

# Xiaoyang Zhong

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## EDUCATION

### PhD in Computer Science

Aug. 2011 – May. 2018

Purdue University (West Lafayette, IN, USA)

GPA: 3.93

- Research Domain: Computer Networks and Systems

### BS in Electrical Engineering

Sep. 2007 – Jul. 2011

University of Science and Technology of China (Hefei, Anhui, China)

GPA: 3.45

## EXPERIENCE

### Graduate Researcher, CS@Purdue University, Indianapolis, IN

Aug. 2011 – May. 2018

- Worked on a broad range of research topics in the area of Wireless Sensor Networks (WSNs) and the Internet of Things (IoT) including both theoretical and practical problems in hardware and software.
- Played an essential role in developing a **complete WSN application suite** for environmental monitoring in cooperation with other students, including sensor node application, gateway, and management system.
- Advised many undergraduate and master students for their thesis/independent study projects.
- Authored/Co-authored 9 journal/conference papers, with 3 papers under review.

## PROJECTS

### Wireless Sensor Network Application (C/nesc, Java)

Aug. 2012 - Now

- Core developer of a sensor node application for a real-world WSN testbed of 100 nodes running RTOS.
- Designed complex functionalities including sampling, routing, wireless reprogramming, compressed sensing, etc. Everything fits in devices with 4KB RAM or 48 KB ROM.
- Implemented multi-hop networking based on IEEE 802.15.4 (the underlying standard of ZigBee).
- Solved the MAC layer mismatch problem between heterogeneous node devices using packet sniffer.
- Maintained and updated the application based on the principles of software development life cycle.

### Routing Protocol for the Internet of Things (C/nesc, Python)

Mar. 2016 - Now

- Designed and implemented a reliable, energy efficient, and extremely scalable routing protocol for node actuation in large-scale IoT systems with resource-constraint devices.
- Designed an adaptive Bloom filter to encode source-route which scales on networks with long hops.
- Applied opportunistic routing during packet forwarding and achieved packet delivery ratio > 98%.
- Evaluated through both simulations (TOSSIM and Cooja) and real-world WSN testbeds.

### IoT Smart Systems (C/C++, Python)

Sep. 2015 – Sep. 2017

- Designed a Smart Home using Raspberry Pi to control home devices using the CoAP protocol.
- Designed a Greenhouse using TelosB to monitor temperature, humidity, light, and soil moisture. Applied RPL routing protocol to build a low power IPv6 multi-hop network.
- Designed a server to parse the sensor data and send notifications through email (SMTP) and SMS (Twilio).

### System Administration (Java, Python, Apache, PostgreSQL, SVN)

Aug. 2016 – Now

- Administrated a sensor network management system deployed using Linux Apache server, including network data/status monitoring, PostgreSQL database management, and version control using SVN.

### Topology Reconstruction for Dynamic WSNs (C/nesc, Python)

Oct. 2013 – Oct. 2015

- Designed a topology reconstruction algorithm based on compressed sensing in cooperation with another student for very dynamic WSNs by piggybacking a 4-byte field in each data packet.
- Deployed the algorithm on real-world WSN testbed and achieved > 96% reconstruction accuracy.

### Wireless Reprogramming for Outdoor WSN testbed (C/nesc, Java)

Sep. 2013 – Jun. 2014

- Designed a mobile tool for outdoor WSN testbed reprogramming, maintenance, query, and diagnosis.
- Enabled fast deployment of new applications and reduced the labor for maintaining WSN testbed.

## Quality of Service Control for the Internet of Things Systems (C/nesC)

Mar. 2012 – Jun. 2013

- Designed a distributed QoS control algorithm based on Gur Game to control nodes' active/standby states.
- Improved energy efficiency of the whole network for about 30%; achieved fast system convergence.

## Sensor Board and Driver for TelosB (TI MSP430) Platform (C/nesC, Eagle)

May. 2015 – Aug. 2016

- Designed a 2-layered sensor board using Eagle to drive analog and digital Decagon sensors (e.g., MPS-2).
- Solved the clock drifting problem of TelosB during UART communication using a fridge and oscilloscope.
- Reduced the cost of unit sensor board to be less than \$10 (about 80% reduction v.s. commercial boards).

## Network Analysis and Benchmarking (Python)

Aug. 2016 – May. 2018

- Analyzed the network performance and routing dynamics of a real-world WSN testbed from three aspects including link level characteristics, routing level characteristics, and temporal characteristics.
- Designed metrics based on network entropy to concretely measure the extent of routing dynamics.
- Devised a benchmark data suite which is the first of its type for the research community.

## SKILLS

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|--|----------------------------|
| • <b>Programming Languages:</b> C/C++, nesC, Java, Python, JavaScript                                | <b>Frameworks:</b> Angular |
| • <b>Operating Systems:</b> Linux, Real-Time Systems, Virtual Machine                                | <b>Tools:</b> Git, SVN     |
| • <b>IoT/WSNs/Embedded Platforms:</b> TinyOS, Contiki OS, Raspberry Pi, Arduino, TelosB, IRIS, MicaZ |                            |

## PROFESSIONAL ACTIVITIES

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- **Peer Reviewer:** IEEE Wireless Communications and Networking Conference (WCNC) 2016 ~ 2018  
IEEE Local Computer Networks Conference (LCN) 2015 ~ 2018  
International Journal of Distributed Sensor Networks (IDJSN) 2017

## HONORS & AWARDS

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- 2018 Gersting Award for an Outstanding Graduate Student (Purdue School of Science)
- 2014 IEEE Travel Grant to attend IEEE MASS 2014

## SELECTED PUBLICATIONS

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- X. Zhong and Y. Liang, "Scalable Downward Routing for Wireless Sensor Networks and Internet of Things Actuation", in *LCN 2018* (submitted for review) and in *arXiv:1802.03898*.
- G. Villalba, F. Plaza, X. Zhong, T. W. Davis, M. Navarro, Y. Li, T. A. Slater, Y. Liang, and X. Liang, "A Networked Sensor System for the Analysis of Plot-Scale Hydrology", *Sensors*, 2017, 17(3), 636.
- X. Zhong and Y. Liang, "Raspberry Pi: An Effective Vehicle in Teaching the Internet of Things in Computer Science and Engineering", *Electronics* (Basel), 2016.
- R. Liu, Y. Liang, and X. Zhong, "Monitoring Routing Topology in Dynamic Wireless Sensor Network Systems," in *ICNP*, 2015.
- X. Zhong, M. Navarro, G. Villalba, X. Liang, and Y. Liang, "MobileDeluge: Mobile Code Dissemination for Wireless Sensor Networks." In *MASS*, 2014.

## Advisors

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**Yao Liang**, Indiana University Purdue University Indianapolis

Professor of Computer Science

*IEEE Senior Member*

Email: yaoliang@iupui.edu

**Y. Charlie Hu**, Purdue University West Lafayette

Michael and Katherine Birck Professor of Electrical and Computer Engineering

Professor of Computer Science (by courtesy)

*IEEE Fellow*

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