Faculty Candidate Seminar

Programmable, Managed, and Optimized Internet-of-Things Analytics in a Fog Computing Platform
Cheng-Hsin Hsu
National Tsing Hua University at Hsin-Chu, Taiwan

Abstract: Although cloud servers are resourceful, they are located in data centers that may be far away from the users. Cloud computing therefore is vulnerable to long delay, congested networks, unreliable connectivity, and high communication costs. Fog computing extends cloud computing towards edge networks and end devices, so as to better support latency sensitive, massive scale, time dependent, and location dependent services. In this talk, I will present our recent work on realizing programmable, managed, and optimized Internet-of-Things (IoT) analytics using a fog computing platform. IoT analytics refer to analyzing data from a large number of sensors deployed across a smart space for diverse applications, like crowd detection and smart parking. While fog computing frees these IoT analytics from sending bulky sensor data (such as videos) to the data centers, machine-learning based IoT analytics may be too heavy for edge servers and end devices. To address this issue, we construct a fog computing platform that runs IoT analytics in a distributed way among multiple devices. A sample research problem to optimize our IoT analytics platform is to make the decisions on: (i) cutting IoT analytics into operators and (ii) deploying operators on individual fog devices. We jointly solve these two problems in two steps. First, we conduct measurement studies to derive the system models of the IoT analytics under different Quality-of-Service (QoS) levels. We then mathematically formulate the problem and propose an efficient algorithm to solve it. Our algorithm is evaluated in both large-scale simulations and real experiments. If time permits, I will also briefly describe our work/plan on optimizing 360-degree video streaming to Head-Mounted Displays, such as offering 6 Degree-of-Freedom (DoF) viewing experience.

Bio: Cheng-Hsin Hsu is currently an Associate Professor at the Department of Computer Science, National Tsing Hua University at Hsin-Chu, Taiwan. He was an Assistant Professor in the same department between 2011 and 2014. His research interests lie in the broad area of multimedia networking, mobile computing, wireless networks, Internet-of-Things (IoT), networked games, fog computing, and computer networks. Cheng-Hsin received the B.Sc. degree in Mathematics and M.Sc. degree in Computer Science and Information Engineering from National Chung Cheng University, Taiwan. He received the M.Eng. degree in Electrical and Computer Engineering from the University of Maryland, College Park, and the Ph.D. degree in Computing Science from Simon Fraser University, Canada. Before teaching in Taiwan, Cheng-Hsin was with Deutsche Telekom Lab (Los Altos, CA), Motorola Inc. (Champaign, IL), and Lucent Technologies (Landover, MD) for six years in total. Cheng-Hsin was selected as one of the Multimedia Rising Stars by the ACM SIGMM in 2015 and won the Best Associate Editor Award from ACM Transactions on Multimedia Computing, Communications, and Applications in 2016. Over years, he also won the Best Paper Awards at IEEE CloudCom'17, APNOMS'16, IEEE RTAS'12, IEEE Innovations'08, and TAOS Technical Committee's Best Paper Award at IEEE GLOBECOM'12, and Best Demo Award at ACM Multimedia'08. Cheng-Hsin has helped organizing international conferences in various capacities, such as Poster co-chair at IEEE NOMS'18, TPC co-chair at ACM MMSys'17, and TPC area co-chair at ACM Multimedia'17. He has been on the TPC committees at ACM Multimedia, WWW, ACM MMSys, ACM NOSSDAV, IEEE ICME, ACM Middleware, IEEE ICC, IEEE GLOBECOM, and IEEE ICDCS.

Date: March 2, 2018
Time: 11:00 am
203 Computer Science Building

MISSOURI S&T