Guest Editorial
Special Issue on Cloud Computing for IoT

IN RECENT years, there has been a growing interest in the ability of embedded devices, sensors, and actuators to communicate, and create a ubiquitous cyber-physical world. The growth of the notion of the Internet of Things (IoT) and the rapid development of technologies such as short range mobile communication and improved energy-efficiency is expected to create a pervasive connection of "things." This will inevitably result in the generation of enormous amount of data, which have to be stored, processed, and accessed. Cloud computing has long been recognized as a paradigm for big data storage and analytics. The combination of cloud computing and IoT can enable ubiquitous sensing services and powerful processing of sensing data streams beyond the capability of individual things, thus stimulating innovations in both fields. For example, cloud platforms allow the sensing data to be stored and used intelligently for smart monitoring and actuation with the smart devices. Novel data fusion algorithms, machine learning methods, and artificial intelligence techniques can be implemented and run centralized or distributed on the cloud to achieve automated decision making. These will boost the development of new applications, such as smart cities, grids, and transportation systems. New challenges, however, arise when IoT meets cloud—there is an urgent need for novel network architectures that seamlessly integrate them, and protocols that facilitate big data streaming from IoT to the cloud. QoS and QoE, as well as data security, privacy, and reliability, are critical concerns during the integration.

This special section solicits high-quality original research papers which focuses on the integration of cloud computing and IoT. We received a total of 16 submissions, and after two rounds of rigorous review, four papers were accepted.

The first paper, "Cloud-Assisted Data Fusion and Sensor Selection for Internet of Things" by Bijarbooneh *et al.*, presents a cloud-based solution that takes into account the link quality and spatiotemporal correlation of data to minimize energy consumption by selecting sensors for sampling and relaying data. It proposes a multiphase adaptive sensing algorithm with belief propagation protocol, which can provide high data quality and reduce energy consumption by turning on only a small number of nodes in the network. It also uses belief propagation to perform inference and reconstruct the missing sensing data.

The second paper, "Twenty Security Considerations for Cloud-Supported Internet of Things" by Singh *et al.*, focuses on security considerations for IoT from the perspectives of cloud tenants, end-users, and cloud providers, in the context of wide-scale IoT proliferation, working across the range of IoT technologies. It analyzes the current state of IoT-cloud offerings to make explicit the security considerations that require further work.

The third paper, "Scalable Cloud–Sensor Architecture for the Internet of Things" by Xu and Helal, argues that the massive scale of sensors and devices that will be deployed in smart cities of the future will be mind bugling. Without an ecosystem and a scalable architecture in place, it will be extremely difficult to manage or program such an expanding and massive IoT. This paper then introduces the cloud-edge-beneath architecture and present its salient scalability features. It also presents a validation study based on an event-driven programming model.

The last paper, "Optimizing Cloud-Based Video Crowdsensing" by Hong *et al.*, studies the optimal transcoding problem on wearable and mobile cameras. It proposes an algorithm to optimally select the coding parameters to fit more videos at higher quality on wearable and mobile cameras. It then empirically investigates the throughput of different file transfer protocols from wearable and mobile devices to cloud servers. A real-time algorithm is used to select the best protocol under diverse network conditions, so as to leverage the intermittent WiFi access. It finally looks into the performance of cloud databases for sensor-annotated videos, and implements a practical algorithm to search videos overlapping with a target geographical region.

CHUANG LIN, *Guest Editor*
Department of Computer Science and Technology
Tsinghua University
Beijing, China

K. K. RAMAKRISHNAN, *Guest Editor*
Department of Computer Science and Engineering
University of California at Riverside
Riverside, CA 92521 USA

JIANGCHUAN LIU, *Guest Editor*
School of Computing Science
Simon Fraser University
Burnaby, BC V5A 1S6, Canada

EDITH NGAI, *Guest Editor*
Department of Information Technology
Uppsala University
Uppsala, Sweden

Digital Object Identifier 10.1109/JIOT.2016.2554738

Chuang Lin (M'03–SM'04) is a Professor with Tsinghua University, Beijing, China, where he is also the Director of the Institute of Computer Network Technology. He was a Visiting Scholar with Purdue University, West Lafayette, IN, USA, The University of Texas at Austin, Austin, TX, USA, and the Hong Kong University of Science and Technology, Hong Kong. He was a Visiting Professor with Hong Kong Baptist University, Hong Kong, and an Honorary Visiting Professor with the University of Bradford, Bradford, U.K. He was an Adjunct Professor with the University of Science and Technology Beijing, Beijing, China, Central China Normal University, Wuhan, China, Central South University, Changsha, China, and the Chinese Academy of Sciences, Beijing, China. His current research interests include Internet and computer networks, parallel and distributed computing, performance evaluation, and analysis of computer systems.

Dr. Lin has served on the Editorial Board of *Computer Networks*, the IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, and *LCNS Transaction on Petri Nets and Other Models of Concurrency*. He is an Editor of the *Journal of Parallel and Distributed Computing*, an Area Editor of the *Journal of Computer Science and Technology*, and is serving on the Editorial Board of *Frontiers of Computer Science* in China. He was a Guest Editor of the "Special Issue on Wireless Network Security" of Wiley's *Journal of Wireless Communications and Mobile Computing* in 2005. He is on the Steering Committee for the International Petri Net Community, an ACM Council Member, and the Duty Director of the Internet Technical Committee and Network and Data Communication Technical Committee in China Computer Federation.

K. K. Ramakrishnan (S'83–M'83–SM'04–F'05) is a Professor with the Department of Computer Science and Engineering, University of California at Riverside (UCR), Riverside, CA, USA. He was most recently a Distinguished Member of Technical Staff with AT&T Labs-Research, and has been recognized for his fundamental contributions on communication networks including his work on congestion control, traffic management, and VPN services. He has created innovative network solutions that are efficient and robust, working at large scale. Prior to 1994, he was a Technical Director and Consulting Engineer in Networking with the Digital Equipment Corporation. From 2000 to 2002, he was with TeraOptic Networks Inc., as Founder and Vice President. He has authored or coauthored over 200 papers. He holds 144 patents. He is on the Editorial Board of several journals concerning networking.

Dr. Ramakrishnan has served as the TPC Chair and General Chair for most of the major conferences on computer networks. He was a Member of the National Research Council Panel on Information Technology for NIST. He currently serves as the Steering Committee Chair for IEEE ICNP.

Jiangchuan Liu (S'01–M'03–SM'08) received the B.Eng. degree (*cum laude*) in computer science from Tsinghua University, Beijing, China, in 1999, and the Ph.D. degree from the Hong Kong University of Science and Technology (HKUST), Hong Kong, in 2003, funded by the HKUST's MED program with recommendation from the Education Ministry of China and scholarship from the Hong Kong Jockey Club.

He is an Associate Professor with the School of Computing Science, Simon Fraser University, Burnaby, BC, Canada, and an EMC-Endowed Visiting Chair Professor with Tsinghua University, Beijing, China. From 2003 to 2004, he was an Assistant Professor with the Department of Computer Science and Engineering, Chinese University of Hong Kong, Hong Kong. He was also a Microsoft Research Fellow. He was with Microsoft Research Asia in 2000–2002, 2007, and 2011. His current research interests include networking and multimedia, in particular, multimedia communications, peer-to-peer networking, cloud computing, social networking, and wireless sensor/mesh networking.

Dr. Liu was a recipient of the ACM TOMCCAP Nicolas D. Georganas Best Paper Award 2013, the ACM Multimedia Best Paper Award 2012, and the IEEE IWQoS'08 and IEEE/ACM IWQoS'12 Best Student Paper Awards. He has served as an Editor/Associate Editor for the IEEE TRANSACTIONS ON MULTIMEDIA, the IEEE INTERNET OF THINGS JOURNAL, the IEEE COMMUNICATIONS TUTORIAL AND SURVEYS, *Elsevier Computer Communications*, and *Wiley Wireless Communications and Mobile Computing*. He is the TPC Co-Chair of IEEE/ACM IWQoS'14 and ChinaCom'12 and the Area Chair (Multimedia Systems and Middleware) of ACM Multimedia'14.

Edith Ngai received the Ph.D. degree in computer science and engineering from the Chinese University of Hong Kong, Hong Kong, in 2007.

From 2008 to 2012, she was an Assistant Professor with the Department of Information Technology, Uppsala University, Uppsala, Sweden, where she is currently an Associate Professor. She performed post-doctoral research with Imperial College London, London, U.K., from 2007 to 2008. She was a Visiting Scholar with the University of California at Los Angeles (UCLA), Los Angeles, CA, USA, Simon Fraser University, Burnaby, BC, Canada, and Tsinghua University, Beijing, China. Her current research interests include wireless sensor and mobile networks, Internet of Things, QoI-aware data collection, information-centric networking, and network security and privacy.

Dr. Ngai was a recipient of the Best Paper Runner-Up Awards of IEEE/ACM IWQoS'10 and ACM/IEEE IPSN'13. She has served as a TPC Member of IEEE ICC, IEEE Globecom, IEEE WCNC, IEEE DCOSS, IEEE LCN, IEEE CloudCom, and IEEE/ACM IWQoS. She was the TPC Co-Chair of the Swedish National Computer Networking Workshop 2012, the Publicity Co-Chair of IEEE MSN'12, and the Web Chair of IEEE/ACM IWQoS'14. She was a Guest Editor for the "Special Issue on Design, Implementation, and Evaluation of Wireless Sensor Network Systems" of the *EURASIP Journal on Wireless Communications and Networking* in 2010. She is a VINNMER Fellow awarded by the Swedish Governmental Agency for Innovation Systems in 2009.