair of the 1991 IEEE International Arden House Speech Recognition Workshop. He has served the IEEE Speech and Language Processing Technical Committee of the Signal Processing Society, as a committee member and associate editor of the Transactions of Speech and Audio Processing. He published extensively and coauthored more than 200 technical papers in the speech and signal processing fields. He is an IEEE Fellow.
Selected Publications


Gang Yu is co-founder and Chairman of Yihaodian (www.yhd.com), a leading e-commerce company in China. Prior to founding Yihaodian, he was Vice President, Worldwide Procurement at Dell Inc. Dr. Yu also served as Vice President, Worldwide Supply Chain Operations at Amazon.com. Before Amazon, Dr. Yu served as the Jack G. Taylor Chair Professor in Business in the Department of Management Science and Information Systems at the McCombs School of Business, the University of Texas at Austin, Director of the Center for Management of Operations and Logistics, and co-Director of the Center for Decision Making under Uncertainty. He is the Founder, former Chairman and CEO of CALEB Technologies Corporation.

In addition to serving as Adjunct Professor at CUHK, Dr. Yu is also Adjunct Professor at Tsinghua University, Beijing University, Wuhan University, Shanghai Jiaotong University, Zhejiang University, Nanjin University, Xian Jiaotong University, Huazhong University of Science and Technology, Beijing University of Aeronautics and Astronautics, Xiamen University, and People’s University of China.

Dr. Yu has also received numerous awards for recognizing his achievements including: the 2002 Franz Edelman Management Science Achievement Award from INFORMS, the 2002 IIE Transaction Award for Best Application Paper, the 2003 Outstanding IIE Publication Award from the Institute of Industrial Engineers, the 2012 Martin K. Starr Excellence in Production and Operations Management Practice Award from POMS, in addition to many awards. Dr. Yu has published over 80 journal articles, 4 books, and Dr. Yu holds 3 US patents.

Dr. Yu co-founded the B2C e-commerce company Yihaodian in China in 2008. Since founding, Yihaodian has enjoyed a rapid growth and it has won the first place of the Deloitte Technology Fast 500 Asia Pacific and the first place Future Stars Award from China Entrepreneur in 2011. Yihaodian now has over 75 million customers, over 10,000 employees, 19 fulfillment centers, over 4 million product offers. Its revenue reached 11.5 billion RMB in 2013.
The stability of financial markets benefits billions of people. In order to respond to the challenge of maintaining healthy and stable markets, today’s systems engineers must possess quantitative and business know-how to understand and manage the complexity of financial instruments and inter-bank dynamics.

Systems engineers master the core skills of modeling economic and human behaviors, and provide insights regarding how to reach economic, social and individual investors’ objectives.

Financial engineering covers modeling, analysis, implementation of financial decision making and risk management. More than just theories, systems engineers develop practical tools with a combination of multiple disciplines including statistics, probability, optimization and stochastic analysis. Related research topics include pricing and hedging, systematic risk management, stochastic volatility models, and portfolio choice.

### High Frequency Trading
**N. Chen**

High frequency trading (HFT) is to use computers to process market information and make elaborate decisions to “initiate buy/sell orders. As of July 2009, HFT firms account for 73% of all US equity trading volumes.” We study how to develop realistic and analytically tractable models for the dynamics of order-driven trading systems. The implications on optimal execution and investment strategies will be investigated.

### Interest Rate Derivative Modeling
**Q. Wu**

Interest rate derivative is the largest global over-the-counter derivative market among all asset classes, with 489 trillion US dollars outstanding notional and 18 trillion market value. It plays instrumental role in the financial lives of countries and institutions. Our research dives into the following three topics: modeling of yield curves and interest rate volatility; physical measure risk management of derivative portfolios; and macro understanding of policy influences on interest rates.

### Limit order books
**X.F. Gao**

As a trading mechanism, limit order books have gained growing popularity in equity and derivative markets in the past two decades. The objective of this project is to understand deeper on different time scales, how the price is driven by supply and demand, which is expressed in the geometric property of the time-varying order book shape.
Mining Streams of Financial Data and News
J. Yu

Financial market trends prediction is a technique to forecast market trend changes, which assists financial market participants to spot arbitrage opportunities for investment. Currently, most existing reported data mining studies for trend prediction focused on the time-series perspectives. However, there are numerous social factors that contribute to financial market trends prediction, but cannot be obtained from or represented in time-series data. First, in order to effectively predict market trends, one main objective of this project is to develop new data mining techniques that deal with two different types of data, namely financial data (time-series data or simply data) and news articles (textual data or simply text) concurrently. Second, stock market traders need to monitor tens of thousands of data/text sources coming as open-ended data/text streams in an on-line fashion, and need to analyse and make decisions based on the data/text streams they have received as soon as they can. We will study trend predictions by investigating the above two interrelated issues and finding associations among multiple data/text streams.

Modeling Time Dependency in Financial Engineering
L.F. Li

A fundamental task in financial engineering is to develop empirically realistic as well as tractable derivative models. For tractability reasons many standard models are assumed to have time-homogeneous local characteristics (i.e. drift, diffusion coefficient, jump measure), which however, are undesirable from the empirical standpoint in many applications, as they cannot capture time dependent behavior such as seasonal spikes observed in electricity spot prices, and cannot achieve satisfactory results in calibrating the term structure of interests (e.g. implied volatilities). The aim of this project is to study the theory and applications of a new technique called additive subordination for modeling time dependency in financial engineering.

Revised Dynamic Mean-Variance Portfolio Selection
D. Li

As the dynamic mean-variance portfolio selection formulation does not satisfy the principle of optimality of dynamic programming, phenomena of time inconsistency occur, i.e., investors may behave irrationally under the pre-committed optimal mean-variance portfolio policy when their wealth is above certain threshold during the investment process. By relaxing the self-financing restriction to allow withdrawal of money out of the market, we develop in this research a revised mean-variance policy which dominates the pre-committed optimal mean-variance portfolio policy in the sense that, while the two achieve the same mean-variance pair of the terminal wealth, the revised policy enables the investor to receive a free cash flow stream during the investment process. This research will further carry out study on minimum-cost mean-variance portfolio selection, as the monotonicity does not hold in the mean-variance world, i.e., not the larger amount you invest, the larger expected future wealth you can expect for a given risk (variance) level.

Spectral Methods for Optimal Decision and First Passage Problems
L.F. Li

We develop a new method based on spectral analysis to solve optimal decision problems including optimal stopping, optimal switching and stochastic games, and first passage problems for a rich class of Markov diffusions, jump-diffusions and pure jump processes, which are building blocks for empirically realistic financial models. These problems arise in a variety of applications in financial engineering, including evaluating financial contracts with early exercise rights or/and with barriers, such as American-style options, barrier options, callable and puttable bonds and convertible bonds, and real options arising in commodity extraction, power generation, optimal investment or divestment timing, and other irreversible decisions.

Time Consistency Issue in Financial Optimization
D. Li

Choosing an appropriate risk measure for specific investor(s) is one of the most important steps in carrying out risk management in investment. When a mean-risk measure does not possess time-consistency in efficiency, following the optimal policy derived from such a mean-risk measure may yield some irrational investment behaviours. Unfortunately, almost all widely adopted risk measures in the literature are not time consistent, or even not time-consistent in efficiency. Furthermore, the theoretical frameworks proposed recently in the literature on time consistency are difficult to satisfy and these abstract measures are not intuitively understandable by investors. The objective of this research is to develop a framework to identify suitable mean-risk measures which possess desirable properties, especially, time consistency in efficiency, and, at the same time, can be intuitively understood and appreciated by investors.
Information Systems is about data-intensive computing for information processing and intelligence extraction to enable better decision-making and execution for complex systems in our changing society.

In order to leverage today’s rapidly-advancing technology, new generations of algorithms and technologies are applied. Systems engineers are well-trained with solid computer-related and programming knowledge for analysing and mining data, building large-scale analytic models, both stochastic and deterministic, creating algorithms for solving problems, executing large-scale simulation models, and allowing users to easily visualize and manipulate the data.

**Audio Search Engines**  
H. Meng

Audio search engines enable us to search through the mass of audio information that is available on the internet, e.g. audio tracks of video, radio broadcasts, meeting recordings, etc. This project combines speech processing and information retrieval technologies to facilitate audio search and retrieval. Features such as automatic segmentation of hours of audio into individual stories, retrieval of Chinese spoken recordings based on textual input queries and also cross-language English-Chinese spoken document retrieval are also possible.

**Bi-directional English-Chinese Machine Translation**  
H. Meng

We have developed one of the first bi-directional English-Chinese Machine Translation systems using semi-automatically generated grammars. The same system can automatically generate the Chinese translation of an input English query as well as the English translation of an input Chinese query. Grammars are derived semi-automatically using a data-driven technique.

**Computer-Aided Second Language Learning through Speech-based Human-Computer Interactions**  
H. Meng

This is a new initiative that aims to develop speech and language technologies to support second language learning, especially for Chinese learners of English. We are developing an automatic speech recognizer that can detect and diagnose the learners’ pronunciation errors, in order to automatically generate corrective feedback that is helpful for the user. Text-to-speech synthesis technologies are also developed to provide spoken feedback. This project brings together the fields of engineering, linguistics and education. It opens up new opportunities in the area of e-learning and collaborative learning using next-generation web technologies.

Please see [www.se.cuhk.edu.hk/hccl/languagelearning](http://www.se.cuhk.edu.hk/hccl/languagelearning)
Graph Database
J. Yu
As rapid growth of Internet and Web-technology, information becomes ever more pervasive and important. The demand keeps increasing for database management systems to provide more effective mechanisms, as being shown in up-to-date research activities in supporting Web, semistructured and XML applications in database systems. This project aims at providing advanced techniques to effectively and efficiently handle graph query processing, indexing, and storage management, for large graph datasets.

Highly Natural Chinese Speech Synthesis with a Talking Head
H. Meng
We have developed Crystal, a text-to-audiovisual-speech synthesizer that can automatically generate a cartoon-talking head based on textual input. This avatar can speak in Cantonese or Putonghua. We are working on improving the naturalness of the avatar, both in terms of its spoken expressions, as well as facial expressions and articulatory gestures. This exciting project has many applications, e.g. electronic books, reading aids for the visually impaired, language learning, etc.

Please see www.se.cuhk.edu.hk/crystal

Information Mining and Discovery from Text Data
W. Lam
Massive amount of information is stored in the form of texts. They can be in the form of unrestricted natural language and in different domains. Some texts are in semi-structured form such as Web pages. This project aims at developing new models for discovering new, previously unknown information that is useful for human or for further construction of intelligent systems. Techniques drawn from machine learning, natural language processing, and information retrieval are investigated.

Learning Text Categorization and Classification
W. Lam
One important and useful basic component in text mining is automatic text categorization. Text categorization has a lot of applications including intelligent document routing and knowledge management. It is more challenging than ordinary classification problems due to high dimensionality, text feature extraction, and skewedly distributed classes. We have been developing new algorithms for this problem. In addition to algorithmic progress, we intend to seek a more realistic model for capturing the inherent properties of text classification.

Multi-modal and Trilingual Spoken Dialog Systems
H. Meng
We are developing distributed spoken dialog systems that support the languages of Hong Kong (Cantonese, Mandarin and English) as well as human-computer interactions using portable PDAs and smart phones connected over a wireless network. Our systems accept multimodal input via speech, handwriting and pointing; and they deliver multimedia output involving text, audio and video. Users can use these systems for information access in the travel and financial domains. Our systems integrate a plethora of technologies involving speech recognition, natural language understanding, multi-modal dialog modelling and speech synthesis.

Integration of Classification and Pattern Mining: A Discriminative and Frequent Pattern-based Approach
H. Cheng
Many existing classification methods assume the input data is in a feature vector representation. However, in many tasks, the predefined feature space is not discriminative enough to distinguish different classes. More seriously, in many other applications, the input data has no predefined feature vector, such as transactions, sequences, graphs, and semi-structured data. For both scenarios, a primary challenge is how to construct a discriminative and compact feature set. Besides popularly investigated machine learning and statistical approaches, frequent pattern mining can be considered as another approach. The direction is interesting because frequent patterns are usually statistically significant and semantically meaningful. The objective of this project is to use discriminative frequent patterns to characterize complex structural data and thus enhance the classification power. I developed a framework of discriminative frequent pattern-based classification which could lead to a highly accurate, efficient and interpretable classifier on complex data.

Network Informal Language Processing
K.F. Wong
Network Informal Language (NIL) refers to the language commonly used on the Internet for real-time information exchange, such as over ICQ, MSN, etc. NIL is very different from natural language. It is dynamic and anomalous in nature. We propose to use a machine learning approach to acquire new vocabulary and grammar rules from a proprietary NIL corpus. Understanding NIL would enable us to analyse the behaviour of Internet users. This in turn could be applied to commercial application, such as customer relationship management.
On the Data Partitioning Problem
C.H. Cheng

Clustering computing environments can provide the performance and reliability required by distributed and parallel database systems. In a typical distributed/parallel database system, a request mostly accesses a subset of the entire database. It is, therefore, natural to organise commonly accessed data together and to place them on the near-by, preferably the same, machine(s)/site(s). For this reason, in distributed database application design, data partitioning and data allocation are critical issues. In this research we focus on data partitioning and in particular, we would like to investigate the use of evolutionary algorithms.

Querying Large Evolving Graphs
J. Yu

The data available on the Web increases significantly over years and will continue to grow significantly. We consider the Web as an example of a large evolving graph, because its content and links structure dynamically change over time. Like the Web, there exist many other large graphs in real applications that change over time dynamically, for example, the social networks. In this project, we study a large evolving graph, which is a sequence of graphs, (G1, G2, G3) such as Gj evolves from Gi if Gi appears before Gj. We focus on providing new effective and efficient mechanisms for users to understand the structural perspectives and understand how these structural perspectives evolve or change over time. The importance of this project is based on the fact that users request to understand changes in terms of structural perspectives in a global sense rather than on a basis of individual documents and Web pages that contain certain keywords, and users request to know how the things, that are not obviously related, are related and how some have impacts over the others.

Social Media and e-Community Analysis
K.F. Wong

Facebook, Twitter, LinkedIn, etc. are popular social media. Today, they are widely used for sharing opinions on different targets, e.g. services, products, politics etc. Social media is becoming an indispensable way of communication in our daily life. Different from traditional communication, social media provides a platform where people are connected together to form e-communities. Hence, social media brings significant advances to our understanding of social behaviors, and the study of social media is of great importance in sociology, biology, and computer science. The core element in social media is the notion of e-community, which serves the roles of an information generator and propagator, as well as a relationship manager. There is, therefore, a growing research interest in understanding e-communities, which is the target of our research team.

Temporal Information Extraction and Processing
K.F. Wong

Temporal information carries information about changes and time of the changes. It is regarded as an equally, if not more, important piece of information in applications like extracting and tracking information over time or planning and evaluating activities. The conventional information systems may maintain and manipulate the occurrence time of events, but they may not be able to handle users’ queries concerning how an event relates to another in time. In this project, we investigate techniques in natural language processing for extracting temporal information from a document and, based on the extracted information, develop techniques in temporal logic inference.
Hong Kong is one of the world’s logistics and supply chain management hubs, which expands to include non-industrial operations involving supply, distribution, transportation, communication and information handling, medical care and safety. According to The Association for Operations Management (APICS), nowadays supply chain management covers the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally.

To increase the agility and flexibility of today’s complex business environment, systems engineers can process huge amounts of business data for decision-making, optimization, and effective execution along the supply chain networks. They possess professional knowledge in the design and control of these operational and information-rich systems, which require the use of many different kinds of scientific management methodologies.

Back to the Future: Sense-and-Respond Public Transit for Historic Urban Centres
J.M.Y. Leung

With the rampant pace of urbanisation, many historic city centres have either been choked by traffic congestion and pollution, or hollowed out as economic activities shift to suburban centres. To maintain or re-create a clean, green and vibrant city centre, city planners are looking to design or re-design low-emissions high-capacity public transit systems (e.g. electric trams and trolleys) to provide comprehensive access to city centres.

The goal of this project is to explore how the pervasiveness of auto-sensed data in urban informatics can be exploited in the design and operation of an environmentally-friendly, efficient and effective urban public transit system that can respond in real time to the transport needs of people in city centres in their daily economic and recreational activities.

We will investigate Sensing, Information Processing and Data Mining techniques to derive real-time demand profile for the transport needs in an urban area. This information would be incorporated into a real-time sense-and-respond operations scheduling and despatch system for public transit.

The results will contribute an exemplar for how a city of the future can maintain or re-vitalise its central urban area as a focus of economic and recreational activities, with efficient access free of congestion and pollution.
Coordinated Decisions of Manufacturer/Distributor in a Fresh Product Supply Chain Involving Long Distance Transportation

X. Cai and Gang Yu

We consider a supply chain where a manufacturer produces a variety of fresh products to supply to a distributor in a distant export market. The manufacturer faces the risk that a fresh product may decay during the process of long distance transportation, in particular in the presence of uncertain events (such as bad weather, airport delays, etc.). The distributor faces the risk that the demand for a product is uncertain and any unsold fresh products may lose its value after the sales period. While the profit potential in supplying the products to the export market is substantial, a great challenge for both parties is how to minimize the loss involved. Because time is a crucial element for fresh products, proper decisions regarding the timing to produce, deliver, and sell, become particularly critical in these situations. Main topics to be investigated include modelling to capture the prominent characteristics and concerns in different scenarios, derivation and analysis of optimal policies, and design and analysis of information and profit sharing schemes.

Manpower Planning and Scheduling with Workforce Flexibility

J.M.Y. Leung

In the global competition of supply-chains vs. supply-chains, swiftness in each value-added process is essential. Many time-critical steps involve rapid “servicing” of transportation equipment at consolidation hubs. This project focuses on crew-scheduling for such servicing to ensure rapid turnaround-times in the supply-chain. This job-assignment/scheduling problem is highly complex because of: the extremely tight time-windows for servicing, and large variety of equipment types, making matching appropriately-skilled crews to jobs difficult. The possibility of new operational modes - such as sharing of jobs by multiple crews to reduce service times - adds further complications.

We hope to extend our understanding of workforce flexibility in rostering/scheduling models. At the operational level, we will develop effective job-assignment and scheduling methods that allows job sharing. At the strategic level, we explore how cross-training and broader skill-sets of the crews impacts optimal schedule costs. In actual operations, unanticipated delays occur, so disruption recovery and redeployment of crews are necessary. This project will also investigate methods for stochastic planning and disruption recovery.

Results from this project may be relevant to many logistics businesses whose operations are time-critical. We hope our findings will contribute to the understanding of the value of resource flexibility.

Pricing, Production and Delivery Decisions, and Cooperative Strategies in a Supply Chain with Products of Time-Varying Values

X. Cai and J. Chen

Many industries face the problem of manufacturing and selling products of time-varying values. Due to the time-varying nature of product values, determining the proper decisions and strategies regarding the best timing to offer new sales price, to place order, and to produce and deliver, is a great challenge for the manufacturer as well as the retailers involved in the supply chain. In this project we examine a supply chain with one manufacturer and multiple retailers, where the manufacturer wishes to determine a proper pricing mechanism and the corresponding production/delivery decisions, while the retailers wishes to make use of the pricing mechanism offered by the manufacturer, through possible grouping with each other to reach the needed purchase quantities for price drops. Cooperation and competition among the retailers, and between the manufacturer and the retailers, will be considered.

Sustainable Public Transit -- On-demand Transit Systems with Electric Vehicles

J.M.Y. Leung

Transportation is one of the industrial sectors most impacted by global climate change. Governments are recognising the urgency of development of transport policies for sustainability. In this project, we would like to explore the design and planning of urban transit alternatives that capitalise on electric cars and other environmentally-sustainable transport technologies now available.

With zero tail pipe emissions, electric vehicles can significantly reduce city air pollution and create a greener environment. The challenge in the wide-spread adoption of electric vehicles is the availability of re-charging stations and the re-charging time. On-demand public transit has also gained popularity in many cities. On-demand public transit combines the servicing of customers with similar routes in the same vehicle. Each passenger still gets point-to-point service with only short
The Impact of a Target on Newsvendor Decisions
Z.Y. Long

In this paper we investigate the impact of a target on newsvendor decisions. Different to the existing approach that maximizes the probability of the profit reaching the target, in this paper we model the effect of a target by maximizing the satisficing measure of a newsvendor’s profit with respect to that target. We study two satisficing measures: i) CVaR satisficing measure that evaluates the highest confidence level of CVaR achieving the target; and ii) Entropic satisficing measure that assesses the smallest risk tolerance level under which the certainty equivalent for exponential utility function achieves the target. For both satisficing measures, we find that the optimal ordering quantity increases with the target level. Further, the newsvendor orders more than the risk-neutral solution (over-order) sometimes and less than that (under-order) other times, depending on the target level. The more interesting finding is that if the target is proportional to the unit marginal profit and is also determined by only one other demand-related factor, then the newsvendor over-orders low-profit product and under-orders high-profit product.

Understanding ERP System Adoption from a User’s Perspective
C.H. Cheng, W.M. Cheung, and J. Yeung

An ERP system is a new management technology that advocates an integrated approach to conduct business. While organizations are hoping to apply this technology to improve overall performance, they must understand what it takes for their employees to use it. Although the use of ERP systems may not be voluntary, the understanding of system adoption from the user’s perspective is useful in helping the organizations prepare their employees to face new challenges and learn how to make good use of the technology. To analyse factors affecting the ERP system usage, we proposed a conceptual model derived from the Triandis framework. The use of the Triandis framework is based on the previous research that documents the importance of social factors on the adoption of a technology. An empirical study was conducted in Hong Kong to understand the adoption process. Based on our findings, we also propose managerial implications in connection with usage promotion.
Operations research combines the applications of optimization, probability and statistics to solve problems in different domains including business, energy and utilities, health services, financial services and logistics. In order to solve today’s complex system environment, operations research often works at the intersection of these disciplines, such as the use of optimization in the estimation of large scale statistical models, optimal collection of information, and stochastic optimization. Systems engineers know how to develop and use mathematical and statistical models to help solve these decision problems. Like other engineers, they are problem formulators and solvers. Their work requires the formation of a mathematical model of a system and the analysis and prediction of the consequences of alternate modes of operating the system.

**Approximation Algorithms for Perishable Inventory Systems**

X.T. Gong

Perishable products such as meat, fruit, dairy products, frozen foods, and pharmaceuticals are ubiquitous and play an indispensable role in our society. However, the control and optimization of perishable inventory systems is very hard due to their finite-lifetime nature. Indeed, the optimal control policy for perishable inventory systems is very complicated; and the computation of the optimal policy using dynamic programs suffers from the well-known “curse of dimensionality” and is intractable even with a relatively short product lifetime. In this project, we aim to develop easy-to-compute and near-optimal approximation algorithms with worst-case performance guarantees for periodic-review perishable inventory systems with general demand processes. If successful, our research will not only significantly contribute to the research literature on perishable inventory management, but also have a broad impact on researchers and practitioners in perishable product industries/organizations.

**Fast Algorithms for Big Data Analytics**

A. M.-C. So

The ubiquity of big datasets and the desire to extract information and knowledge from them have motivated the development of a wide array of data analytics tools in recent years. Many of these tools aim at identifying the most informative features in a dataset according to some criteria. As such, they often require the algorithmic solution of certain (intractable)optimization problems. In this project, we will develop efficient algorithmic implementations of various optimization-based data analytics tools and rigorously establish their performance guarantees (such as convergence rate, approximation quality and statistical properties). This will contribute to both the theory and practice of big data optimization. We will also test our results on various applications, such as recommender systems and systems biology.
Financial Systemic Risk
N Chen

Financial institutions knit a complex network. They interconnect with each other directly through active borrowing-and-lending activities and holding significant amount of marketable securities against each other. In normal times, this network helps the institutions diversify their idiosyncratic risks to achieve an efficient allocation of economic resources. However, under crisis conditions, this network can be easily turned into a conduit that propagates failures at one or several institutions to the entire system. Further complicating the matter is a second layer of interconnectedness of the institutions, indirectly via the market. The asset fire sale by a distressed firm will create a significant negative externality for the rest of the system. As the recent financial crisis reveals, these two, direct and indirect but mutually enhancing, channels play an important role in the development of systemic risk. The objectives of my research aims to develop mathematical tools to modeling and analyzing systemic risk, in particular studying how defaults spread through the entire financial system.

Low-Rank Tensor Recovery and Tensor PCA
S.Q. Ma

Stimulated by the need of big data analytics, and motivated by the success of compressed sensing and low-rank matrix optimization, it is important and timely to study methods for analyzing massive tensor data. Traditional matrix-based data analysis is inherently two-dimensional, which limits its ability in extracting information from a multi-dimensional perspective. Tensor-based multi-dimensional data analysis has shown that tensor models can take full advantage of the multi-dimensional structures of the data, and generate more useful information. A common observation for huge-scale data analysis is that the data exhibits a low-dimensional property. This leads to the study of low-rank tensor optimization problems. The primal goals of our research under this project are: (i) to develop new matricization schemes for tensor and to analyze the corresponding relation between its CP rank and the rank of its matrix counterpart; (ii) to apply the matricization scheme to low-rank tensor recovery problems and their variants, and to develop efficient first-order optimization algorithms for solving these problems; (iii) to develop efficient algorithms for solving sparse PCA for tensor; (iv) to apply these models and algorithms to solve tensor optimization problems arising from real applications such as statistics, signal processing, machine learning and bioinformatics.

Managing Underperformance Risk in Project Portfolio Selection
Z.Y. Long

We consider a project selection problem where each project has an uncertain return with partially characterized probability distribution. The decision maker selects a feasible subset of projects so that the risk of the portfolio return not meeting a specified target is minimized. Our work extends the riskiness index of Aumann and Serrano (2008) by incorporating the target and also distributional ambiguity. We minimize the underperformance risk of the project portfolio, which we define as the reciprocal of the absolute risk aversion (ARA) of an ambiguity averse individual with constant ARA who is indifferent between the target return with certainty and the uncertain portfolio return. Our model captures correlation and interaction effects such as synergies. We solve the model using binary search, and obtain solutions of the subproblems from Benders decomposition techniques. A computational study shows that project portfolios generated by minimizing the underperformance risk are more than competitive in achieving the target with those found by benchmark approaches, including maximization of expected return, minimization of underperformance probability, mean-variance analysis, and maximization of Roy’s (1952) safety first ratio. As a simpler alternative, we describe a greedy heuristic, which routinely provides project portfolios with near optimal underperformance risk.

Hidden Convexity
D. Li

The research goal is to develop sufficient conditions to identify hidden convex minimization problems. A non-convex minimization problem is called a hidden convex minimization problem if there exists an equivalent transformation such that the transformed minimization problem is convex. Sufficient conditions that are independent of transformations can be derived for identifying such class of seemingly non-convex minimization problems that are equivalent to convex minimization problems. A global optimality can be thus achieved for this class of hidden convex optimization problems by using local search methods.
Managing Operational and Financing Decisions to Meet Consumption Targets

Z.Y. Long

We study dynamic operational decision problems where risky cash flows are being resolved over a finite planning horizon. Financing decisions via lending and borrowing are available to smooth out consumptions over time with the goal of achieving some prescribed consumption targets. To evaluate the ability of these consumptions in meeting respective targets, we propose the Consumption Short-fall Risk (CSR) criterion, that has salient properties of attainment content, starvation aversion, subadditivity and positive homogeneity. In particular, we study the entropic CSR (ECSR) criterion, which is based on the aggregation of the Aumann and Serrano (2008) riskiness indices of the consumption excesses over targets and has desirable computational properties in dynamic decisions making. We show that if borrowing and lending are unrestricted, the optimal policy that minimizes ECSR criterion is to finance consumptions at the target levels for all periods except the last. Moreover, the optimal policy has the same control state as the optimal risk neutral policy and could be achieved with relatively modest computational effort. Under restricted financing, we show that for convex dynamic decision problems, the optimal policies correspond to those that maximize expected additive-exponential utilities, and can be obtained by an efficient algorithm. We also analyse the optimal policies of joint inventory-pricing decision problems under the target-oriented criterion and provide optimal policy structures. With a numerical study for inventory control problems, we report favorable computational results for using targets in regulating uncertain consumptions over time.

New Models in Capacitated Lot Sizing Decisions

C.H. Cheng

Existing research in the capacitated lot sizing problem (CLSP) often assumes setup time to be negligible. Although there have been efforts to reduce setup time, it is not possible to reduce it to near zero in many industries. Hence, excluding setup time from CLSP models is not practical, especially when setup time is significant and production capacity is tightly constrained. In this research, this limitation will be addressed. General models considering alternate production options will be developed. In particular the inclusion of setup time will be investigated. Further the structure of the problem will be studied and solution algorithms based on the underlying structure will be developed. An extensive computational study will be carried out.

New Scheduling Models with Applications to Berth Allocation

X. Cai and C.Y. Lee

The study focuses on modelling, analysis, and algorithms for a class of new scheduling problems where a big job must occupy a full machine, while a small job may share a machine with some other jobs at the same time. Applications to berth allocation in container terminals are also investigated.

Nonconvex Approaches to Rank-Constrained Semidefinite Programs

A. M.-C. So

Many intractable problems in engineering can be formulated as a semidefinite program (SDP) with a rank constraint. Currently, a standard approach to tackle these problems is semidefinite relaxation. The idea is to drop the rank constraint to get an efficiently solvable SDP. However, standard SDP solvers typically yield high-rank solutions. In this project, we investigate the use of nonconvex regularization terms to promote low-rank solutions. The focus will be on both the computational complexity of such approaches and their practical implementations.

Nonconvex Optimization and Global Optimization

D. Li and C. K. Ng

The research goal is to develop equivalent transformations for generating a saddle point for nonconvex optimization problems. A saddle point condition is a sufficient condition for optimality. A saddle point can be generated in an equivalent representation space for nonconvex optimization problems that do not have a saddle point in their original settings. Certain equivalent transformations may convexify the perturbation function and a zero duality gap can be thus achieved. This investigation would lead to some efficient dual search algorithms that ensure the global optimality for a class of nonconvex optimization problems.
Nonlinear Integer Programming
D. Li and C. K. Ng
The research goal is to establish convergent duality theory and to develop efficient solution algorithms for large-scale nonlinear integer programming problems. The fundamental target underlying our theoretical development is to eliminate duality gap in the classical Lagrangian dual formulation. We have developed nonlinear Lagrangian theory that has yielded several new dual formulations with asymptotic zero duality gap. The key concept is the construction of a nonlinear support for a nonconvex piecewise-constant perturbation function. Our numerical implementation of a duality-gap reduction process relies on some novel cutting procedures. Performing objective-level cut, objective contour cut or domain cut reshapes the perturbation function, thus exposing eventually an optimal solution to the convex hull of a revised perturbation function and guaranteeing a zero duality gap for a convergent Lagrangian method. Applications include nonlinear knapsack problems, constrained redundancy optimization in reliability networks, and optimal control problems with integer constraints.

Scheduling with Negotiable Third-Party Machines
X. Cai, C.Y. Lee and George Vairakarakis
Suppose a manufacturer has received a number of orders (jobs) from his customers, which should be completed by their respective due dates. Most of the facilities needed to process the jobs are available in the manufacturer’s own factory. However, for some reason, certain parts of the jobs must be outsourced to a third party who possesses the machines needed to process these parts. The availability of the third-party machines is negotiable, depending on the price. Consequently, the manufacturer has to (1) negotiate an agreement to secure the machine time on the third-party machines, and (2) generate a schedule to process the jobs, so as to minimize the total cost, including the cost for the use of the third-party machines and the cost incurred if the due dates of the jobs cannot be met. In general, consideration of third-party machines in machine scheduling problems relaxes a common assumption made in traditional scheduling studies. The main objective of this project is to explore models and algorithms to solve this new branch of scheduling problems. Nash Bargaining theory will be applied.

Scheduling of Perishable Jobs under Uncertain Deadlines
X. Cai and X. Zhou
We study a new class of scheduling problems involving perishable jobs with post-completion deterioration, where each finished product will be picked up by a transporter that arrives with uncertainty. The processing time to complete a job, as well as its fresh time, are random variables. If a job is finished too early, it may decay and thus incur a decaying cost; on the other hand, if it misses the pickup, it will suffer a loss due to such causes as having to be put to a local market at a discounted price. The problem is to determine an optimal policy to process and handle all the jobs, so as to minimize the total expected loss. The objective of this project is to develop an in-depth study of scheduling problems with features as described above. Topics to be addressed include those on modelling, propositions of optimal policies, and algorithms.
Sparse Optimization for High-Dimensional Data Analysis
S.Q. Ma

Introduction: In modern high dimensional data analysis, we are facing large-scale and completely dense data. It is hard to analyze these data using traditional approaches. In many problems, however, the large-scale and completely dense data usually have special structures such as sparse and low-rank structures of their solutions. Sparse optimization is a recently developed tool to analyze the data and extract the sparse information from the completely dense data. The primary goals of our research under this project are: (i) to develop a suite of efficient algorithms for solving large-scale sparse optimization problems; (ii) to provide theoretical foundations for these algorithms such as proofs of their global convergence, rate of convergence and iteration complexity for epsilon-optimality; (iii) to apply these algorithms to solve very large-scale and challenging problems from compressed sensing, machine learning and statistics such as robust PCA, sparse PCA, sparse inverse covariance selection, latent variable graphical model selection, stable principal component pursuit and compressive principal component pursuit; (iv) to implement a variety of software packages for solving these real applications that can be used in different areas.

Solutions to Diophantine Equations
D. Li

Efficient methods in finding solutions to Diophantine equations are not only of their theoretical importance, but also of their far reaching impacts on many long-standing challenges in operations research, for example, the knapsack problem. It is well-known that linear Diophantine equations are polynomially solvable, while linear Diophantine equations on a bounded integer set are NP-complete. In this research we develop novel schemes for finding solutions to Diophantine equations by disaggregation and variable fixation.

Strong approximations in multiclass queuing networks
X.F. Gao

Multiclass queueing networks have been used to model manufacturing and communication systems. For those multiclass networks with a static priority service discipline, the diffusion approximation for the queue length of a higher priority group is identically zero. This approximation is not satisfactory, particularly when the traffic contributed by those higher priority class customers in each station is not negligible. The goal of this project is to propose better approximate methods for analyzing multiclass networks, especially those with feedback structure.

Theory and Applications of Chance Constrained Optimization
A. M.-C. So

In the formulation of optimization models, the data defining the objective functions and/or constraints are often collected via estimation or sampling, and hence are only approximations of the nominal values. One approach to incorporate data uncertainty in optimization models is through chance constrained programming, in which one only needs to satisfy the constraints for most but not all realizations of the data. Unfortunately, such an approach often leads to computationally difficult optimization problems. Our aim in this project is twofold: (i) to develop tractable reformulations or approximations of chance constrained optimization problems, in which the data satisfy certain stochastic properties, and (ii) to apply our methodologies to practical problems, such as those arise in signal processing, wireless communications, control and finance.

U-OPT Production Line
C.H. Cheng

Just-In-Time (JIT) manufacturing is proposed to eliminate waste of material, labour, and space in their manufacturing systems. U-shaped production lines instead of traditional straight production lines are adopted. In this research, we investigate the problem of designing U-shaped lines. Unlike designing traditional straight lines, very little research has been done on the U-line problem. The purpose of this research is to develop new knowledge for designing and operating U-lines. In particular, we explore and evaluate the use of various algorithms.
Major pillars of the Hong Kong economy are related to services such as finance, professional services, medicine, education and logistics. Those service systems are complex systems in which specific arrangements of people and technologies take actions that provide value for others. Systems are designed and built to provide and sustain services, yet because of their complexity and size, operations do not always go smoothly, and all interactions and results cannot be anticipated. As a result, systems engineers are trained to develop quantitative decision-making tools and methodologies for smooth, agile and resilient operations in data-intensive service systems such as finance, healthcare, and logistics.

**Financial Digital Library**  
**J. Yu, C.C. Yang and W. Lam**

The Financial Digital Library being developed contains annual reports, financial news articles, and government documents that allows users from different places to access and search for the information they need based on concept space. We have a collection of annual reports from 249 Hong Kong public firms, real-time stock quotes, and a set of agents to support technical and fundamental analysis. We have also conducted a series of studies on how an electronic filing system can improve transparency of financial information transmission in Hong Kong.

**Integration of OLAP and Multidimensional Inter Transaction Mining**  
**J. Yu**

Today’s markets are much more competitive and dynamic than ever before. Business enterprises prosper or fail according to the sophistication and speed of their information systems, and their ability to analyse and synthesize information using those systems. Integration of On-Line Analytical Processing (OLAP) and data mining is a promising direction since it facilitates interactive exploratory data analysis. The objective of this project aims at integrating OLAP and multidimensional inter-transaction data mining for large financial multidimensional databases.

**Internet Privacy and Security Issues**  
**C.H. Cheng**

Malicious use of Internet resources may be a threat to individual privacy and security. In this research, we examine the possibility of profiling individuals using Internet tools commonly-used by the community. Through this study, we hope to understand how the profiling on individuals is done, how accurate the information is, and what individuals may do to protect their privacy and security.

**Knowledge Discovery**  
**W. Lam, H. Meng and J. Yu**

This project focuses on automated or semi-automated learning from data and texts, and the transformation of learned theories into some knowledge representation formalisms. We expect to develop the theory and techniques for partial or full automation of the time-consuming process of expert knowledge elicitation through automatic knowledge discovery or learning from data. We aim not only at the accuracy and effectiveness of the learned information, but also at improving the level and depth of knowledge discovered.
Undergraduate Programme

Admissions
According to University regulations, applicants seeking admission to a course of study leading to a Bachelor’s degree of the University should satisfy the minimum entrance requirements of the University and the programme concerned.

All students will be admitted through the broad-based admission scheme of the Faculty of Engineering. Please refer to http://www.erg.cuhk.edu.hk/334 for details.

Scholarships
To help eligible students with financial need, the HKSAR Government has made provisions for grants and loans through the Joint Committee on Student Finance. The University and its constituent colleges also administer their own scholarships, bursaries, loans, and campus work schemes. There is also a number of scholarships specifically for Systems Engineering and Engineering Management students, a substantial portion of which is supported by the Ji & Li Family Foundation, Inc. Students may also obtain financial assistance from the schemes of Student Travel Loans, the Summer Subsistence Loans, University Bursaries and Loans, Emergency Bursaries and Loans, Student Campus Work Schemes, etc. Further details are available at the Office of Admissions and Financial Aid and the General Office of the Department.

Curriculum
There are four streams of specialisation: Business Information Systems, Financial Engineering, Logistics and Supply Chain Management, Service Engineering and Management. Students may choose to specialise in one of the four streams and select courses as prescribed. A student who does not wish to specialise in any of the four streams should follow a study scheme devised with the advice of the academic advisers of the Department.

Recommended Study Plan
Students are required to complete a minimum of 75 units of courses as follows:

(i) Faculty Package 9 units
(ii) Foundation Science Courses 9 units
(iii) Foundation Mathematics Courses 12 units
(iv) Required Courses 27 units
(v) Six Elective Courses 18 units
Total: 75 units
### Recommended Elective Courses

Students choosing a stream of specialisation should take at least 6 courses (2 stream required and 4 stream elective courses) from the corresponding list for their stream of specialisation.

#### Business Information Systems Stream

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<td>LSCI1003/</td>
<td>Life Sciences for Engineers</td>
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<tr>
<td>MATH1510/</td>
<td>Calculus for Engineers</td>
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<tr>
<td>PHYS1003/</td>
<td>General Physics for Engineers</td>
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<tr>
<td>PHYS1110/</td>
<td>Engineering Physics I</td>
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<tr>
<td>SEEM2440/ESTR2500/</td>
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<tr>
<td>SEEM2460</td>
<td>Introduction to Data Science</td>
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<td>ENGG1100/ESTR1000</td>
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<td>Problem Solving By Programming</td>
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<td>CHEM1070/</td>
<td>Principles of Modern Chemistry</td>
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<td>CHEM1280/</td>
<td>Introduction to Organic Chemistry and Biomolecules</td>
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<td>CHEM1380/</td>
<td>Basic Chemistry for Engineers</td>
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<td>CSCI1120/ESTR1100/</td>
<td>Introduction to Computing Using C++</td>
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<td>Introduction to Computing Using Java</td>
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<td>ENGG1410/ESTR1004/</td>
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<td>ENGG2430/ESTR2002/</td>
<td>Probability and Statistics for Engineers</td>
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<td>ENGG2440/ESTR2004/</td>
<td>Discrete Mathematics for Engineers</td>
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<td>ENGG2520/ESTR2006/</td>
<td>Engineering Physics II</td>
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<tr>
<td>IERG2060/</td>
<td>Basic Analog and Digital Circuits</td>
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<td>LSCI1001/</td>
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<td>Engineering Economics</td>
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<td>Term 3</td>
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</tbody>
</table>
Admission Criteria

The Ph.D. programme in SEEM normally requires the candidate to hold a research-based Master degree in engineering, applied mathematics, computer science, or related areas. The M.Phil. programme in SEEM normally requires the candidate to hold a bachelor degree in engineering, applied mathematics, computer science, or related areas. Exceptional candidates with a bachelor degree may apply directly to the Ph.D. Programme.

Applicants must meet the general qualifications required for admission to the Graduate School http://www2.cuhk.edu.hk/gss/entry.php

All applicants must also fulfil the “English Language Proficiency Requirement” as stipulated by the Graduate School before being considered for admission. Please refer to the “Postgraduate Prospectus” of the Chinese University of Hong Kong for details. Please refer to Admission On-line of CUHK for more information: http://www.cuhk.edu.hk/gss

Application Procedures

Applicants can apply for either M.Phil. or Ph.D. programme. The applications may be made in September for admission in August of the following year. Ph.D. applications during other periods will be subject to the available places. Please submit online application form to http://www.cuhk.edu.hk/gss and send the supporting documents (such as TOEFL, and GRE General Test scores) to our Department. An applicant should also have the following credentials sent separately to the Department as early as possible:

- one official transcript of academic record, to be sent by the original university/institution; the institution should be requested to indicate the programme that the candidate applies for;
- two letters of recommendation by his/her former teachers; and
- one copy of academic credentials, certificates, diplomas, etc.
Curricula

An M.Phil. student in this Division is required to take at least 4 courses with a total of 12 units. A Ph.D. student is required to take at least 5 courses with a total of 15 units, including at least one faculty core course. Undergraduate courses cannot be used to fulfil this requirement. Moreover, a Ph.D. student must fulfil the candidacy requirements within the maximum period of his/her pre-candidacy stage before the advancement to the post-candidacy stage. In addition, all M.Phil. and Ph.D. students must register for the Research for Thesis course (SEEM8003, SEEM8006 & SEEM8012). Exemption to any of the above requirements must be approved by the Division Head on a case-by-case basis.

Area I: Operations Research

- SEEM5320 Markov Decision Process
- SEEM5410 Optimal Control
- SEEM5510 System Simulation
- ENGG5501 Foundations of Optimization (SEEM5520 Optimization I)
- SEEM5540 Optimization II
- SEEM5580 Advanced Stochastic Models
- SEEM5650 Integer Programming
- SEEM5660 Conic Optimization and Applications
- SEEM5690 Queueing Systems

Area II: Information Systems

- SEEM5010 Advanced Database and Information Systems
- SEEM5330 Speech and Language Processing
- SEEM5460 Information Systems Engineering
- SEEM5470 Knowledge Systems
- SEEM5530 Client/Server Systems Engineering
- SEEM5560 E-Commerce Systems
- SEEM5640 Human-Computer Spoken Language Systems
- SEEM5680 Text Mining Models and Application

Area III: Engineering Management

- SEEM5320 Markov Decision Process
- SEEM5420 Scheduling and Sequencing
- SEEM5430 Optimal Production Planning
- SEEM5480 Engineering Management Strategy
- SEEM5600 Logistics and Transportation Planning
- SEEM5610 Inventory and Supply Chain Management
- SEEM5630 Stochastic Inventory and Revenue Management

Area IV: Financial Engineering

- SEEM5310 Dynamic Asset Allocation
- SEEM5340 Stochastic Calculus
- SEEM5550 Computational Intelligence in Financial Information Systems
- SEEM5570 Numerical Methods in Finance
- SEEM5590 Financial Decision Models
- SEEM5620 Data Warehousing for Financial Engineering
- SEEM5670 Advanced Models in Financial Engineering
Presentation and Seminar Requirements

An M.Phil. or a Ph.D. student is required to give a presentation on his/her research progress each year before his/her Thesis Advisory Committee and submit a research report during his/her normative period of study. In addition, he/she must complete the SEEM seminar courses (SEEM5201 and SEEM5202) in his/her first year of study.

Financial Aid

All full-time M.Phil. and Ph.D. students receive financial support. This could be:

1. Postgraduate Studentships: For 2014-2015, the monthly stipend is around HK$14,350 which is non-taxable. The amount may be adjusted annually to accommodate cost-of-living adjustments. Students with postgraduate studentships are generally required to take up some tutoring duties;
2. Scholarships and Bursaries: There are a number of scholarships and bursaries available to eligible students.
M.Sc. Programme in
E-Commerce and Logistics Technologies

The Programme focuses on information and logistics technologies that support Internet business, and aims at training a new generation of talents in both the management and engineering aspects of E-Commerce and Logistics Technologies.

Admission Criteria
An applicant should have:

1. graduated from a recognized university and obtained a Bachelor’s degree in engineering, science, business administration or related fields, normally with Second Class Honours or higher, or an average grade of B or better in his undergraduate courses; or
2. completed a course of study in a tertiary educational institution and obtained professional or similar qualifications equivalent to an honours degree in related fields.

All applicants must also fulfil the “English Language Proficiency Requirement” as stipulated by the Graduate School before being considered for admission. Please refer to the “Postgraduate Prospectus” of The Chinese University of Hong Kong for details. Please refer to Admission Online of CUHK for more information: http://www.cuhk.edu.hk/gss

Curriculum
All students are required to take a minimum of 8 postgraduate courses (24 credits in total) within a normal period of two years (Part-time mode) or one-year (Full-time mode) of which 4 should be required courses and 4 elective courses. An exemption from a required course may be sought provided that the student has sufficient background and knowledge in the required course. The exempted course must be replaced with an approved elective course. Other M.Sc. courses from the Faculty of Engineering may be taken as electives with the approval of the Division Head. The degree of Master of Science will be conferred upon students who have completed the prescribed coursework with a cumulative grade-point average of 2.0 or above.

Required Courses
ECLT5710 Fundamentals of E-Commerce Technologies
ECLT5720 Electronic Payments Systems
ECLT57930 Engineering Economics
Either ECLT5730 Logistics Management or ECLT5940 Supply Chain Management

Elective Courses
A student should choose at least two courses from each area:

Area I: Internet and Information Systems
ECLT5740 Cryptography, Information Security and E-Commerce
ECLT5810 E-Commerce Data Mining Techniques
ECLT5820 Distributed and Mobile Systems
ECLT5830 Network and Web Programming
ECLT5840 Open Systems for E-Commerce
ECLT5850 Project I in E-Commerce and Logistics Technologies

Area II: Enterprise Solutions
ECLT5860 Mobile Commerce and Mobile Logistics
ECLT5910 Information Technology Management
ECLT5920 Decision Methodology with Financial Application
ECLT5940 Supply Chain Management
ECLT5950 Project II in E-Commerce and Logistics Technologies
M.Sc. Programme in Systems Engineering and Engineering Management

This taught programme is offered with the following objectives:

1. to provide advanced training for engineers and professionals who aspire to take up more management responsibilities in their careers, and
2. to offer students a well-rounded education through a selected set of courses on state-of-the-art subjects and cutting-edge technologies.

Admission Criteria
An applicant should have:

1. graduated from a recognized university and obtained a Bachelor’s degree in engineering, science, business administration or related fields, normally with Second Class Honours or higher, or an average grade of B or better in his undergraduate courses; or
2. completed a course of study in a tertiary educational institution and obtained professional or similar qualifications equivalent to an honours degree in related fields.

All applicants must also fulfil the “English Language Proficiency Requirement” as stipulated by the Graduate School before being considered for admission. Please refer to the “Postgraduate Prospectus” of The Chinese University of Hong Kong for details. Please refer to Admission Online of CUHK for more information: http://www.cuhk.edu.hk/gss

Curriculum
All students are required to take a minimum of 8 postgraduate courses (24 credits in total), within a normal period of two years (Part-time mode) or one year (Full-time mode) of which 3 should be required courses and 5 elective courses. An exemption from a required course may be sought provided that the student has sufficient background and knowledge in the required course. The exempted course must be replaced with an approved elective course. Other M.Sc. courses from the Faculty of Engineering may be taken as electives with the approval of the Division Head. The degree of Master of Science will be conferred upon students who have completed the prescribed coursework with a cumulative grade-point average of 2.0 or above.

Required Courses
SEEM5710 Principles of Engineering Management
SEEM5730 Information Technology Management
SEEM5820 Models and Decisions with Financial Applications

Elective Courses
Students must complete 5 elective courses but they cannot take more than 2 from each of the following three areas. SEEM5910 may be grouped under any of the areas.
SEEM5910 Project in SEEM

Area I: Engineering Management
SEEM5720 Manufacturing and Service Operations Management
SEEM5740 Engineering Economics
SEEM5780 Quality Assurance and Control
SEEM5790 Project and Technology Management
SEEM5800 Logistics Management
SEEM5880 Supply Chain Management
SEEM5890 Economics of Information

Area II: Information Systems
SEEM5750 Expert Systems and Decision Support
SEEM5760 Client/Server Information Systems
SEEM5770 Open Systems and Electronic Commerce

Area III: Financial Engineering
SEEM5830 Stochastic Investment Models
SEEM5840 Financial Analysis and Security Trading
SEEM5850 Computational Intelligence in Financial Information Systems
SEEM5860 Data Analysis in Financial Markets
SEEM5870 Computational Finance
Executive M.Sc. Programme in Logistics and Supply Chain Management

This part-time taught programme is offered jointly with the Tsinghua University Graduate School in Shenzhen. The objective of the programme is to help local and multinational companies, facing logistics and supply chain issues, develop new creative solutions to improve logistics and supply chain efficiencies and reduce costs by grooming their logistics and supply chain executives.

Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>LSCM5701</td>
<td>Essentials of Engineering Management</td>
</tr>
<tr>
<td>LSCM5702</td>
<td>Strategies in Logistics and Supply Chain Management</td>
</tr>
<tr>
<td>LSCM5703</td>
<td>Cost and Financial Analysis for Supply Chains</td>
</tr>
<tr>
<td>LSCM5704</td>
<td>Principles of Engineering Economics</td>
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<tr>
<td>LSCM5705</td>
<td>Demand and Customer Relationship Management</td>
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<tr>
<td>LSCM5706</td>
<td>Decision Methodologies</td>
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<tr>
<td>LSCM5707</td>
<td>Supply Chain Coordination and Integration</td>
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<tr>
<td>LSCM5708</td>
<td>Manufacturing Logistics</td>
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<td>LSCM5709</td>
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<td>LSCM5710</td>
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<td>LSCM5711</td>
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<td>LSCM5712</td>
<td>Field Studies</td>
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<td>Special Topics in Logistics and Supply Chain Management</td>
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<td>LSCM5714</td>
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<td>LSCM5715</td>
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<td>LSCM5716</td>
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</table>

Admission Criteria

An applicant should have:

1. graduated from a recognized university and obtained a Bachelor's degree, normally with honours not lower than Second Class; or

2. graduated from an honours programme of a recognized university with a Bachelor's degree, normally achieving an average grade of not lower than “B” in undergraduate courses; or

3. completed a course of study in a tertiary educational institution and obtained professional or similar qualifications equivalent to an honours degree.

Curriculum

The Programme requires students to complete 16 required courses (24 credits in total) within a normal period of two years. Students are assessed on the basis of their performance in course examinations and assignments. The degree of Master of Science will be conferred upon students who have completed the prescribed coursework with a cumulative grade-point average of 2.0 or above.
Careers of Systems Engineers

To lead in today’s rapidly-changing world, systems engineers need to have strong quantitative and interdisciplinary training. Our graduates work in a wide range of industries, such as telecommunications, entertainment, finance, fast moving consumer goods, healthcare, logistics, manufacturing, semiconductors, sports, travel, and transportation. They have pursued successful careers in entrepreneurship, consulting, investment banking, enterprise management, financial analysis, government policy analysis, industrial research, line management, product development, project management, strategic planning, and university teaching and research. Examples of employers of our graduates include:

- AIA Group
- Accenture
- Agricultural Bank of China
- Bank of China
- Bank of Communications
- Cathay Pacific Airways
- China Construction Bank
- China Mobile
- China Securities Index Co.
- DBS Bank
- Deloitte
- FedEx
- Hang Seng Bank
- Hong Kong Air Cargo Terminals
- Hong Kong Interbank Clearing
- Hong Kong International Terminals
- HSBC
- Huawei Technologies
- IBM
- Industrial and Commercial Bank of China
- ING
- J.P. Morgan
- Kerry Logistics
- KPMG
- MAERSK
- Merrill Lynch
- Modern Terminals
- Oracle
- Orient Overseas Container Line
- Pacific Alliance Group
- PCCW
- PricewaterhouseCoopers
- Society for Worldwide Interbank Financial Telecommunication (SWIFT)
- Shell
- Standard Chartered Bank
- Swire
- Tectura
- The Hong Kong Jockey Club
- The Hong Kong SAR Government
- Tibbett & Britten
- Wing Lung Bank
Placement and Internship Programme

To have the opportunity to apply the knowledge acquired from our programme, our students can consider joining the Placement and Internship Programme (PIP). Through the PIP, our students can become familiar with the real business world, as they can involve in day-to-day business operations.

By joining the PIP, our students can enhance their technical knowledge, as well as gain leadership and teamwork experiences. In order to become competent systems engineers, our students can learn about project management in the real world, where tight deadlines and quality deliverables are expected.

In some cases, students will be assigned to different departments inside a company to understand the collaborations among departments. These opportunities provide our future systems engineers with solid knowledge and exposure on how to design and manage a complex system in today's ever-changing environments.

Industry-type Final Year Projects

The careers of systems engineers are exciting and rewarding. They can help our society and businesses solve challenging problems and add value to existing operations. To prepare undergraduates to enter the business world, a final year project is required of each student. The topics of the projects are designed by professors, targeting problems in the daily operations of businesses, and students work in groups on a specific topic to gain collaboration experience.

At the same time, business leaders are invited to be project advisors, whose advice will stimulate our students to consider, as systems engineers, different perspectives in real-world situations, enhancing our students critical thinking ability, knowledge and skills. The project advisors include leaders from local and international corporations such as All Nippon Airways, Convoy Financial Services, Deloitte Touche Tohmatsu, ESRI, FTI Consulting, HSBC, IKEA, Mitsui O.S.K. Lines, Prudential Brokerage, Toshiba and UOB Kay Hian.
State-of-the-Art Laboratories

Our department is equipped with state-of-the-art-laboratories, where our students can engage in the use of leading technology to conduct quantitative analysis, test their hypothesis, discover new insights and formulate innovative methodologies. Our integrated technology platforms can deal with today's challenging requirements include big-data, mobile technologies, cloud computing and enterprise information exchange. Our department has the following laboratories to conduct data-intensive teaching and research.

- E-Services Laboratory
- Financial Engineering Laboratory
- Human-Computer Communications Laboratory
- Information Systems Laboratory (Key Laboratory of High Confidence Software Technologies)
- Knowledge Engineering Laboratory

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E-Services Laboratory

This laboratory supports research and teaching in E-Services technology. Through this laboratory, we aim to broaden and strengthen the service industry of Hong Kong and help transform the local service industry from the traditional labour-intensive paradigm to a sophisticated Internet-based electronic service paradigm. The laboratory is equipped with the state-of-the-art equipment to support both research and teaching. The latest PCs and enterprise servers are interconnected by a high-speed network. This provides an ideal environment to support sophisticated commercial systems and software. Our research focuses on decision methodology and information systems to improve service business operations. In one on-going project, we develop RFID-enabled sensing technologies for service operations. The project plans to develop a configurable RFID hardware platform, which cannot be found in any of the commercially available active RFID technologies to house various external sensor and utility modules based on different monitoring needs.

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Financial Engineering Laboratory

Hong Kong is a world financial centre. The development of its financial market is, therefore, a key factor to the success of the city. In the Financial Engineering Laboratory (FEL), theoretical as well as practical financial problems, such as portfolio selection, financial and behavioural risk assessment, asset liability management, stochastic control, pricing models and computational methods are investigated. In addition, data-driven analytical models are studied to extract critical information hidden in a huge amount of dynamically changing financial data. The FEL provides great opportunities for faculty and students to investigate various new financial issues.
Human-Computer Communications Laboratory

The Human-Computer Communications Laboratory (HCCL) was established in 1999. Our vision is to leverage the powerful confluence of massive of computing, communication and content to derive intelligence in a form that is amenable to effective access, visualization and utilization for humans. Our mission is to foster interdisciplinary research and education in human-centric information systems. The scope of our study includes how interactive and intelligent human-computer interfaces to information should be designed and realized, in order to enable users to accomplish their desired tasks in smart, effective and efficient ways.

Guided by our mission, HCCL supports research areas including but not limited to: speech recognition, spoken language understanding, speech generation and synthesis, conversational systems development, audio information processing, multimodal and multimedia interface development, multi-biometric authentication, intelligent agents, mobile computing and e-learning.

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Information Systems Laboratory (Key Laboratory of High Confidence Software Technologies)

This laboratory supports research and teaching in all aspects in information processing and management.

The scope includes effective information retrieval and management, efficient data organization and storage, automated knowledge discovery and machine learning, intelligent analysis and reasoning, as well as friendly access and timely delivery techniques. A major goal is to facilitate sophisticated decision making for enterprise operations and management. The laboratory also provides the state-of-the-art facilities offering excellent support for conducting cutting edge research and developing industrial-strength projects.

To achieve the goal, the laboratory investigates both basic and applied research issues including but not limited to: intelligent information retrieval, natural language processing (Chinese and English), data mining and text mining, knowledge discovery and automated reasoning, machine learning, multimedia information processing, and text mining for financial applications.

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Knowledge Engineering Laboratory

The Knowledge Engineering (KE) Lab has dedicated research in a number of research topics covering intelligent information systems in both software and hardware. These include:

3. Three-dimensional integrated circuits (3D-IC) for dynamic programming networks (in IEEE Circuits & Systems Magazine and Transactions, 2011)
Excellence in our department’s research is reflected through many publications in top journals and conferences in our fields of expertise. Our work has also been realized in applications and generated impact across different sectors. We also create knowledge for the industries to develop strategic new directions to enhance their competitiveness. Our faculty has been awarded many research grants and industry sponsorships to support our R&D programmes and our postgraduate students, including:

<table>
<thead>
<tr>
<th>Investigators</th>
<th>Grant</th>
<th>Project Title</th>
<th>Amount</th>
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<td>X. Cai</td>
<td>RGC - General Research Fund</td>
<td>Elective Surgery Planning and Scheduling with Inter-Hospital Cooperation</td>
<td>HK$836,450</td>
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<tr>
<td>X. Cai</td>
<td>RGC - General Research Fund</td>
<td>Dynamic Stochastic Scheduling with Uncertain Loss of Work Subject to Machine Breakdowns: A Unified Approach via Semi-Markov</td>
<td>HK$662,400</td>
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<td>X. Cai</td>
<td>Private Fund</td>
<td>Asian Institute of Supply Chains &amp; Logistics - Center for Logistics Technologies and Supply Chain Optimization</td>
<td>HK$520,000</td>
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<tr>
<td>X.Cai</td>
<td>D.D. Yao</td>
<td>Joint R&amp;D Center with Tsinghua University For Chinese Enterprise Internet Operations</td>
<td>HK$6,000,000</td>
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<tr>
<td>N. Chen</td>
<td>RGC - General Research Fund</td>
<td>A Computational Approach for Stochastic Dynamic Programming and its Applications in Financial Engineering</td>
<td>HK$717,000</td>
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<tr>
<td>N. Chen</td>
<td>RGC - General Research Fund</td>
<td>Studies on Financial Systemic Risk – A Network-Based Approach</td>
<td>HK$500,000</td>
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<tr>
<td>C.H. Cheng</td>
<td>CUHK Research Committee Funding (Direct Grants)</td>
<td>Critical Infrastructure Protection: A Stochastic Semidefinite Programming Approach</td>
<td>HK$60,492</td>
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<tr>
<td>C.H. Cheng</td>
<td>RGC - General Research Fund</td>
<td>Network epidemiology modeling of dynamic human behaviors for controlling hospital acquired diseases</td>
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<td>C.H. Cheng</td>
<td>Asian Institute of Supply Chains and Logistics</td>
<td>Image-based Drug Verification for Risk Management in Drug Dispensing Logistics</td>
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<td>C.H. Cheng</td>
<td>Asian Institute of Supply Chains and Logistics</td>
<td>Resources Management via Real-time RFID Tracking Data Analytics - A Case in the Healthcare Industry</td>
<td>HK$204,000</td>
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<td>On Efficient Top-K Nearest Keyword Search in Scale-free Networks</td>
<td>HK$61,550</td>
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<td>HK$603,000</td>
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<td>H. Cheng</td>
<td>Microsoft Research</td>
<td>Optimal Point of Interest Routing in a Urban Environment</td>
<td>HK$155,279</td>
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<td>Link Analysis in Big Signed Networks</td>
<td>HK$987,000</td>
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<td>X.T. Gong</td>
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<td>Dynamic Inventory Models with Limited Capital and Financing Capability: Optimal Policy and Heuristic Algorithms</td>
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<td>Entity Search from the Web via Exploiting Structural Organization of Text Content with Proximity-Based Model and Search Intent Extraction</td>
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<td>W. Lam</td>
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<td>Social-Aware News Trend Discovery via Joint Detection of Latent Information Structure from News and Social Media Text Content</td>
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<td>Incorporating Non-Local Interactions and Logical Inference into Sequence Classification Model for Practical Text Mining</td>
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<td>W. Lam</td>
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<td>Reader Interest-Aware News Summarization for Smart Phone Users</td>
<td>HK$838,500</td>
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<td>Mining Time-Aware Urban Living Styles via Latent Semantic Concept Analysis</td>
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<td>Dynamic Decision Making with the Objective in Meeting Profit Targets</td>
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<td>The Use of Phonologically-Motivated Distinctive Features for Computational Acoustic Characterization of Dysarthric Speech</td>
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<td>Acoustic-Phonetic Modeling of Non-native Speech with Discriminative Refinement for Segmental Mispronunciation Detection and Diagnosis in Computer-Aided Pronunciation Training</td>
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<td>H. Meng</td>
<td>Focused Investments Scheme</td>
<td>Future Development of the CUHK-MoE-Microsoft Key Laboratory on Human-centric Computing and Interface Technologies</td>
<td>HK$2,500,000</td>
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<td>H. Meng</td>
<td>ITF</td>
<td>The Author Once, Present Anywhere (AOPA) Software Platform</td>
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<td>H. Meng</td>
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<td>Developing a Speech Technologies Platform to Support Computer-Aided Pronunciation cross-speaker, cross-lingual text-to-speech synthesis based on spectral space warping</td>
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<td>Discriminative Acoustic and Visual Modeling for Segmental Mispronunciation Detection and Diagnosis in Computer-aided Pronunciation Training</td>
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<td>H. Meng</td>
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<td>Ministry of Education of China (MoE) Higher Education Outstanding Scientific Research Output Awards 2009</td>
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<td>Effective visualization of articulatory processes using visual speech synthesis technologies for corrective feedback generation in computer-aided pronunciation training for Chinese learners of English</td>
<td>HK$200,000</td>
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<td>Research Work in Spoken Language Technologies</td>
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<td>The Big Data Decision Analytics (BDDA) Research Center</td>
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<td>Error Bounds and Convergence Rate Analysis of First-Order Methods for Matrix Norm Regularization</td>
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<td>Non-Convex Optimization Approaches to Network Localization - Polynomial-Time Computability and Rigidity-Theoretic Implications</td>
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<td>Chance Constrained Conic Optimization with Polynomial Data Perturbations: Analytic Approximations and Efficient Algorithms</td>
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<td>K.F. Wong</td>
<td>北京大學</td>
<td>國家“核高基”科技專項課題測試委託項目</td>
<td>HK$595,200</td>
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<td>2008 Internet-based Robotics Inter School Competition</td>
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<td>CUHK Opinion Mining Platform</td>
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<td>Interest Rate Derivatives Modeling in the Post-Crisis Era</td>
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<td>Low-dimensional Modeling of Collateralized Term Structure with Non-Gaussian Dynamics for Centrally-cleared Interest Rate Swaptions</td>
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<td>Querying Graphs: Keywords, Patterns, and Subgraphs</td>
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<td>J. Yu</td>
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<td>Large Scale Graph Processing in Cloud</td>
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<td>Finding Information Nebula over Large Networks</td>
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<td>Patrick Huen Wing Ming Professorship of Systems Engineering and Engineering Management</td>
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<td>Donation</td>
<td>Department of SEEM Distinguished Lecture Series and Dr. Ina Chan Fellowship</td>
<td>HK$3,000,000</td>
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