Empower with Managerial Insights
Our Mission

The Department’s vision is to create and disseminate knowledge and technologies of systems engineering and engineering management for the ever-changing society.

Our goal is to develop novel analytic models and artificial intelligence techniques to derive managerial insights for optimal decision-making in complex environments.

To achieve the goal, the Department conducts innovative research with focus on Financial Engineering and FinTech, Information Systems, Logistics and Supply Chain Management, Operations Research, and Service Engineering.
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The Department of Systems Engineering and Engineering Management was established in the year 1991 (in the name of Department of Systems Engineering) as the first of its kind in tertiary educational institutions in Hong Kong. In August the same year, the Department was one of the 4 founding departments of the newly established Faculty of Engineering. In the past three decades, the Department not only has made itself become a regional and internationally renowned academic programme, but also has contributed significantly to the growth of the Faculty, by its vigorous pursuit in teaching, research and service.

The Department offers two undergraduate programmes. The Bachelor of Engineering in Systems Engineering and Engineering Management is currently organized around four focal areas: Business Information Systems; Financial Engineering; Logistics and Supply Chain Management; and Service Engineering and Management. The Bachelor of Engineering in Financial Technology was newly launched in 2017 to meet foreseeable strong demands for FinTech professionals in the coming decades. At the graduate level, the Department offers research-based programmes leading to Master of Philosophy (M.Phil) and Doctor of Philosophy (Ph.D). The Department also offers two course-based programmes leading to the degree of Master of Science (M.Sc.). The first taught master programme, MSc programme in Systems Engineering and Engineering Management, launched in 1996. In 1998, the Faculty started to offer MSc programme in E-Commerce (Technologies) which was administrated by the SEEM Department. The programme (renamed to MSc in E-Commerce and Logistics Technologies in 2006) is now affiliated with the Department since 2008.
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
Accolades

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
- ACM Transactions on Database Systems
- Computer Speech and Language
- Computers & Operations Research
- Data Science and Engineering (DSE) Journal
- 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
- Omega - International Journal of Management Science
- Operations Research
- Optimization Methods and Software
- Quantitative Finance
- Reliability Engineering and System Safety
- SIAM Journal on Control and Optimization
- SIAM Journal on Financial Mathematics
- SIAM Journal on Optimization
- 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.
- Best Oral Paper Award in the Asia-Pacific Signal and Information Processing Association Annual Summit and Conference 2010
- Best Paper of the 15th International Conference on Database Systems for Advanced Applications (DASFAA'10) 2010
- Best Paper of the 21st Australasian Database Conference (ADC'10) 2010
- Best Paper Award in the 26th Australasian Database Conference (ADC’15) 2015
- Best Paper award of the 32nd IEEE International Conference on Data Engineering 2016
- CUHK Research Excellence Award 2016-17
- Distinguished Project Award of China Innovation and Entrepreneurship Fair 2016
- Elected Distinguished Lecturer of the International Speech Communication Association (ISCA)
- Elected Fellow of the Chartered Institute of Logistics and Transport (2014)
- Elected Fellow of the International Speech Communication Association (2016)
- Elected Member of IEEE Board of Governors
- Elected Member of IEEE Speech and Language Processing Technical Committee
- Fellow of HKIE
- Fellow of IEEE
- Humboldt Distinguished Lecture 2013
- IBM Faculty Award 2016
- IEEE Communications Society Asia-Pacific Outstanding Paper Award 2014
- IEEE Signal Processing Society Best Paper Award 2018
- Inaugural Distinguished Lecturer of APSIPA (Asia-Pacific Signal and Information Processing Association) 2012-2014
- INFORMS Optimization Society Young Researcher Prize 2010
- Invited Speaker of Okawa Prize 2012 Commemorative Symposium
- Microsoft Research Outstanding Collaborator Award 2016
- Outstanding Fellow of the Faculty of Engineering 2015 for five years
- Outstanding ICT Women Professional Award of the Hong Kong Computer Society 2015
- Overview Speaker of IEEE Workshop on Multimedia Signal Processing 2011
- Plenary Speaker of CoGInfoComm 2013
- Shenzhen Municipal Government "Peng Cheng" Visiting Professorship 2010 - Present
Our faculty members have been active in serving professional and societal roles that are related to their expertise:

- Mentor, ESF Science Fair, 2019, New York, US
- Member, Board of Directors, Applied Science & Technology Research Institute (ASTRI)
- Member, Distance Business Programme Vetting Committee
- Academic Committee, The Chinese National Research Center of Mathematics and Cross-Disciplinary Science, Department of Finance and Economics
- 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
- Honorable Advisor, IBM Collaborative Innovation Program
- IEEE Speech and Language Technical Committee
- Joint Committee on Information Technology for the Social Welfare Sector, appointed by the Director of Social Welfare
- Judging Panel Member, nominations to the State Scientific and Technological Progress Awards (SSTPA) and State Technological Invention Awards (STIA), The Hong Kong SAR Government
- Keynote Speaker of the International Symposium on Scheduling (2013), Tokyo, Japan
- Member of Advisory Board, Cyber Security Lab, Applied Science & Technology Research Institute (ASTRI)
- Member of the Innovation and Technology Fund Research Projects Assessment Panel, The Hong Kong SAR Government
- Member of Technology Review Board, ASTRI
- 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 Steering Committee in 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
- 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 Student Paper Competition at the 2018 INFORMS Annual Meeting
- Championship in B4B Challenge 2018 student stream
- Championship of openlab x FinTecubator Innovation Challenge 2019
- Gold Award in the 46th International Exhibition of Inventions of Geneva in 2018
- 1st Runner-up The HSBC Financial Innovation Case Study Competition 2019
- Best Paper Award in the IEEE International Conference on Multimedia and Expo 2016
- Best Student Paper Award in the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2019
- Best Student Paper Award in the 19th IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC) 2018
- Challenge Cup Prizes, over three years
- Championship of the case study competition in the 12th CILTHK Student Day
- Championship of the case study competition in the 13th CILTHK Student Day
- Championship of the case study competition in the 22th CILTHK Student Day
- First Runner-Up Award at 2016 HKSQ Company Based Student Project Competition
- Global Scholarship Programme for Research Excellence - CNOOC Grants 2012
- Honorable mention at the Best Student Paper Competition at the Seventh POMS-HK International Conference
- Microsoft Research Asia Fellowship, multiple years
- MSR Best Student Paper Award in the Fourth China Computer Federation (CCF) Conference on Natural Language Processing & Chinese Computing (NLPCC2015) 2015
- Outstanding Team Award in the BEA 100 Fintech Challenge 2019
- Second-Place Prize of Student Paper Competition at the 3rd Asia Quantitative Finance Conference 2015
- Second-Place Prize of Best Student Paper Competition at the 6th POMS-HK International Conference 2015
- 第四屆中國運籌學會數學規劃分會研究生論壇 優秀成果獎 2018
- 兩岸四地大學生創業計劃大賽二等獎 2012
- 實時真錢港股投資比賽冠軍 2012
- 期望杯高校期貨論文大獎賽一等獎 2011
- 2nd Runner-up HKIE Manufacturing and Industrial Division Student Project Competition 2013-2014
- 2nd Runner-up HKIE Manufacturing and Industrial Division Student Project Competition 2014-2015
WORLD-CLASS
Faculty Members
Dr. Jeffrey Xu Yu is a Professor and the Chairman of the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong. His current main research interests include keyword search in relational databases, graph mining, graph query processing, and graph pattern matching. Dr. Yu served in over 300 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, ICDM’12, NDBC’13, ADMA’14, CikM’15 and Bigcomp’17, DSAA’19 and CikM’19, and the conference general co-chair of APWeb’13 and ICDM’18. 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), and the chair of the steering committee in Asia Pacific Web Conference (2013-2016). Currently, he serves as associate editor in ACM Transactions on Database Systems (TODS), WWW Journal, Data Science and Engineering, the International Journal of Cooperative Information Systems, the Journal on Health Information Science and Systems (HISS), and Journal of Information Processing. Jeffrey Xu Yu is a member of ACM, a senior member of IEEE, and a member of IEEE Computer Society.

Selected Publications


Rong-Hua Li, Lu Qin, Fanghua Ye, Jeffrey Xu Yu, Xiaokui Xiao, Nong Xiao, and Zibin Zheng: “Skyline Community Search in Multi-valued Networks”, in Proceedings of the 2018 ACM SIGMOD International Conference on Management of Data (SIGMOD’18), 2018.


Hao Wei, Jeffrey Xu Yu, Can Lu, and Xuemin Lin: “Speedup Graph Processing by Graph Ordering”, in Proceedings of the 2016 ACM SIGMOD International Conference on Management of Data (SIGMOD’16), 2016.

Jiao Su, Qing Zhu, Hao Wei, and Jeffrey Xu Yu: “Reachability Querying: Can it Be Even Faster”, Vol. 29, No. 3, IEEE Transactions on Knowledge and Data Engineering, 2016.


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.
Dohyun Ahn received a B.S. degree with a double major in Industrial & Systems Engineering and Management Science in 2011 and his M.S. and Ph.D. degrees in Industrial & Systems Engineering in 2013 and 2018, all from KAIST. His methodological background lies in applied probability, optimization, and stochastic simulation, whereas his application area includes, but is not limited to, financial engineering, risk management, and network analysis.

He received the ISE Best Thesis Award from KAIST, placed second at the 2015 INFORMS Section on Finance Best Student Paper Competition, and won the 2015 KORMS Best Paper Award. The paper “Analysis and Design of Microfinance Services: A Case of ROSCA” was highlighted in the December 2017 issue of ISE magazine published by the IISE. The paper “Shock Amplification in Financial Networks with Applications to the CCP feasibility” was selected as a Feature Article of Quantitative Finance.


• Selected as a Feature Article of the journal


• KORMS Best Paper Award, 2015
• 2nd Place, Best Student Paper Competition, INFORMS Section on Finance, 2015

• Highlighted in ISE magazine (December 2018) published by IISE

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 has also been appointed, concurrently, Associate Vice President and Presidential Chair Professor of The Chinese University of Hong Kong, Shenzhen. He is an Academician of the International Academy for Systems and Cybernetic Sciences, and a Fellow of Hong Kong Institute of Engineers.

Selected Publications


Prior to joining CUHK as Professor of Practice in FinTech starting September 2018, Prof. Chun Kwong CHAN has been the Chief Information Officer, Retail Banking & Wealth Management, Asia Pacific at HSBC since 2015. From 2012-2015, Professor Chan was the Global Head of Digital Mobile & Channels Engineering at HSBC, having led the direction and engineering of banking applications in implementing the Digital Strategy for HSBC globally. He joined HSBC in Vancouver, Canada in 1990 to help start up the Group Development Centre for HSBC, and moved back to Hong Kong in 2007 to take up key IT management positions at HSBC Asia Pacific.

Besides working in financial technology in the last 28 years, Professor Chan started his career in Hong Kong as an engineer with Fairchild Semiconductor Ltd in 1975, and as an IT professional with Hong Kong Telephone, Hong Kong Telecom, and Computasia. During 1988-1990, Professor Chan took up a sabbatical to lecture on Management Information System at the then City Polytechnics of Hong Kong (now City University of Hong Kong).

Professor Chan has won numerous innovation awards by IDC, Asian Bankers, etc. and currently serves on the Innovation and Technology Fund Research Projects Assessment Panel, Hong Kong SAR Government and the Board of Applied Science and Technology Research Institute (ASTRI).

Professor Chan obtained his Bachelor of Science Engineering degree from University of Hong Kong, Master of Business Administration from Chinese University of Hong Kong, and Doctor of Business Administration from City University of Hong Kong.

Selected Publications


Professional Contributions

Member, Board of Directors, Applied Science & Technology Research Institute (ASTRI)

Member, Distance Business Programme Vetting Committee

Member, Innovation and Technology Fund Research Projects Assessment Panel (Information Technology Subgroup), Hong Kong SAR Government

Judging panel member - nominations to the State Scientific and Technological Progress Awards (SSTPA) and State Technological Invention Awards (STIA), Hong Kong SAR Government

Member of Technology Review Board, Applied Science & Technology Research Institute (ASTRI)

Member of Advisory Board, Cyber Security Lab, Applied Science & Technology Research Institute (ASTRI)

Honorable Advisor, IBM Collaborative Innovation Program
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. He served as associate editor for Operations Research Letters from 2007-2008. He is now an associate editor of International Review of Finance, Digital Finance and has chaired/been a member of the program committees of several international conferences on quantitative finance and Monte Carlo simulation.

Prof. Chen now serves as director of the Bachelor of Engineering Program in Financial Technology at CUHK. The program is the first of its kind in Hong Kong to offer comprehensive undergraduate education in FinTech. He is also director of Master of Science Program in Financial Engineering at CUHK Shenzhen.

Awards and Grants

- Best Student Research Paper Award (Second Place), Financial Services Section, INFORMS, 2006.
- GRF: Computational Methods for Option Pricing under Stochastic Volatility Jump Diffusion Models, 2009-2011, HK$716,000.
- Exemplary Teaching Award, Faculty of Engineering, The Chinese University of Hong Kong, 2009.
- GRF: Financial Systemic Risk, 2014-2016, HK$500,000 (Co-Pi: David D. Yao, Columbia University)

- GRF: Simulation from Characteristic Functions, 2016-2018, HK$744,000.
- GRF: Dynamic Portfolio Selection and Option Pricing with Market Frictions, 2018-2021, HK$7632,421.

Awards Received by His Students

- Xin Liu, Finalist (top 5), Best Student Research Paper Competition, Section of Financial Service, INFORMS, 2015.
- 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.

Selected Publications


Awards Received by His Students

- Xin Liu, Finalist (top 5), Best Student Research Paper Competition, Section of Financial Service, INFORMS, 2015.


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


Jia Li, Zhichao Han, Hong Cheng, Jiao Su, Pengyuan Wang, Jianfeng Zhang, Lujia Pan. "Predicting Path Failure in Time-Evolving Graphs", Proceedings of the 25th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 19), Anchorage, AK, USA, August 2019.


Jia Li, Yu Rong, Helen Meng, Zhihui Lu, Timothy Kwok and Hong Cheng. "TATC: Predicting Alzheimer’s Disease with Actigraphy Data", Proceedings of the 24th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 18), London, United Kingdom, August 2018.


Yu Rong, Hong Cheng and Zhiyu Mo. "Why It Happened: Identifying and Modeling the Reasons of the Happening of Social Events", Proceedings of the 21st ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 15), Sydney, Australia, August 2015.


Xin Huang, Hong Cheng, Lu Qin, Wentao Tian, and Jeffrey Xu Yu. "Querying K-Truss Community in Large and Dynamic Graphs", Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data (SIGMOD 14), Snowbird, Utah, June 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.


Xuedong He received the B.Sc. degree in Mathematics and Applied Mathematics from Peking University in 2005 and the Ph.D. degree in Mathematical Finance from the University of Oxford in 2009. He was an assistant professor at Columbia University in 2009 - 2015 and joined the Chinese University of Hong Kong as an associate professor in 2016.

Xuedong He’s research interests include portfolio selection and asset pricing in behavioral finance and economics, risk management, and financial technology. He has published papers in leading journals such as Management Science, Operations Research, Mathematical Finance, and Mathematics of Operations Research. He is serving as Associate Editor for Operations Research and Digital Finance. He also organized clusters and sessions in international conferences such as the INFORMS Annual Meetings and the SIAM Financial Mathematics and Engineering Conference.

Selected Publications

Lam Wai received a Ph.D. in Computer Science from the University of Waterloo. He obtained his B.Sc. and M.Phil. degrees from The Chinese University of Hong Kong. After completing his Ph.D. degree, he conducted research at Indiana University Purdue University Indianapolis (IUPUI) and the University of Iowa. He joined The Chinese University of Hong Kong, where he is currently a professor.

His research interests include intelligent information retrieval, text mining, digital library, machine learning, and knowledge-based systems. He has published articles in IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Information Systems, etc.

His research projects have been funded by the Hong Kong SAR Government General Research Fund (GRF) and DARPA (USA). He also managed industrial projects funded by Innovation and Technology Fund (industrial grant) and IT companies.

Cai, D. and Lam, W., “AMR Parsing via Graph <-> Sequence Iterative Inference”, Annual Meeting of the Association for Computational Linguistics (ACL), 2020.


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 finance and computational finance. He worked as a quant in the commodity strategies group at Morgan Stanley in the summer of 2009.

**Selected Publications**


Xunying Liu received his PhD degree in speech recognition and MPhil degree in computer speech and language processing both from University of Cambridge, after his undergraduate study at Shanghai Jiao Tong University. He was a Senior Research Associate at the Machine Intelligence Laboratory of the Cambridge University Engineering Department, prior to joining the Department of Systems Engineering and Engineering Management, Chinese University of Hong Kong, as an Associate Professor in 2016. He was the recipient of best paper award at ISCA Interspeech2010 for his paper titled “Language Model Cross Adaptation For LVCSR System Combination”. He is a co-author of the widely used HTK toolkit and has continued to contribute to its current development in deep neural network based acoustic and language modelling. His research outputs led to several large scale speech recognition systems that were top ranked in a series of international research evaluations. These include the Cambridge Mandarin Chinese broadcast and conversational telephone speech recognition systems developed for the US government sponsored speech translation evaluations from 2006 to 2011, and the Cambridge 2015 multi-genre broadcast speech transcription system. His current research interests include machine learning, large vocabulary continuous speech recognition, statistical language modelling, noise robust speech recognition, speech synthesis, speech and language processing. He is a regular reviewer for journals including IEEE/ACM Transactions on Audio, Speech and Language Processing, Computer Speech and Language, Speech Communication, the Journal of the Acoustical Society of America Express Letters, Language Resources and Evaluation, and Natural Language Engineering. He has served as a member of the scientific committee and session chair for conferences including IEEE ICASSP and ISCA Interspeech. Dr. Xunying Liu is a member of IEEE and ISCA.
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


Helen Meng is Patrick Huen Wing Ming Professor of Systems Engineering & Engineering Management at The Chinese University of Hong Kong. She received all her degrees from MIT and joined CUHK in 1998. She is the Founding Director of the Microsoft-CUHK Joint Laboratory for Human-Centric Computing and Interface Technologies in 2003, which has been recognized as a Ministry of Education of China (MoE) Key Laboratory since 2008. In 2006, she founded the Tsinghua-CUHK Joint Research Centre for Media Sciences, Technologies and Systems and has served as its Director. In 2013, she helped establish the CUHK Stanley Ho Big Data Decision Analytics Research Center and serves as its Founding Director. She served as former Associate Dean (Research) of Engineering (2006-2010), and former Chairman of the Department (2012-2018).

Helen's professional services include former Editor-in-Chief of the IEEE Transactions on Audio, Speech and Language Processing, and a member of the IEEE Board of Governors. She has served or is serving as a member of the Advisory Panel of the Hong Kong Science and Technology Park Corporation, the review panels of the Swedish Research Council European Research Infrastructure Initiative, and the National Centres of Competence in Research of the Swiss National Science Foundation. She is a member of the HKSAR Government's Steering Committee on eHealth Record Sharing, Convener of the Engineering Panel HKSAR Government’s Competitive Research Funding Schemes for the Self-financing Degree Sector, member of the Hong Kong/Guangdong ICT Expert Committee and Coordinator of the Working Group on Big Data Research and Applications, Council membership of the Open University of Hong Kong, member of the Research Grants Council, former Council Member of the Hong Kong Productivity Council, former member of the HKSAR Government’s Digital 21 Strategy Advisory Committee, and Chairlady of the Working Party of the Manpower Survey of the Information Technology Sector (undertaken by the Hong Kong Census and Statistics Department) for 2014-2017.

Helen is a recognized scholar in her field. She leads the interdisciplinary research team that received the first Theme-based Research Scheme Project in Artificial Intelligence in 2019. Her recent awards include 2019 IEEE Signal Processing Society Leo L Beranek Mentornous Service Award, 2018CogInfoComm Best Paper Award, 2017 Outstanding Women Professional Award (one of 20 since 1999). 2016 Microsoft Research Outstanding Collaborator Award (one of 52 academics worldwide), 2016 IBM Faculty Award, 2016 IEEE ICME Best Paper Award, 2015 ISCA Distinguished Lecturer, 2015 HKCS inaugural Outstanding ICT Women Professional Award and 2012 Asia-Pacific Signal and Information Processing Association (APSIPA) inaugural Distinguished Lecturer. Prior to that, she has also received such awards as the CUHK Faculty of Engineering Exemplary Teaching Award, Young Researcher Award and Service Award; APSIPA Best Oral Paper Award, and 2009 Ministry of Education Higher Education Outstanding Scientific Research Output Award in Technological Advancements. She has delivered numerous invited and keynote talks, such as IEEE SISAS 2016, ASTRI-HPE Conference 2016, Internet Economy Summit 2017, GMIC 2017, INTERSPEECH 2018 Plenary, SIGDIAL 2019 Keynote, etc. She is a Fellow of the Hong Kong Computer Society, Hong Kong Institution of Engineers, International Speech Communication Association and IEEE.

Selected Publications


Anthony Man-Cho So received his BSE degree in Computer Science from Princeton University 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 and his PhD degree in Computer Science with a PhD minor in Mathematics from Stanford University. Dr. So joined The Chinese University of Hong Kong (CUHK) in 2007. He currently serves as Associate Dean of Student Affairs in the Faculty of Engineering, Deputy Master of Morningside College, and Professor in the Department of Systems Engineering and Engineering Management. His research focuses on optimization theory and its applications in various areas of science and engineering, including computational geometry, machine learning, signal processing, and statistics.

Dr. So is appointed as an Outstanding Fellow of the Faculty of Engineering at CUHK in 2019. He currently serves on the editorial boards of Journal of Global Optimization, Optimization Methods and Software, and SIAM Journal on Optimization. He has also served on the editorial boards of IEEE Transactions on Signal Processing (2012-2016) and Mathematics of Operations Research (2012-2015). Dr. So has received a number of research and teaching awards, including the 2018 IEEE Signal Processing Society Best Paper Award, the 2016-17 CUHK Research Excellence Award, the 2015 IEEE Signal Processing Society Signal Processing Magazine Best Paper Award, the 2014 IEEE Communications Society Asia-Pacific Outstanding Paper Award, the 2010 Institute for Operations Research and the Management Sciences (INFORMS) Optimization Society Optimization Prize for Young Researchers, and the 2010 CUHK Young Researcher Award, as well as the 2013 CUHK Vice-Chancellor’s Exemplary Teaching Award, the 2011, 2013, 2015 CUHK Faculty of Engineering Dean’s Exemplary Teaching Award, and the 2008 CUHK Faculty of Engineering Exemplary Teaching Award. He also co-authored with his student a paper that receives the Best Student Paper Award at the 19th IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC 2018).

Selected Publications


Hoi-To Wai received his PhD degree from Arizona State University (ASU) in Electrical Engineering in Fall 2017, B. Eng. (with First Class Honor) and M. Phil. degrees in Electronic Engineering from The Chinese University of Hong Kong (CUHK) in 2010 and 2012, respectively. He is currently an Assistant Professor in the Department of Systems Engineering and Engineering Management at CUHK. Previously he has held research positions at ASU (USA), UC Davis (USA), Telecom ParisTech (France), Ecole Polytechnique (France), and LIDS, MIT (USA).

His research interests are in the broad area of optimization algorithms, network science, machine learning and signal processing. He has received a Best Student Paper Award from ICASSP 2018, and the 2017’s Dean’s Dissertation Award from the Ira A. Fulton Schools of Engineering of ASU for his thesis on network science and distributed optimization.

Selected Publications


Sibo Wang is an Assistant Professor in the Department of Systems Engineering and Engineering Management, Faculty of Engineering (since Dec 2018). He received his B.E. in Software Engineering in 2011 from Fudan University and his Ph.D. in Computer Science in 2016 from Nanyang Technological University. His main research area is database and data mining. He is currently interested in graph data management, big data analysis, especially social network analysis, and efficient algorithms with indexing and approximation.

Selected Publications


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 (CJE), CUHK. He serves as the President of Asian Federation of Natural Language Processing (AFNLP 2015-2016), President of the Governing Board of Chinese Language Computer Society CLCS (2015-2017). Also, he was the President of Hong Kong Information Technology Joint Council (2007-2014) and the Vice President of VLDB School China (2005-2013).

His research interest focuses on Chinese computing, databases and information retrieval. He has published over 250 technical papers in these areas in different international journals and conferences and books. He is a member of the ACM, Senior Member of IEEE as well as Fellow of BCS (UK), IET (UK) and HKIE. He is the founding Editor-in-Chief of ACM Transactions on Asian Language Processing (TALIP), and serves as associate editor of International Journal on Computational Linguistics and Chinese Language Processing. He was the Conference Co-Chair of NDBC2016 (Shenzhen), BigComp2016 (Hong Kong), NLPC2015 (Nanchang) and IJCNLP2011 (Thailand), the Finance Chair SIGMOD2007 (Beijing); the PC Cochair of IJCNLP2006 (Jeju, Korea), and the Local Organization Chair of EMNLP-IJCNLP’2019 (Hong Kong). Also, he is the General Chair of the AACL-IJCNLP’2020 (Suzhou). Also he is a Programme Committee member of many international conferences. He was awarded by the HKSAR Government Medal of Honour (MH) for his contribution to information technology development in Hong Kong in 2011, by the Shenzhen Innovation technology Council “Virtual University Campus Outstanding Project Investigator Honor Certificate” and by the Hong Kong Scout Association, the Medal of Long Services in 2013.

BOOK

JOURNAL PAPERS (2018-2019)


CONFERENCE PAPERS (2018-2109)
Tengjiao Wang, Binyang Li, Wei Chen, Yuxiao Zhang, Ying Han, Jinhong Niu, Kam-Fai Wong: An Environment-Aware Market Strategy for Data Allocation and Dynamic Migration in Cloud Database. ICDE 2019: 2022-2035

Jing Ma, Wei Gao, Kam-Fai Wong: Detect Rumors on Twitter by Promoting Information Campaigns with Generative Adversarial Learning. WWW 2019: 3049-3055


Zhongyu Wei, Qianlong Liu, BaoLin Peng, Huixiao Tou, Ting Chen, Xuanjing Huang, Kam-Fai Wong, Xiangying Dai: Task-oriented Dialogue System for Automatic Diagnosis. ACL (2) 2018: 201-207

Jing Ma, Wei Gao, Kam-Fai Wong: Rumor Detection on Twitter with Tree-structured Recursive Neural Networks. ACL (1) 2018: 1980-1989


Binyang Li, Jun Xiang, Le Chen, Xu Han, Xiaoyan Yu, Ruifeng Xu, Tengjiao Wang, Kam-Fai Wong: The UIR Uncertainty Corpus for Chinese: Annotating Chinese Microblog Corpus for Uncertainty Identification from Social Media. LREC 2018

Xingshan Zeng, Jing Li, Lu Wang, Nicholas Beauchamp, Sarah Shugars, Kam-Fai Wong: Microblog Conversation Recommendation via Joint Modeling of Topics and Discourse. NAACL-HLT 2018: 375-385

Chuang Fan, Qinghong Gao, Jiachen Du, Lin Gui, Ruifeng Xu, Kam-Fai Wong: Convolution-based Memory Network for Aspect-based Sentiment Analysis. SIGIR 2018: 1161-1164

Jing Ma, Wei Gao, Kam-Fai Wong: Detect Rumor and Stance Jointly by Neural Multi-task Learning. WWW (Companion Volume) 2018: 585-593

Selected Publications
Keith Wong has years of working experience in multinational financial institutions. For more than four years in HSBC, Keith’s working responsibilities included quantitative analysis and independent price verification on interest rate derivatives in product control function and reviewing models in global markets model review function. Prior to that Keith also worked in different areas in the finance industry, including treasury asset and liability management in Hong Kong Exchange and Clearing Limited and actuarial analysis in AIG.

Keith graduated in CUHK, where he obtained his BSc (Math), PDGE (Math), MPhil (SEEM) and PhD (SEEM).

Selected Publications


XU, Huifu
徐慧福

Professor
BSc, MSc (Nanjing)
PhD (Ballarat)

Research Interests
> Robust optimization
> Risk analytics
> Stochastic programming
> Data-driven optimization
> Optimization in energy and finance

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Huifu Xu is a Professor of the Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong. Prior to joining CUHK, he was a professor of Operational Research in the School of Mathematical Sciences, University of Southampton and the Director of the Centre of Operational Research, Management Science and Information Technology (2016-2018), one of the largest research centres in the areas of OR, MS and IT. Huifu Xu obtained BSc in computational mathematics and MSc in numerical optimization from Nanjing University in 1980s and PhD from University of Ballarat (Federation University Australia) in 1999. He was a lecturer of Ningbo University from 1989 to 1996 and a postdoctoral research fellow in the Australian Graduate of Management from 1999 to 2002. From 2002, he moved to work in the UK as a lecturer, senior lecturer and professor of operational research in the University of Southampton and City University London (2013-2015).

Huifu Xu’s current research is on optimal decision making under uncertainty such as preference robust optimization and distributionally robust optimization which are associated with ambiguity in decision maker’s utility preference or risk attitude and distribution of exogenous uncertainty data. His focus is on developing robust models and computational methods for these problems and applying them in finance, engineering and management sciences. He has published more than 70 papers in the international journals of operational research and optimization including Mathematical Programming, SIAM Journal on Optimization, Mathematics of Operations Research and Operations Research. Huifu Xu is an associate editor of Computational Management Science and a member of Mathematical Optimization Society.

Selected Publications


Chen Yang received a B.Sc. degree in Mathematics and Applied Mathematics from Zhejiang University in 2008, and his Ph.D. degree in Financial Mathematics from National University of Singapore in 2017. Prior to joining the Chinese University of Hong Kong, he was a postdoctoral researcher at ETH Zurich from 2017 to 2019.

Chen Yang’s research interests include optimal investment with market frictions, financial technology, mathematical finance, and market microstructure. One of his papers was published in the leading journal The Review of Financial Studies.

Yizhou Cao, Min Dai, Steven Kou, Lewei Li and Chen Yang, “Designing Stable Coins”, submitted for publication.


Sin C. Ho received her PhD degree from the Department of Informatics, University of Bergen in Norway. Her research is within the development of mathematical models and solution algorithms for decision problems in the areas of transportation and logistics. Before joining CUHK, she has held a faculty position at Aarhus University in Denmark for several years.

Selected Publications


NG, Chi-Kong (Kevin) obtained his B.Sc., M.Sc., and M.Phil. degrees from the Hong Kong Baptist University. He received his Ph.D. degree in Systems Engineering and Engineering Management in 2003 from The Chinese University of Hong Kong (CUHK), and is currently a senior lecturer there. His Ph.D. Dissertation, entitled “High Performance Continuous/Discrete Global Optimization Methods,” has been awarded the CUHK Young Scholars Dissertation Awards 2003 by CUHK and the Outstanding Ph.D. Thesis Award 2003 by the Faculty of Engineering, CUHK.

Kevin’s research interests include theoretical, computational, and practical aspects of global optimization, nonlinear integer programming, discrete time optimal control, inventory control and supply chain management. He has published articles in SIAM Journal on Optimization, Computers & Operations Research, Journal of Global Optimization, Computational Optimization and Applications, etc. He is a member of IEEE, INFORMS, POP, and SIAM.


Shu-Cherng Fang holds the Walter Clark Chair and Alumni Distinguished Graduate Professorship in 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 Bell 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 and Systems Engineers in 2002 and Fellow of the Chinese Institute of Industrial Engineers in 2015. The most recent honor he received is the 2019 Siwei Cheng Award in Quantitative Management in Granada, Spain.

Selected Publications


Dr. Hsiao-Wuen Hon is Corporate Vice President of Microsoft, Chairman of Microsoft’s Asia-Pacific R&D Group, and Managing Director of Microsoft Research Asia. He drives Microsoft’s strategy for research and development activities in the Asia-Pacific region, as well as collaborations with academia.

Dr. Hon has been with Microsoft since 1995. He joined Microsoft Research Asia in 2004 as a Deputy Managing Director, stepping into the role of Managing Director in 2007. Under Hon’s leadership, Microsoft Research Asia has grown into a world-class research lab. Microsoft Research Asia has had influence not only within Microsoft but also on the broader community. Besides winning many paper awards from top conferences (e.g. ACM & IEEE) and academic/industrial competitions (e.g. ImageNet, SQuAD, WMT), technologies from the lab have been adopted by international standards bodies such as MPEG4, IETF, and ITU/ISO. MIT Technology Review named Microsoft Research Asia “the hottest computer lab in the world”.

Dr. Hon also founded and managed Microsoft Search Technology Center from 2005 to 2007 and led development of Microsoft’s search products (Bing) in Asia-Pacific. In 2014, Dr. Hon was appointed as chairman of Microsoft Asia-Pacific R&D Group.

Prior to joining Microsoft Research Asia, Dr. Hon was the founding member and architect of the 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 VLSI! 2004 Editors’ Choice Award), Natural User Interface Platform and Microsoft Assistance Platform, he was 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 SAPI and speech engine technologies. He previously worked at Apple, where he led research and development for Apple’s Chinese Dictation Kit.

An IEEE Fellow and a Distinguished Scientist of Microsoft, Dr. Hon is an internationally recognized expert in speech technology. Dr. Hon has published more than 120 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 used in universities around the world. Dr. Hon holds three dozens patents in several technical areas.

Dr. Hon received a Ph.D. in Computer Science from Carnegie Mellon University and a B.S. in Electrical Engineering from National Taiwan University.

Selected Publications


Y. Cao, J. Xu, T.Y. Liu, H. Li, Y. Huang, H.W. Hon, "Adapting ranking SVM to document retrieval", 29th annual international ACM SIGIR-2006 conference, Seattle, WA.
Selected Publications

Yujia Xiao, Lei He, Huaping Ming, Frank Soong, “Improving Prosody with Linguistic and Bert Derived Features in Multi-speaker Based Mandarin Chinese Neural TTS,” ICASSP 2020
Haohan Guo, Frank Soong, Lei He, Lei Xie, “Exploiting Syntactic Features in a Parsed Tree to Improve End-to-End TTS,” Interspeech 2019
Haohan Guo, Frank Soong, Lei He, Lei Xie, “A New GAN-based End-to-End TTS Training Algorithm,” Interspeech 2019
Yibin Zheng, Xi Wang, Lei He, Shifeng Fan, Frank K Soong, Zhengai Wen and Jianhua Tao, “Forward-Backward Decoding for Regularizing End-to-End TTS,” Interspeech 2019
Shaoguang Mao, Zhiyong Wu, Jinhuaui Jiang, Pelyiu Liu, Frank Soong, “NN-Based Ordinal Regression for Assessing Fluency of ESL Speech,” ICASSP 2019
Yang Cui, Xi Wang, Lei He, Frank K. Soong, “A New Glottal Neural Vocoder for Speech Synthesis,” Interspeech 2018
Yujia Xiao, Frank K. Soong, Wenping Hu, “Paired Phone Posteriors Approach to ESL Pronunciation Quality Assessment,” Interspeech 2018
Liping Chen, Yong Zhao, Shi-Xiong Zhang, Jie Li, Guoli Ye, Frank Soong, “Exploring Sequential Characteristics in Speaker Bottleneck Feature for Text-Dependent Speaker Verification,” ICASSP 2018
Yujia Xiao, Frank K. Soong, “Proficiency Assessment of ESL Learner’s Sentence Prosody with TTS Synthesized Voice as Reference,” Interspeech 2017
Jinghua Zhong, Wenping Hu, Frank Soong, Helen Meng, “DNN i-vector Speaker Verification with Short, Text-Constrained Test Utterances,” Interspeech 2017
Yuchen Fan, Yao Qian, Frank K. Soong, Lei He, “Speaker and Language Factorization in DNN-based TTS Synthesis,” ICASSP-2016

Frank Soong is a Senior Principal Researcher in the Speech Group, Microsoft Research Asia, Beijing, China. 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 NTI 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.

Adjunct Professor
BS (National Taiwan University)
MS (The University of Rhode Island)
PhD (Stanford University)

Research Interests
> Speech and Language Processing

Selected Publications

Yujia Xiao, Lei He, Huaping Ming, Frank Soong, “Improving Prosody with Linguistic and Bert Derived Features in Multi-speaker Based Mandarin Chinese Neural TTS,” ICASSP 2020
Haohan Guo, Frank Soong, Lei He, Lei Xie, “Exploiting Syntactic Features in a Parsed Tree to Improve End-to-End TTS,” Interspeech 2019
Haohan Guo, Frank Soong, Lei He, Lei Xie, “A New GAN-based End-to-End TTS Training Algorithm,” Interspeech 2019
Yibin Zheng, Xi Wang, Lei He, Shifeng Fan, Frank K Soong, Zhengai Wen and Jianhua Tao, “Forward-Backward Decoding for Regularizing End-to-End TTS,” Interspeech 2019
Shaoguang Mao, Zhiyong Wu, Jinhuaui Jiang, Pelyiu Liu, Frank Soong, “NN-Based Ordinal Regression for Assessing Fluency of ESL Speech,” ICASSP 2019
Dr. Gang Yu is the co-founder and Executive Chairman of 111, Inc. NASDAQ: YI. Dr. Yu received Bachelor of Science from Wuhan University, Master of Science from Cornell University and Ph. D. from the Wharton School of the University of Pennsylvania.

Prior to founding 111, Inc., he was the co-founder and Chairman of Yihaodian - a leading ecommerce company in China.

Dr. Yu served as Vice President; Worldwide Procurement at Dell Inc. and Vice President, Worldwide Supply Chain at Amazon.com.

Before Amazon, Dr. Yu served as Chair Professor at University of Texas at Austin, and Director of the Center for Management of Operations and Logistics, and co-Director of the Center for Decision Making under Uncertainty.

Dr. Yu has received numerous international awards 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. Dr. Yu has published over 80 journal articles, 6 books, and he holds 3 US patents.

Dr. Yu is the founder and CEO of CALEB Technologies Corporation in 1995 in the US, the company was later acquired by Accenture.

### Selected Publications

Research

ACTIVITIES
What is Financial Engineering?

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 modelling economic and human behaviours, and provide insights regarding how to reach economic, social and individual investors’ objectives.

Financial engineering covers modelling, 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.

Data-Driven Deep Learning Methods for Financial Decision Making

L. Li

A model based approach is typically adopted for solving financial decision making problems, which is prone to model error. In this project, we develop a data-driven approach that is free of parametric models and we use neural networks to approximate the control functions. The availability of massive computing power makes it possible to implement our approach within time constraints in reality.

First-Loss Capital

X. He

In most U.S. hedge funds, the managers take a performance fee, such as 20%, for any profit they generate for the investors but do not pay in case of a loss. In China private equities and also in some new hedge funds in the United States, the managers, however, need to provide a first-loss capital to absorb the investors’ loss and charge a performance fee at a higher rate, e.g., 40%. We study how the first-loss capital can reduce fund risk, improve the well-being of the managers and investors, and separate skilled managers from unskilled ones.
Hedging Periodic Cashflow

C. Yang

Financial products such as Leveraged ETFs involve the hedging of an infinite-horizon cashflow stream, where the hedging occurs in continuous time while the hedging performance is monitored periodically at discrete time points. Traditional theoretical frictionless hedging strategy can cause a considerable amount of market frictional costs and lead to large hedging error. We study how the incorporation of market frictions affects the characteristics of the optimal hedging strategy, and how to strike a balance between minimising the frictions and minimising the hedging error.

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.

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.

Markov Chain Approximation for Option Pricing and Hedging

L. Li

Markov chain approximation provides a general approach to handle Markovian asset price models in a unified and efficient way. In this project, we develop algorithms using Markov chain approximation for pricing and hedging exotic options with complex features and solve the challenging problem of convergence rate analysis.

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.

Multivariate Stress Scenario Selection

D. Ahn

In modern financial systems, stress testing has been considered an important tool to figure out the effect of multiple economic factors on the stability of financial institutions. In usual stress testing, by applying extreme-yet-plausible stress scenarios, we compute risk measures that might not be easily captured by analyzing historical market data or by using stochastic models for market prediction. However, due to the complicated nature of the financial systems, it is hard to identify stress scenarios that cause large losses and threaten the stability of the financial system. Such identification of extreme-yet-plausible scenarios, called reverse stress testing, can help us understand the potential triggers of risky events and remove the arbitrariness in the scenario selection for stress testing. The aim of this project is thus to provide an optimization approach to reverse stress testing, i.e., choosing the most likely scenarios among scenarios that cause a risk measure exceeding a given threshold.

Realization Utility

X. He

Individual investors derive realization utility: every time they buy a stock, an investment account is created in their mind and will be closed when the stock is sold. They feel good with a realized gain and bad with a realized loss. In this project, we study how the derivation of realization utility affects the investors’ trading behavior and accounts for various empirical findings such as disposition effect.
What is Information Systems?

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

Efficient Deep Learning Algorithms for Human Language Big Data

X. Liu

Human languages are natural forms of big data. Statistical language models form key components of many human language technology applications including speech recognition, machine translation, natural language processing, human computer interaction, language learning and handwriting recognition. A central part of language modelling research is to appropriately model long-distance context dependencies. In recent years deep learning based language modelling techniques are becoming increasingly popular due to their strong generalization performance and inherent power in modelling sequence data. The application of deep learning techniques to speech and language processing also opened up a number of key research challenges. The computational cost incurred in training and evaluation significantly limits their scalability and the number of possible application areas. In order to address these issues, this project aims to significantly improve the efficiency and performance of recurrent neural network based deep language modelling approaches on large data sets.

Efficient Random Walk Based Query Processing on Massive Graphs

S. Wang

Random walk based queries on graphs find extensive applications in search engines, social recommendations, community detection, spam detections, and so on. In the era of big data, one big challenge is how to handle the random walk based queries efficiently and effectively since such queries are typically processed in large batches and a regular manner by many IT companies, like Twitter, Pinterest, and Tencent. This project aims to devise more efficient solutions for the random walk based queries by considering many aspects including developing new algorithms with improved time complexity, devising novel index structures with bounded space consumption, exploring new hardware or distributed computing, and considering new models of random walks for improved accuracy.
Graph Algorithms and Systems

**J. Yu**

Graph has been widely used as a data structure to abstract complex relationships among entities. There exist many large graphs, for example, online bibliographic networks (DBLP, PubMed), online social networks (Facebook, Twitter, Flickr, LinkedIn), Wikipedia, or even the entire WWW. To support graph analytics over large graphs, algorithms are designed and systems are developed to maintain information, understand the complex relationships, and discovery knowledge. There are several challenges. Firstly, many graph analytical tasks are hard problems. To compute the exact solution for such hard problems induces high time complexities, making it impractical to be applied to real-world huge graphs. It needs to design new graph algorithms. Secondly, there are many graph processing systems developed. Such graph processing systems have their own features to deal with certain type of graph tasks efficiently, but not all. It needs to build an unified graph processing system that can efficiently process graph tasks in general. In this project, we concentrate on new algorithms design and graph processing system development.

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.

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.

Graph data modeling and inference

**H.-T. Wai**

Inferring graph structure from (behavioral) data is an important topic in data science as the relationship between nodes are often unknown. In this research, we develop novel graph signal processing model and inference methods with improved, explicit bounds on the sampling complexity. These data models stem from opinion dynamics, finance networks, and complex systems, providing the mathematical framework for information flow on a network. We test our methods on real datasets to obtain new insights about the underlying networks. In the case of opinion data, this research also focuses on applications to understand and combat the spread of fake news or adoption of new products.

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

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.
**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.

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**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.

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**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.

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**To Support Machine Learning by Database System**

**J. Yu**

In the big data era, machine learning techniques have been extensively studied to learn new things from a huge amount of data, instead of find new things by programming. Given the goal of machine learning is to learn from data, it becomes a natural question how machine learning and database system can be integrated tightly in the same platforms, instead of simply extracting massive data from a database system to conduct machine learning tasks every time when there is such a need, which is with high cost. We concentrate ourselves on supporting machine learning in the kernel of a database system. We focus on query processing techniques, and aim at enhancing query processing to efficiently support machine learning algorithms in a standalone/distributed database system.
What is Logistics and Supply Chain Management?

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.

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.
Preservation of Supermodularity and Its Application on Supply Chain

Z.Y. Long

We conduct a systematic study of the preservation of supermodularity under parametric optimization, allowing us to derive complementarity among parameters and monotonic structural properties for optimal policies in many operational models. We introduce the new concepts of mostly-sublattice and additive mostly-sublattice which generalize the commonly imposed sublattice condition significantly, and use them to establish the necessary and sufficient conditions for the feasible set so that supermodularity can be preserved under various assumptions about the objective functions. Further, we identify some classes of polyhedral sets which satisfy these concepts. Finally, we illustrate the use of our results in assemble-to-order systems.

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

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.

The Impact of a Target on Newsvendor Decisions

Z.Y. Long

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, 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.
What is Operations Research?

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.

Best System Identification Using Ordinal Optimization

D. Ahn
Given a number of stochastic systems and a finite sampling budget, we consider an ordinal optimization problem to find an optimal allocation that maximizes the likelihood of selecting the system with the best performance. Generalized linear models are used to describe the relationship between system performance and feature vectors, and unknown parameters are estimated using maximum likelihood estimation. We first formulate the problem in a tractable form by characterizing the structural properties of the optimal allocation with the large deviations theory and then obtain a Euclidean approximation for the optimal allocation. This enables us to design a sampling strategy that is near-optimal particularly when the first- and second-best systems are comparable. The proposed sampling strategy turns out to be not only computationally tractable when the model is correctly specified but also applicable to the case of model misspecification.

Distributionally Robust Discrete Optimization

Z. Y. Long
We study the discrete optimization problem under the distributionally robust framework. We optimize the Entropic Value-at-Risk, which is a coherent risk measure and is also known as Bernstein approximation for the chance constraint. We propose an efficient approximation algorithm to resolve the problem via solving a sequence of nominal problems. The computational results show that the number of nominal problems required to be solved is small under various distributional information sets.
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.

Fast Algorithms for Distributionally Robust Optimization
A. M.-C. So
Distributionally robust optimization (DRO) has received much attention lately due to its ability to incorporate data uncertainty in and provide robustness interpretation of optimization models. Many of the DRO problems that arise in practice admit exact convex reformulations and can be solved by off-the-shelf solvers. Nevertheless, the use of such solvers severely limits the applicability of DRO in large-scale problems, as they often rely on general purpose interior-point algorithms. Our goal in this project is to develop practically efficient algorithmic frameworks for tackling various DRO problems.

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.

Langevin Dynamics for Sampling and Global Optimization
X.F. Gao
Langevin Dynamics (LD) have received considerable attention recently in the field of machine learning and computational statistics. LD has been proven to be powerful techniques for two closely-related tasks: 1) globally optimizing a non-convex objective function, and 2) sampling from a high-dimensional probability distribution. Langevin dynamics is based on the overdamped Langevin stochastic differential equation which is reversible in time. In this project, we aim to understand how breaking the reversibility could accelerate the Langevin dynamics for both optimization and sampling.

Multi-Attribute Utility Preference Robust Optimization and Robust Spectral Risk Optimization
H. Xu
Decision maker’s preference in utility or risk determines which utility function or risk measure to use in an optimal decision making problem. Ambiguity arises when there is incomplete information about decision maker’s preference and such ambiguity is ubiquitous in multi-attribute decision making problems such as healthcare management, network management, airport operations management, finance and supply chain management.

In this project, we will propose various preference robust optimization models which can be effectively used to mitigate the risks arising from the endogenous preference uncertainty, and develop efficient computational methods for solving the resulting robust optimization problems. We will also develop the underlying theory which can be effectively used to examine stability of the proposed models and numerical schemes in a data-driven environment.

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 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.

Nonconvex Optimization for Big Data Analysis: Theory and Practice

A. M.-C. So

Optimization is now widely reckoned as an indispensable tool in big data analysis. Although convex optimization remains a powerful, and is by far the most extensively used, paradigm for tackling big data applications, we have witnessed a shift in interest to non-convex optimization techniques over the last few years. Given the potential of non-convex optimization techniques for dealing with big data applications, our goal is to elucidate common structures that are present in the non-convex formulations of various applications from machine learning, signal processing, and statistics, and to demonstrate how such structures can be exploited in the design and analysis of numerical methods that are suitable for large-scale 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.

Risk in Project 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. 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.

Robust Mechanism for Risk Management in Absence of Complete Information on Risk Preference

H. Xu

Quantitative measure of risk is a key element in risk management for many financial institutions and regulatory authorities.

Over the past few decades, many risk measures have been introduced. In all of these research, it is assumed that the information on decision maker’s risk preference is complete.

In this project, we propose to study robust mechanisms for quantitative risk measurement and management where decision maker’s risk preference is ambiguous.

We focus on the distortion risk measure which allows us to use a distortion functional to characterize a decision maker’s risk preference and construct the ambiguity set in the absence of complete information of the true preference.

We propose to develop effective elicitation procedures to construct the ambiguity set and numerical schemes for computing the robust risk measure.

As an application, we apply the proposed robust models to capital allocation problems. This research fills out an important gap in the area of risk measurement and risk management and will have some direct and/or indirect impact on behavioural economics.
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.

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.

Stochastic and Dynamical Optimization Techniques for Machine Learning

H.-T. Wai

The recent success of machine learning is inseparable from the advancements of stochastic optimization techniques. We look at two different directions in this research. The first one deals with ‘big-data’ spread across a network of machines. We develop new optimization algorithms that are adaptable to a distributed setting and are provably efficient, applying the problems such as matrix completion, logistic regressions, etc., as well as resource allocation problems in cyber-physical systems. The second one deals with reinforcement learning (RL) which has been applied to complicated tasks such as Go game, Starcraft as well as self driving cars. However, the theoretical analysis of the algorithms used in RL is rare and many applications rely on mere heuristics. We analyze reinforcement learning algorithms as optimization methods that process dynamical data obtained from interacting with the environment. Particularly, we draw connections to the rich theories of control systems and stochastic optimization.

Target-based Dynamic Decision Making

Z. Y. Long

We investigate a dynamic decision model that facilitates a target-oriented decision maker in regulating her risky consumption based on her desired target consumption level in every period in a finite planning horizon. We focus on dynamic operational decision problems of a firm where risky cash flows are being resolved over time. The firm can finance consumption by borrowing or saving to attain prescribed consumption targets over time. To evaluate the ability of the consumption in meeting respective targets, we propose the Consumption Shortfall Risk (CSR) criterion, which has salient properties of attainment content, starvation aversion, subadditivity and positive homogeneity. We show that if borrowing and saving are unrestricted and their interest rates are common, the optimal policy that minimizes the CSR criterion is to finance consumption at the target level for all periods except the last. For general convex dynamic decision problems, the optimal policies correspond to those that maximize an additive expected utility, in which the underlying utility functions are concave and increasing. Despite the interesting properties, this approach violates the principle of normative utility theory and we discuss the limitations of our target-oriented decision model.
What is Service Engineering and Management

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.

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.
Programmes
Undergraduate Programmes

The Department offers two Undergraduate Programmes, namely, Bachelor of Engineering in Financial Technology and Bachelor of Engineering in Systems Engineering and Engineering Management. Programme details are provided in the following paragraphs.

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 the Faculty offer Admission Scholarships to newly admitted students covering JUPAS, Non-JUPAS, International and Mainland students with excellent entrance grades in public examinations. 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 students in the Department of Systems Engineering and Engineering Management, such as the Niuniu Ji Scholarship. 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.
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.

The FTEC programme accepts Year 1 JUPAS (JUPAS Code JS4428) and Non-JUPAS (Local, International and Mainland) students. Please refer to http://fintech.se.cuhk.edu.hk for details.

Curriculum

Recommended Study Plan

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

(i) Faculty Package 9 units
(ii) FinTech Foundation Courses 13 units
(iii) Required Courses 39 units
(iv) Five Elective Courses 14 units
Total: 75 units

Term 1

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<th>Course Title</th>
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<td>ENGG1110/ESTR1002 Problem Solving By Programming</td>
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<td>FINA2310 Fundamentals of Business Finance</td>
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<td>MATH1510 Calculus for Engineers</td>
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Term 2

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<td>ENGG1120/ESTR1005 Linear Algebra for Engineers</td>
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<td>ENGG1130/ESTR1006 Multivariable Calculus for Engineers</td>
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<td>ECON2011 Basic Microeconomics</td>
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Term 3

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<td>CSCI1120/ESTR1100/ Introduction to Computing Using C++</td>
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<td>CSCI1130/ESTR1102 Introduction to Computing Using Java</td>
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<td>ENGG2440/ESTR2004 Discrete Mathematics for Engineers</td>
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<td>ENGG2760/ESTR2018 Probability for Engineers</td>
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<td>FTEC2602 Financial Technology Practicum</td>
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<td>SEEM2520 Fundamentals in Financial Engineering</td>
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<td>CSCI2100/ESTR2102 Data Structures</td>
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<td>ENGG2780/ESTR2020 Statistics for Engineers</td>
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<td>FTEC2001 FinTech Regulation and Legal Policy</td>
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<td>FTEC2101 /ESTR2520 Optimization Methods</td>
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<td>CSCI4130/IERG4130/ESTR4306 Introduction to Cyber Security</td>
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<td>FTEC3001/</td>
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<td>FTEC3002</td>
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<td>SEEM3590/ESTR3509 Investment Science</td>
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### Term 6

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<td>FTEC3002</td>
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<td>Major Electives for respective stream</td>
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### Recommended Elective Courses

14 units of courses (At least 6 units of FTEC courses, and from 3 other subject areas outside FTEC).

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<tr>
<td>ACCT2111 Introductory Financial Accounting</td>
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<td>CSCI2040 Introduction to Python</td>
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<td>CSCI2120 Introduction to Software Engineering</td>
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<td>CSCI3150/ESTR3102 Introduction to Operating Systems</td>
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<td>CSCI3160/ESTR3104 Design and Analysis of Algorithms</td>
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<td>CSCI3320 Fundamentals of Machine Learning</td>
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<td>CSCI4160/ESTR4104 Distributed and Parallel Computing</td>
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<td>CSCI4180/ESTR4106 Introduction to Cloud Computing and Storage</td>
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<tr>
<td>CSCI4430/IERG3310/ESTR3310/ESTR4120 Data Communication and Computer Networks or Computer Networks</td>
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<td>ECON2021 Basic Macroeconomics</td>
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<td>ENGG1820 Engineering Internship</td>
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<td>FINA3020 International Finance</td>
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<td>FINA3030 Management of Financial Institutions</td>
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<td>FINA3070 Corporate Finance: Theory and Practice</td>
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<td>FINA3210 Risk Management and Insurance</td>
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<td>FINA4010 Security Analysis</td>
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<td>FTEC4001 Advanced Database Technologies</td>
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<td>FTEC4002 Behavioral Analytics</td>
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<td>FTEC4003 Data Mining for FinTech</td>
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<td>FTEC4004 E-payment Systems and Cryptocurrency Technologies</td>
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<td>FTEC4005 Financial Informatics</td>
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<td>FTEC4006 Internet Finance</td>
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<td>FTEC4007 Introduction to Blockchain and Distributed Ledger Technology</td>
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<tr>
<td>IERG4080/ESTR4312 Building Scalable Internet-based Services</td>
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<td>IERG4210 Web Programming and Security</td>
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<td>MKTG4120 Quantitative Marketing</td>
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<td>SEEM3410 System Simulation</td>
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<td>SEEM3450/ESTR3502 Engineering Innovation and Entrepreneurship</td>
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<tr>
<td>SEEM3570/ESTR3508 Stochastic Models</td>
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<td>SEEM3580 Risk Analysis for Financial Engineering</td>
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<tr>
<td>SEEM4730/ESTR4508 Statistics Modeling and Analysis in Financial Engineering</td>
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</table>
B.Eng. in Systems Engineering and Engineering Management (SEEM)

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.

Students admitted through the broad-based admission scheme of the Faculty of Engineering (JUPAS Code JS4401) are eligible for admission into the SEEM programme. Please refer to http://www.erg.cuhk.edu.hk/erg/Admissions for details.

Curriculum
There are two streams of specialization: Business Information Systems, Decision Analytics. Students may choose to specialize in one of the two streams and select courses as prescribed. A student who does not wish to specialize in any of the two 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 Courses 18 units
(iii) Required Courses 30 units
(iv) Six Elective Courses 18 units
Total: 75 units

Term 1

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<td>ENGG1110/ESTR1002 Problem Solving By Programming</td>
<td>3</td>
</tr>
<tr>
<td>MATH1510 Calculus for Engineers</td>
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<tr>
<td></td>
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<tr>
<td>Term 2</td>
<td>Course Title</td>
</tr>
<tr>
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</tr>
<tr>
<td>ENGG1120/ESTR1005/9188</td>
<td>Linear Algebra for Engineers</td>
</tr>
<tr>
<td>ENGG1130/ESTR1006/9188</td>
<td>Multivariable Calculus for Engineers</td>
</tr>
<tr>
<td>ENGG1310/ESTR1003/9188</td>
<td>Engineering Physics: Electromagnetics, Optics and Modern Physics</td>
</tr>
<tr>
<td>ENGG2720/ESTR2014/9188</td>
<td>Complex Variables for Engineers</td>
</tr>
<tr>
<td>ENGG2740/ESTR2016/9188</td>
<td>Differential Equations for Engineers</td>
</tr>
<tr>
<td>PHYS1003/0918</td>
<td>General Physics for Engineers</td>
</tr>
<tr>
<td>PHYS1110/0918</td>
<td>Engineering Physics: Mechanics and Thermodynamics</td>
</tr>
<tr>
<td>SEEM2460/ESTR2540/0918</td>
<td>Introduction to Data Science</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3</th>
<th>Course Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI1120/1130/ESTR1100/808</td>
<td>Introduction to Computing Using C++/Introduction to Computing Using Java</td>
<td>12</td>
</tr>
<tr>
<td>ENGG2440/ESTR2004/808</td>
<td>Discrete Mathematics for Engineers</td>
<td>6</td>
</tr>
<tr>
<td>ENGG2760/ESTR2018/808</td>
<td>Probability for Engineers</td>
<td>6</td>
</tr>
<tr>
<td>SEEM2440/ESTR2500/808</td>
<td>Engineering Economics</td>
<td>6</td>
</tr>
<tr>
<td>SEEM2602/808</td>
<td>Systems Engineering Practicum</td>
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</tr>
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<thead>
<tr>
<th>Term 4</th>
<th>Course Title</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>CSCI2100/ESTR2102/808</td>
<td>Data Structures</td>
<td>8</td>
</tr>
<tr>
<td>ENGG2780/ESTR2020/808</td>
<td>Statistics for Engineers</td>
<td>8</td>
</tr>
<tr>
<td>SEEM2420/808</td>
<td>Operations Research I</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 5</th>
<th>Course Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI2040/808</td>
<td>Introduction to Python</td>
<td>8</td>
</tr>
<tr>
<td>SEEM3410/808</td>
<td>System Simulation</td>
<td>8</td>
</tr>
<tr>
<td>SEEM3440/ESTR3500/808</td>
<td>Operations Research II</td>
<td>8</td>
</tr>
<tr>
<td>Major Elective for respective stream</td>
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<table>
<thead>
<tr>
<th>Term 6</th>
<th>Course Title</th>
<th>Unit</th>
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<tbody>
<tr>
<td>SEEM3550/ESTR3506/808</td>
<td>Fundamentals in Information Systems</td>
<td>6</td>
</tr>
<tr>
<td>SEEM3650/ESTR3516/808</td>
<td>Fundamentals in Decision and Data Analytics</td>
<td>6</td>
</tr>
<tr>
<td>Major Elective for respective stream</td>
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<thead>
<tr>
<th>Term 7</th>
<th>Course Title</th>
<th>Unit</th>
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<tbody>
<tr>
<td>SEEM4998/808</td>
<td>Final Year Project I</td>
<td>3</td>
</tr>
<tr>
<td>Major Electives for respective stream</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Term 8</th>
<th>Course Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM3450/ESTR3502/808</td>
<td>Engineering Innovation and Entrepreneurship</td>
<td>6</td>
</tr>
<tr>
<td>SEEM4999/808</td>
<td>Final Year Project II</td>
<td>6</td>
</tr>
<tr>
<td>Major Electives for respective stream</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 8</th>
<th>Course Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM3450/ESTR3502/808</td>
<td>Engineering Innovation and Entrepreneurship</td>
<td>6</td>
</tr>
<tr>
<td>SEEM4999/808</td>
<td>Final Year Project II</td>
<td>6</td>
</tr>
<tr>
<td>Major Electives for respective stream</td>
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<table>
<thead>
<tr>
<th>Term 8</th>
<th>Course Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM3450/ESTR3502/808</td>
<td>Engineering Innovation and Entrepreneurship</td>
<td>6</td>
</tr>
<tr>
<td>SEEM4999/808</td>
<td>Final Year Project II</td>
<td>6</td>
</tr>
<tr>
<td>Major Electives for respective stream</td>
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<td>6</td>
</tr>
</tbody>
</table>
### Recommended Elective Courses

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

<table>
<thead>
<tr>
<th><strong>Business Information Systems (BIS)</strong></th>
<th><strong>Decision Analytics (DA)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM3430 Information Systems Analysis and Design</td>
<td>SEEM3620/ ESTR3514 Introduction to Logistics and Supply Chain Management</td>
</tr>
<tr>
<td>SEEM4540 Open Systems for E-Commerce</td>
<td>SEEM4760/ ESTR4512 Stochastic Models for Decision Analytics</td>
</tr>
<tr>
<td>AIST3510/ SEEM3510 Human and Computer Interaction</td>
<td>ENGG1820 Engineering Internship (1 Unit)</td>
</tr>
<tr>
<td>CSCI4140 Open Source Software Project Development</td>
<td>FTEC4002 Behavioral Analytics</td>
</tr>
<tr>
<td>ENGG1820 Engineering Internship (1 Unit)</td>
<td>FTEC4005 Financial Informatics</td>
</tr>
<tr>
<td>FTEC4001 Advanced Database Technologies</td>
<td>MKTG2010 Marketing Management</td>
</tr>
<tr>
<td>FTEC4005 Financial Informatics</td>
<td>SEEM2520 Fundamentals in Financial Engineering</td>
</tr>
<tr>
<td>FTEC4007 Introduction to Blockchain and Distributed Ledger Technology</td>
<td>SEEM3500 Quality Control and Management</td>
</tr>
<tr>
<td>IERG4210 Web Programming and Security</td>
<td>SEEM3580 Risk Analysis for Financial Engineering</td>
</tr>
<tr>
<td>SEEM3460/ ESTR3504 Computer Processing System Concepts</td>
<td>SEEM3590/ ESTR3509 Investment Science</td>
</tr>
<tr>
<td>SEEM3490 Information Systems Management</td>
<td>SEEM3630/ ESTR3510 Service Management</td>
</tr>
<tr>
<td>SEEM3680/ ESTR3512 Technology, Consulting and Analytics in Practice</td>
<td>SEEM4630 E-Commerce Data Mining</td>
</tr>
<tr>
<td>SEEM4570 System Design and Implementation</td>
<td>SEEM4670 Service Systems</td>
</tr>
<tr>
<td>SEEM4630 E-Commerce Data Mining</td>
<td>SEEM4720/ ESTR4506 Computational Finance</td>
</tr>
<tr>
<td></td>
<td>SEEM4730/ ESTR4508 Statistics Modeling and Analysis in Financial Engineering</td>
</tr>
<tr>
<td></td>
<td>SEEM4750/ ESTR4510 Advances in Logistics and Supply Chain Management</td>
</tr>
</tbody>
</table>
Postgraduate Programmes

M. Phil. – Ph.D. Programme in Systems Engineering and Engineering Management

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://www.gs.cuhk.edu.hk/page/EntryRequirements

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 7 courses with a total of 21 units. At most 1 undergraduate course with a total of 3 units can be used to fulfill this requirement. Among the 7 courses, at least 4 courses with a total of 12 units are required to be completed during the pre-candidacy stage, including at least 1 faculty core course. Moreover, a Ph.D. student must fulfill 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.

<table>
<thead>
<tr>
<th>Area I: Operations Research</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM5160</td>
<td>Advanced Data Science for Systems Engineering</td>
</tr>
<tr>
<td>SEEM5350</td>
<td>Numerical Optimization</td>
</tr>
<tr>
<td>SEEM5380</td>
<td>Optimization Methods for High-Dimensional Statistics</td>
</tr>
<tr>
<td>SEEM5410</td>
<td>Optimal Control</td>
</tr>
<tr>
<td>ENGG5501</td>
<td>Foundations of Optimization (SEEM5520 Optimization I)</td>
</tr>
<tr>
<td>SEEM5580</td>
<td>Advanced Stochastic Models</td>
</tr>
<tr>
<td>SEEM5650</td>
<td>Integer Programming</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area II: Information Systems</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM5010</td>
<td>Advanced Database and Information Systems</td>
</tr>
<tr>
<td>SEEM5160</td>
<td>Advanced Data Science for Systems Engineering</td>
</tr>
<tr>
<td>SEEM5330</td>
<td>Speech and Language Processing</td>
</tr>
<tr>
<td>SEEM5470</td>
<td>Knowledge Systems</td>
</tr>
<tr>
<td>SEEM5680</td>
<td>Text Mining Models and Application</td>
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</table>

<table>
<thead>
<tr>
<th>Area III: Engineering Management</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ENGG5501</td>
<td>Foundations of Optimization (SEEM5520 Optimization I)</td>
</tr>
<tr>
<td>SEEM5630</td>
<td>Stochastic Inventory and Revenue Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area IV: Financial Engineering</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM5160</td>
<td>Advanced Data Science for Systems Engineering</td>
</tr>
<tr>
<td>SEEM5340</td>
<td>Stochastic Calculus</td>
</tr>
<tr>
<td>SEEM5360</td>
<td>Term Structure Modeling of Interest Rates</td>
</tr>
<tr>
<td>SEEM5370</td>
<td>Topics in Behavioral Finance and Economics</td>
</tr>
<tr>
<td>SEEM5410</td>
<td>Optimal Control</td>
</tr>
<tr>
<td>SEEM5570</td>
<td>Numerical Methods in Finance</td>
</tr>
<tr>
<td>SEEM5670</td>
<td>Advanced Models in Financial Engineering</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Other SEEM courses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM5120</td>
<td>Advanced Topics in Systems Engineering and Engineering Management (I)</td>
</tr>
<tr>
<td>SEEM5121</td>
<td>Advanced Topics in Systems Engineering and Engineering Management (II)</td>
</tr>
<tr>
<td>SEEM5130</td>
<td>Advanced Topics in Systems Engineering and Engineering Management (III)</td>
</tr>
<tr>
<td>SEEM5131</td>
<td>Advanced Topics in Systems Engineering and Engineering Management (IV)</td>
</tr>
<tr>
<td>SEEM5201</td>
<td>Seminars in Systems Engineering and Engineering Management (I)</td>
</tr>
<tr>
<td>SEEM5202</td>
<td>Seminars in Systems Engineering and Engineering Management (II)</td>
</tr>
</tbody>
</table>
Presentation and Seminar Requirements

Each Ph.D. (post-candidacy) student is required to give a presentation on his/her research progress 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 2020-2021, the monthly stipend is around HK$18,025 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
- ECLT5930 Engineering Economics
- Either ECLT5730 Logistics Management or ECLT5940 Supply Chain Management

Elective Courses

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

<table>
<thead>
<tr>
<th>Area I: Internet and Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECLT5740 Cryptography, Information Security and E-Commerce</td>
</tr>
<tr>
<td>ECLT5810 E-Commerce Data Mining Techniques</td>
</tr>
<tr>
<td>ECLT5820 Distributed and Mobile Systems</td>
</tr>
<tr>
<td>ECLT5830 Network and Web Programming</td>
</tr>
<tr>
<td>ECLT5840 Open Systems for E-Commerce</td>
</tr>
<tr>
<td>ECLT5850 Project I in E-Commerce and Logistics Technologies</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Area II: Enterprise Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECLT5910 Information Technology Management</td>
</tr>
<tr>
<td>ECLT5920 Decision Methodologies with Financial Application</td>
</tr>
<tr>
<td>ECLT5940 Supply Chain Management</td>
</tr>
<tr>
<td>ECLT5950 Project II in E-Commerce and Logistics Technologies</td>
</tr>
</tbody>
</table>
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 Operations Management
SEEM5730 Information Technology Management
SEEM5820 Introduction to Financial Engineering

Elective Courses

Students must complete 5 elective courses but they must take at least 1 from each of the following three areas. SEEM5910 may be grouped under any of the areas.

SEEM5910 Project in SEEM

<table>
<thead>
<tr>
<th>Area I: Operations Management</th>
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</thead>
<tbody>
<tr>
<td>SEEM5740 Engineering Economics</td>
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<tr>
<td>SEEM5790 Project and Technology Management</td>
</tr>
<tr>
<td>SEEM5800 Logistics Management</td>
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<tr>
<td>SEEM5880 Supply Chain Management</td>
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</tbody>
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<tr>
<th>Area II: Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEM5750 Expert Systems and Decision Support</td>
</tr>
<tr>
<td>SEEM5760 Client/Server Information Systems</td>
</tr>
<tr>
<td>SEEM5770 Open Systems and Electronic Commerce</td>
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</table>

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<thead>
<tr>
<th>Area III: Financial Engineering</th>
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</thead>
<tbody>
<tr>
<td>SEEM5830 Stochastic Investment Models</td>
</tr>
<tr>
<td>SEEM5840 Quantitative Risk Management</td>
</tr>
<tr>
<td>SEEM5870 Computational Finance</td>
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</tbody>
</table>
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
- Hongkong 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

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.
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 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.

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.
COMPETITIVE Research Funding

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:

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<tr>
<th>Grant</th>
<th>Project Title</th>
<th>Amount</th>
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<td>D. Ahn CUHK Research Committee</td>
<td>Rare-Event Simulation for Systemic Risk Measurement</td>
<td>HK$124,311</td>
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<td>Funding (Direct Grants)</td>
<td>Asymptotic and Robust Analysis for High-Dimensional Risks in Complex Networks</td>
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<td>Multivariate Stress Testing of Financial Networks for Systemic Risk Management</td>
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<td>Probability Density Expansion of Multivariate Jump-Diffusion Processes and Its</td>
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<td>H. Cheng RGC - General Research</td>
<td>Dynamic Portfolio Selection and Option Pricing with Market Frictions</td>
<td>HK$632,421</td>
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<td>H. Cheng Microsco Research</td>
<td>Modeling and Inferring Relation across Multiple Information Networks: A Deep</td>
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<td>Asia Grant</td>
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<td>H. Cheng Oriental Power</td>
<td>A Natural Language Based Interactive System To Query Knowledge Graphs</td>
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<td>X.D. He RGC - General Research</td>
<td>Asset Management with First-Loss Capital</td>
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<td>W. Lam RGC - General Research Fund</td>
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<td>W. Lam ITF</td>
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<td>Asian Institute of Supply Chains &amp; Logistics -Centre for Logistics Technologies and Supply Chain Optimization - MG6</td>
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<td>W. Lam Civil Engineering &amp; Development Department, HKSAR Government</td>
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<td>Deep Learning Architectures for Automatic Recognition of Dysarthric Speech</td>
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<td>A. So RGC - General Research Fund</td>
<td>Pinning Down the Łojasiewicz Exponent: Towards Understanding the Convergence Behavior of First-Order Methods for Structured Non-Convex Optimization Problems</td>
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<td>Odds Verification for Forecast, Tierce, and Trio Merged Pool</td>
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<td>A. So Research Sustainability of Major RGC Funding Scheme</td>
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<td>H.T. Wai CUHK Research Committee Funding (Direct Grants)</td>
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<td>精神障礙隊列研究共享平台的建立</td>
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<td>C. Yang</td>
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<td>Huawei Technologies Company Limited Overlapping Community Detection and Travelling Companion Discovery</td>
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