Department of Computer Science
香港城市大學
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COMPUTER SCIENCE COLLOQUIUM

Optimizing Data Acquisition with Wireless Sensor Networks

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VENUE G7315, 7th Floor, Green Zone, Yeung Kin Man Academic Building, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon Tong

ABSTRACT

Wireless sensor networks (WSNs) and the Internet of Things (IoT) are transforming scientific and engineering practices by enabling continuous monitoring of physical variables at unprecedented spatial densities and temporal resolutions. This advancement has significantly impacted diverse fields, including environmental science, ecosystem monitoring, natural hazard detection, precision agriculture, and smart city. Our focus is on large-scale, outdoor WSNs/IoT deployments in harsh environments such as mountainous regions, hilly watersheds, and forests. These settings pose substantial data acquisition challenges due to the severe resource constraints of sensor nodes, including limited battery life, bandwidth, memory, and processing capabilities, as well as very dynamic communication conditions. In this presentation, I will discuss our group's work on efficient data acquisition framework for WSNs. We have developed a novel compressed sensing approach that enables high-fidelity data reconstruction at the sink node, even when only a very small subset of data packets is collected. This method significantly reduces network transmissions, thereby extending the operational lifetime of WSNs and IoT systems. Our approach has been validated using a real-world environmental WSN testbed deployed in Pennsylvania, USA. This deployment incorporates our energy-efficient and balanced routing protocol, along with novel routing topology tomography techniques, to optimize network performance and reliability.

BIOGRAPHY

Yao Liang received his B.S. degree in Computer Engineering and M.S. degree in Computer Science from Xi'an Jiaotong University, Xi'an, China. He received his Ph.D. degree in Computer Science from Clemson University, Clemson, USA, in 1997. Dr. Yao Liang is a Professor in the Department of Computer Science at the Luddy School of Informatics, Computing, and Engineering, Indiana University, Indianapolis, USA. His research interests encompass wireless sensor networks, the Internet of Things, cyberinfrastructure, machine learning, neural networks, open data and model integration, data engineering, and distributed systems. His research projects have been primarily funded by NSF. He received the 2019 Glenn W. Irwin, Jr., M.D., Research Scholar Award, Indiana University-Purdue University Indianapolis, and Faculty Recognition Award, Luddy School of Informatics, Computing, and Engineering, Indiana University, 2024. Dr. Liang also brings extensive industrial R&D experience as a Technical Staff Member at Alcatel USA. He has served on program committees for various major international conferences. He was the General Co-Chair of the International Conference on Big Data Engineering (BDE) from 2019 to 2022. Dr. Liang has delivered invited talks and lectures at numerous universities and conferences across the United States, Europe and China.

All are welcome!

In case of questions, please contact Prof LIANG Weifa at weifa.liang@cityu.edu.hk, or visit the CS Departmental Seminar Web at https://www.cs.cityu.edu.hk/events/cs-seminars/recent-cs-colloquiums.