Symposium on Advances in Network Science

Date: 1 May, 2015 (Friday)

Time: 14:00 - 17:00

Venue: G/F, Library Auditorium, UM Wu Yee Sun Library (E2)

Time	Program
13:45-14:00	Topic: Introduction to UM *Speaker: Lionel Ni, Vice Rector (Academic Affairs), University of Macau*
14:00-14:20	Topic: Resource-Aware Crowdsourcing in Wireless Networks *Speaker: Guohong Cao, The Pennsylvania State University*
14:20-14:40	Topic: The Network Tomorrow and in Future *Speaker: Jianfei He, Huawei Technologies Co Ltd*
14:40-14:55	**Break**
14:55-15:15	Topic: Scheduling with Multiple Resource Types in Cloud Datacenters *Speaker: Baochun Li, University of Toronto*
15:15-15:35	Topic: Maximizing Network Capacity in Wireless MIMO Networks *Speaker: Pengjun Wan, Illinois Institute of Technology*
15:35-15:50	**Break**
15:50-16:10	Topic: Collaborative Mobile Charging and Coverage *Speaker: Jie Wu, Temple University*
16:10-16:30	Topic: Crowdsourcing as a Computing Paradigm *Speaker: Guoliang Xue, Arizona State University*
16:30-17:00	**Q&A**

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澳門大學

UNIVERSIDADE DE MACAU

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Symposium on Advances in Network Science

1st May 2015

Title: **Resource-Aware Crowdsourcing in Wireless Networks**

Speaker: Prof. Guohong Cao**,** The Pennsylvania State University

Abstract: Photos obtained via crowdsourcing can be used in many critical applications such as disaster recover. Due to the limitations of communication bandwidth, storage and processing capability, it is a challenge to transfer large amount of crowdsourced photos. To address this problem, we propose a framework, called SmartPhoto, to quantify the quality of crowdsourced photos based on the accessible geographical and geometrical information (called metadata) including the smartphone's orientation, position and all related parameters of the built-in camera. From the metadata, we can infer where and how the photo is taken, and then only transmit the most useful photos. Three optimization problems regarding the tradeoffs between photo utility and resource constraints are studied. We have implemented SmartPhoto in a testbed using Android based smartphones, and proposed techniques to improve the accuracy of the collected metadata.

Biography: Guohong Cao (http://www.cse.psu.edu/~gcao) received his PhD degree in computer science from the Ohio State University in 1999. Since then, he has been with the Department of Computer Science and Engineering at the Pennsylvania State University, where he is currently a Professor. His research interests include wireless networks, wireless security, smartphones, vehicular networks, wireless sensor networks, and distributed fault tolerant computing. He has served on the editorial board of IEEE Transactions on Mobile Computing, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, and has served on the organizing and technical program committees of many conferences, including the TPC Chair/Co-Chair of IEEE SRDS'2009, MASS'2010, and INFOCOM'2013. He was a recipient of the NSF CAREER award in 2001. He is a Fellow of the IEEE.

Title: **The Network Tomorrow and in Future**

Speaker: Mr. Jianfei He, Huawei

Abstract: Softwarization movement(SDN/NFV) is definitely one important trend in the network industry, but, besides some real impacts, there are hypes that never happen from a pragmatic viewpoint. There are other innovative network architectures worthwhile exploring in the short term, such as "automation network" and "deterministic network". The most promising feature for future network is to integrate the functions of computing, storage and networking, but the correct methodology is probably "top-down": starting from establishing an information layer, instead of jumping directly into the networking layer. Under all these possibilities, the exploration in the network area is generally full of uncertainty, due to the absence of a solid theory.

Biography: Mr. Jianfei (Jeffrey) is director engineer of the Research Department of Fixed Network Product line in Huawei Technologies Co., Ltd, taking the responsibility of the mid/long term research in the areas of data access/transport. He has been in Telecom industry for more than 15 years. Since 2003, he started to attend standardization activities in ITU-T SG15, IEEE 802.1 and IETF and made contributions to the development of standards, particularly on multi-service transport platform and Packet Transport Network. His main research interest in recent years is on future internet, exploring how cloud computing/video/mobile broadband will drive the network evolution in future. Some preliminary results of his research have been demonstrated and presented in Sigcomm and Globecom.

Title: **Scheduling with Multiple Resource Types in Cloud Datacenters**

Speaker: Prof. Baochun Li, University of Toronto

Abstract: In the age of big data, it has been the norm for cloud datacenters to run data analytic applications at a large scale. Yet, as multiple applications share resources in these datacenters, it is important to design scheduling disciplines for datacenter resources to be shared in a fair and efficient manner. In this talk, I will present a new class of scheduling disciplines that are specifically designed for sharing multiple resource types in cloud datacenters. I will first discuss how multiple resource types are to be shared in space, and present a new design that allocates resources to applications by scheduling their computing tasks onto datacenter nodes. I will then focus on the problem of sharing resources over time, and present a new scheduler to multiplex application flows in software routers, sharing both CPU and link bandwidth. In both contexts, I will open with examples, explore their theoretical underpinnings related to fairness and efficiency, and conclude with challenges and observations in real-world implementations.

Biography: Baochun Li received the B.Engr. degree from the Department of Computer Science and Technology, Tsinghua University, China, in 1995 and the M.S. and Ph.D. degrees from the Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, in 1997 and 2000.
Since 2000, he has been with the Department of Electrical and Computer Engineering at the University of Toronto, where he is currently a Professor. He holds the Nortel Networks Junior Chair in Network Architecture and Services from October 2003 to June 2005, and the Bell Canada Endowed Chair in Computer Engineering since August 2005. His research interests include large-scale distributed systems, cloud computing, peer-to-peer networks, applications of network coding, and wireless networks.
Dr. Li has co-authored more than 280 research papers, with a total of over 13000 citations, an H-index of 58 and an i10-index of 183, according to Google Scholar Citations. He was the recipient of the IEEE Communications Society Leonard G. Abraham Award in the Field of Communications Systems in 2000. In 2009, he was a recipient of the Multimedia Communications Best Paper Award from the IEEE Communications Society, and a recipient of the University of Toronto McLean Award. He is a member of ACM and a Fellow of IEEE.

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Title: **Maximizing Network Capacity in Wireless MIMO Networks**

Speaker: Prof. Pengjun Wan, Illinois Institute of Technology

Abstract: Multiple-input multiple-output (MIMO) technology provides a means of boosting network capacity without requiring additional spectrum. It has received widespread attention over the past decade from both industry and academic researchers, now forming a key component of nearly all emerging wireless standards. Despite the huge promise and considerable attention, a rigorous algorithm-theoretic framework for maximizing network capacity in wireless MIMO networks is missing in the state of the art. The existing algorithms and protocols for maximizing network capacity in wireless MIMO networks are purely heuristic without any provable performance guarantees. This talk presents a comprehensive algorithm study for maximizing network capacity in wireless MIMO networks with receiver-side interference suppression, including the full characterization of NP-hardness and APX-hardness, the polynomial time approximation schemes, and the practical approximation algorithms with provable performance guarantees.

Biography: Dr. Peng-Jun Wan is currently a Professor of Computer Science and Engineering at the Illinois Institute of Technology. He received his PhD degree in Computer Science from University of Minnesota in 1997, his MS degree in Operations Research and Control Theory from the Chinese Academy of Sciences in 1993, and his BS degree is Applied Mathematics from Tsinghua University in 1990. His research interests include wireless networking and approximation algorithms. His professional services include TPC Chairs of IEEE Infocom 2016 and ACM Mobihoc 2008, and Associate Editors of IEEE/ACM Transactions on Networking and Journal of Computer and System Sciences.

Title: **Collaborative Mobile Charging and Coverage**

Speaker: Prof. Jie Wu, Temple University

Abstract: Recent breakthroughs in wireless energy transfer, based on rechargeable lithium batteries, provide a promising application of mobile vehicles. These mobile vehicles act as mobile chargers to transfer energy wirelessly to static sensors in an efficient way. In this talk, we discuss several charging and coverage problems involving multiple mobile chargers. In collaborative mobile charging, a fixed charging location, called a base station (BS), provides a source of energy to mobile chargers, which in turn are allowed to recharge each other while collaboratively charging static sensors. The objective is to ensure sensor coverage while maximizing the ratio of the amount of payload energy (used to charge sensors) to overhead energy (used to move mobile chargers from one location to another). We first consider the uniform case, where all sensors consume energy at the same rate, and propose an optimal scheduling scheme that can cover a one-dimensional (1-D) wireless sensor networks (WSNs) with infinite length. Then, we present several greedy scheduling solutions to 1-D WSNs with non-uniform sensors and 2-D WSNs. Then, we study another variation, in which all mobile chargers have batteries of unlimited capacity without resorting to a BS for recharging. The objective is then to deploy and schedule a minimum number of mobile chargers that can cover all sensors. Again, we provide an optimal solution to this problem in a 1-D WSN with uniform sensors and a greedy solution with a competitive approximation ratio to the problem setting of 1-D WSNs with non-uniform sensors.

Biography: Jie Wu is the chair and a Laura H. Carnell professor in the Department of Computer and Information Sciences at Temple University. Prior to joining Temple University, he was a program director at the National Science Foundation and was a Distinguished Professor at Florida Atlantic University. His current research interests include mobile computing and wireless networks, routing protocols, cloud and green computing, network trust and security, and social network applications. Dr. Wu regularly publishes in scholarly journals, conference proceedings, and books. He serves on several editorial boards, including IEEE Transactions on Service Computing and the Journal of Parallel and Distributed Computing. Dr. Wu was general co-chair/chair for IEEE MASS 2006, IEEE IPDPS 2008, IEEE ICDCS 2013, and ACM MobiHoc 2014, as well as program co-chair for IEEE INFOCOM 2011 and CCF CNCC 2013. He was an IEEE Computer Society Distinguished Visitor, ACM Distinguished Speaker, and chair for the IEEE Technical Committee on Distributed Processing (TCDP). Dr. Wu is a CCF Distinguished Speaker and a Fellow of the IEEE.

Title: **Crowdsourcing as a Computing Paradigm**

Speaker: Prof. Guoliang Xue, Arizona State University

Abstract: In many situations, the wisdom of the crowds is superior to that of a few experts. With the increasing popularity of mobile devices interconnected via wireless networks, crowdsourcing has emerged as is a new computing paradigm, which uses collective intelligence to accomplish computing tasks. In this computing paradigm, individual users can make a profit by providing service to needed clients. Crowdsourcing finds its applications in WiFi mapping, traffic monitoring, mobile phone sensing, and is the winning strategy in the DARPA network challenge. Examples of crowdsourcing include Wikipedia, Open Innovation, the Linux open source project, and WAZE—a community based traffic and navigation app.
However, crowdsourcing has its limitations and challenges. How to mobilize users to contribute to the system? How to eliminate/reduce conflicts among users of the system? How to deal with noise in the crowdsourced data? The list goes on and on. In this talk, we will discuss recent research advances and future research opportunities related to crowdsourcing computing paradigm, truthful incentive mechanisms, the problems of and solutions for free-riding and false reporting, as well as nose in data obtained from crowdsourcing.

Biography: Guoliang Xue is a Professor of Computer Science and Engineering at Arizona State University. He earned a PhD degree in Computer Science in 1991 from the University of Minnesota. His research interests include resource allocation in computer networks, and survivability and security issues in networks. He is a recipient of Best Paper Award at IEEE ICC'2012 and IEEE MASS'2011, as well as a Best Paper Runner-up at IEEE ICNP'2010. He is an Area Editor of IEEE Transactions on Wireless Communications for the Wireless Networking Area, and an Editor of IEEE Network. He was a past editor of Computer Networks, IEEE/ACM Transactions on Networking, and IEEE Transactions on Wireless Communications. He was a TPC co-chair of IEEE INFOCOM'2010 and is the vice chair of the INFOCOM Standing Committee. He is an Area Chair of IEEE ICNP'2014 and an Area Chair of IEEE INFOCOM'2015. He is a co-General Chair of IEEE CNS'2014 and a TPC member of ACM CCS'2014 and CCS'2015. He is a Keynote Speaker at IEEE LCN'2011. He is an IEEE Fellow.

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