

# Shizhen Zhao

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## EDUCATION

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Shanghai Jiao Tong University, China

Sept. 2006- June 2010

- BS (with honor) in Electrical Engineering (GPA: 89/100) & BS in Mathematics (GPA: 95/100).

Purdue University, West Lafayette, IN, USA

Aug. 2010-Aug. 2015

- Direct Ph.D. in Electrical and Computer Engineering (GPA: 4.0/4.0); will graduate in **08/15/2015**.

## RESEARCH AREAS

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- **Wireless Networking:** Supporting large volume of delay sensitive traffic in wireless networks.
- **Smart Grid:** Integrating high percentage of renewable energy into the existing power grid.
- **Related Skills:** Stochastic optimization, convex optimization, large deviation, robust optimization, etc.

## RESEARCH EXPERIENCE

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Intern, Qualcomm Flarion Technologies (Corporate R&D), Bridgewater, NJ

Summer 2014

**1. Driver detection using smartphones (Supervised by Lei Zhang, Sichao Yang & Xinzhou Wu).**

- Developed an inertial-sensor (including gyroscope and accelerometer) based approach to determine the location of a smartphone in a vehicle without using additional equipment.
- Proposed to use the lateral movement of a vehicle, caused by one wheel of the vehicle hitting a pothole, to determine whether the smartphone is on the driver side or on the passenger side.
- One patent under submission.

**2. In-vehicle PLC (power line communication) (Supervised by Chong Li & Xinzhou Wu).**

- Analyzed the characteristics of the power line channels in the vehicular environment.
- Proposed to use repetition and relay to improve the reliability of **OFDM**-based physical-layer transmissions.

Research Assistant, School of Electrical and Computer Engineering, Purdue University

Aug. 2010-now

**1. Study the operating reserve for future power grid with high renewable penetration (ongoing work) (Supervised by Prof. Xiaojun Lin & Prof. Dionysios Aliprantis)**

- Developed a theoretical approach to quantify the amount of reserve required to maintain power-grid stability under high demand- and supply- uncertainties.

**2. Design online EV (Electric Vehicle) charging algorithms in order to smooth the demand in power grid. (Supervised by Prof. Xiaojun Lin & Prof. Minghua Chen)**

- Developed a general methodology to design competitive online algorithms that achieve optimal worst-case guarantees for EV charging with imprecise future knowledge. (*This is the first work that incorporates inaccurate future knowledge into the design of competitive online algorithms.*)
- Proposed an algorithm robustification procedure to design algorithms with both good average-case performance and optimal worst-case guarantee. (*This is also the first work that deals with the fundamental disadvantage of competitive online algorithms, i.e., algorithms with optimal worst-case performance may have poor average-case performance*)
- Two papers accepted at **51st Annual Allerton Conference on Communication, Control, and Computing 2013 & INFOCOM 2015**.

**3. Design delay-optimal algorithms in wireless networks subject to fairness constraints. (Supervised by Prof. Xiaojun Lin)**

- Designed a converge-cast scheduling algorithm that is large-deviations optimal using a recently proposed “drift-minimizing principle”.
- Revealed a limitation of the “drift-minimizing principle”. That is, for general networks, such a

drift-minimizing algorithm may not exist.

- Paper accepted at **INFOCOM 2012**.

#### 4. Study adaptive live-streaming algorithms in multi-user multi-channel (OFDM) wireless cellular networks.

(Supervised by Prof. Xiaojun Lin)

- Proposed a class of threshold-based rate-control and bipartite-matching based scheduling algorithms with provable optimality for adaptive live streaming with stringent delay constraints.
- Paper accepted at **INFOCOM 2014**.

Research Assistant, Dept. of Electrical Engineering, Shanghai Jiao Tong University

June 2009-June 2010

#### 1. Study the delay performance in large-scale wireless multi-hop networks with intermittent connectivity.

(Supervised by Prof. Xinbing Wang)

- Quantified an upper bound and a lower bound for the delay performance of large-scale wireless multi-hop networks with intermittent connectivity using percolation theory.
- Two papers accepted at **MOBICOM 2011 & IEEE/ACM Transaction on Networking 2013**.

### PUBLICATION

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#### Conference:

- Shizhen Zhao, Xiaojun Lin, Minghua Chen, "Peak-Minimizing Online EV Charging: Price of Uncertainty and Algorithm Robustification," in IEEE INFOCOM, Hong Kong, China, April, 2015.
- Shizhen Zhao, Xiaojun Lin, Minghua Chen, "Peak-Minimizing Online EV Charging," in 51st Annual Allerton Conference on Communication, Control, and Computing, Monticello, Illinois, Oct. 2013.
- Shizhen Zhao, Xiaojun Lin, "Packet-Level Rate-Control and Scheduling for Wireless Live Streaming with Stringent Deadline Constraints," in IEEE INFOCOM, Toronto, Canada, April, 2014.
- Shizhen Zhao, Xiaojun Lin, "On the Design of Scheduling Algorithms for End-to-End Backlog Minimization in Multi-hop Wireless Networks," in IEEE INFOCOM, Orlando, Florida, USA, March 2012.
- Shizhen Zhao, Luoyi Fu, Xinbing Wang, Qian Zhang, "Fundamental Relationship between Node Density and Delay in Wireless Ad Hoc Networks with Unreliable Links," in ACM MobiCom 2011, Las Vegas, Sept. 2011.

#### Journal:

- Shizhen Zhao, Xiaojun Lin, "On the Design of Scheduling Algorithms for End-to-End Backlog Minimization in Multi-hop Wireless Networks under K-hop Interference Model," submitted to IEEE/ACM Transactions on Networking, 2014 (under 2<sup>nd</sup> round review).
- Shizhen Zhao, Luoyi Fu, Xinbing Wang, Qian Zhang, "Relationship between Node Density and Delay in Wireless Networks with Unreliable Links," in IEEE/ACM Transaction on Networking, 2013.
- Yaokun Wu, Shizhen Zhao, "Incidence Matrix and Cover Matrix of Nested Interval Orders," in Electronic Journal of Linear Algebra, 2012.

### HONORS & AWARDS

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- August 2014 Nominated for the Roberto Padovani Scholarship (A Qualcomm intern award)
- August 2014 **Bililand Dissertation Fellowship** (2 students are awarded in Purdue ECE)
- April 2012/2014 Travel Grants for INFOCOM 2012 and INFOCOM 2014
- June 2010 Shanghai Outstanding graduate
- Apr. 2009 **Meritorious Award** in the Mathematical/Interdisciplinary Contest in Modeling
- Oct. 2008 **Meritorious Award** in China Undergraduate Mathematical Contest in Modeling
- Oct. 2007-2009 First Class Scholarship in Shanghai Jiao Tong University
- Oct. 2008/2009 National Scholarship in China
- Sept. 2004 First prizes in National Physics Competition and Chinese Mathematical Olympiad