

# Desheng Zhang

## Personal Information

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**Office Phone:** 848-445-8307

**Fax:** 732-445-0537

**Email:** [dz220@cs.rutgers.edu](mailto:dz220@cs.rutgers.edu)

**Web:** <http://www.cs.rutgers.edu/~dz220/>

**Address:** Department of Computer Science,  
Rutgers, The State University of New Jersey,  
110 Frelinghuysen Road, Piscataway, NJ 08854  
Office: CoRE 307

## Research Interests

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- Broadly concentrated on bridging **Cyber-Physical Systems** (also known as **Internet of Things** under some contexts) and **Data Science** by technical integration of communication, computation and control in data-intensive urban systems for **Smart Cities**.
- Focused on the life cycle of **Big-Data-Driven Urban Systems**, from streaming data collection to multi-source data fusion, heterogeneous model integration, visualization, service design and deployment in complex urban setting.

## Employment

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Assistant Professor 8.2016-Present  
Rutgers, The State University of New Jersey, USA

Research Associate 10.2015-8.2016  
University of Minnesota, U.S.A

## Education

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Ph.D of Computer Science 9.2011-10.2015  
University of Minnesota, U.S.A with **Government Award**

Master of Computer Applied Technology 9.2008-6.2011  
Heilongjiang University, China with **Excellent Thesis Award**

Bachelor of Software Engineering 9.2004-6.2008  
Heilongjiang University, China with **Excellent Thesis Award**

## Selected Awards

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*Best Paper Nominee*, ICCPS Committee (Acceptance Rate: 3/91) 3.2015

*Best Paper Award*, CWSN Committee (Acceptance Rate: 1/200+) 10.2010

*Best Paper Runner-up Award*, CyberC Committee (Acceptance Rate: 1/297) 10.2010

*Best Poster Award*, INFOCOM Committee 4.2011

*Best Thesis Award in Computer Science*, Heilongjiang Dept. of Education (1/46,000) 12.2011

*Best Thesis Award*, Heilongjiang University 6.2008

*Excellent Thesis Research Travel Award*, University of Minnesota 11.2013

*Excellent Researcher Award*, Chinese Academy of Sciences 4.2011

*Chinese Government Award for Outstanding Students*, (Acceptance Rate: 4/250,000) 9.2014

*Doctoral Dissertation Fellowship Award*, University of Minnesota 4.2014

*ADC Fellowship Award*, University of Minnesota 4.2011

*National Scholarship*, China Ministry of Education (Acceptance Rate: 1/212) 11.2007

## Selected Conference Paper Publications

**Highlights:** 12 first-author papers in premium CS conferences including MobiCom, SenSys, IPSN, ICCPS, SIGSPATIAL, ICDCS, and RTSS, with 3 best paper awards.

### Cyber-Physical Systems

- [C01] **Desheng Zhang**, Juanjuan Zhao, Fan Zhang, Ruobing Jiang and Tian He.  
*Feeder: Supporting Last-Mile Transit with Extreme-Scale Infrastructure Data.*  
In ACM Conference on Information Processing in Sensor Networks (**IPSN'15**). 27/110≈24%
- [C02] **Desheng Zhang**, Juanjuan Zhao, Fan Zhang, and Tian He.  
*UrbanCPS: Cyber-Physical System Based on Multi-Source Data with Model Integration.*  
In ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS'15**). 25/91≈27%
- [C03] **Desheng Zhang**, Jun Huang, Ye Li, Fan Zhang, Chengzhong Xu, and Tian He.  
*Exploring Human Mobility with Multi-Source Data at Extremely Large Metropolitan Scales.*  
In 20<sup>th</sup> ACM Conference on Mobile Computing & Networking (**MobiCom'14**). 36/220≈16%
- [C04] **Desheng Zhang**, Ye Li, Fan Zhang, Ming Lu, Yunhuai Liu, and Tian He.  
*coRide: Carpool Service with a Win-Win Fare Model for Taxicab Networks.*  
In 11<sup>th</sup> ACM Conference on Embedded Networked Sensor Systems (**SenSys'13**). 21/123≈17%
- [C05] **Desheng Zhang**, and Tian He.  
*pCruise: Reducing Cruising Miles for Taxicab Networks.*  
In the 33<sup>rd</sup> IEEE International Real-time Systems Symposium (**RTSS'12**). 35/157≈22%

### Big-Data Analytics

- [C06] **Desheng Zhang**, Fan Zhang, and Tian He.  
*MultiCalib: National-Scale Traffic Model Calibration with Multi-source Incomplete Data*  
In the ACM Conference on Geographic Information Systems (**SIGSPATIAL'16**). 40/217≈18%
- [C07] **Desheng Zhang**, Juanjuan Zhao, Fan Zhang, and Tian He.  
*coMobile: Real-time Human Mobility Modeling at Urban Scale by Multi-View Learning*  
In the ACM Conference on Geographic Information Systems (**SIGSPATIAL'15**). 38/216≈18%
- [C08] **Desheng Zhang**, Ruobing Jiang, Shuai Wang, Yanmin Zhu, Bo Yang, Tian He, and Jian Cao.  
*Everyone Counts: Fine-Grained Digital Media Advertising in Urban Metro Systems.*  
In the IEEE International Conference on Big Data (**BigData'15**). 62/363≈17%
- [C09] **Desheng Zhang**, Tian He, Shan Lin, Sirajum Munir, and John A. Stankovic.  
*Dmodel: Online Taxicab Passenger Demand Model from Large Roving Sensor Networks.*  
In the 3<sup>rd</sup> IEEE International Congress on Big Data (**BigData'14**). 38/200≈19%
- [C10] **Desheng Zhang**, Tian He, Yunhuai Liu, and John A. Stankovic.  
*CallCab: a Unified Recommendation System for Carpooling and Regular Taxicab Services.*  
In the IEEE International Conference on Big Data (**BigData'13**). 45/259≈17%

### Wireless Networking and Others

- [C11] **Desheng Zhang**, Tian He, Yunhuai Liu, Yu Gu, Fan Ye, Raghu K. Ganti, and Hui Lei.  
*Acc: Generic On-Demand Accelerations for Neighbor Discovery.*  
In 10<sup>th</sup> ACM Conference on Embedded Networked Sensor Systems (**SenSys'12**). 23/123≈18%
- [C12] **Desheng Zhang**, Tian He, Fan Ye, Raghu K. Ganti, and Hui Lei.  
*EQS: Neighbor Discovery and Rendezvous Maintenance with Extended Quorum System.*  
In 32<sup>nd</sup> International Conference on Distributed Computing Systems (**ICDCS'12**). 71/515≈13%
- [C13] **Desheng Zhang**, Jinbao Li, and Longjiang Guo.  
*MCR: a Dynamic and Optimal Duty Cycle Based MAC Protocol for Wireless Sensor Networks.*  
In 4<sup>th</sup> Conference for Wireless Sensor Networks (**CWSN'10**). **Best Paper Award.** 1/212≈0.4%
- [C14] **Desheng Zhang**, and Tian He.  
*Collaborative Sensing and Control in Large-Scale Transportation Systems.*  
In the Conference on Collaboration Technologies and Systems (**CTS'14**). Invited Paper

- [C15] F. Miao, S. Lin, S. Munir, J. A. Stankovic, H. Huang, **Desheng Zhang**, T. He, and G. J. Pappas.  
*Taxi Dispatch with Real-Time Data in Metropolitan Areas - a Receding Horizon Control Approach*.  
In ACM Conference on Cyber-Physical Systems (**ICCPS'15**). **Best Paper Runner-up**. 2/91
- [C16] Jinbao Li, and **Desheng Zhang**.  
*M&M: A Multi-Channel MAC Protocol with Multiple Channel Reservation for Sensor Networks*.  
In the Conference on Cyber-Enabled Computing (CyberC'10). **Best Paper Runner-up**. 1/297

### **Selected Journal Article Publications**

- [J1] F.Miao, S.Han, S.Lin, J.A. Stankovic, H.Huang, **Desheng Zhang**, S.Munir, T.He, G.J. Pappas.  
*Taxi Dispatch with Real-Time Data in Metropolitan Areas: A Receding Horizon Control Approach*.  
In IEEE Transactions on Automation Science and Engineering (**TASE**), 2016.
- [J2] **Desheng Zhang**, Tian He, Shan Lin, Sirajum Munir, and John A. Stankovic.  
*Taxi Passenger Demand Modeling from a Roving Sensor Network*.  
Minor Revision for IEEE Transactions on Big Data (**TBD**), 2016.
- [J3] **Desheng Zhang**, Tian He, Fan Ye, Raghu K. Ganti and Hui Lei.  
*Neighbor Discovery and Maintenance with Extended Quorum Systems*.  
In IEEE Transactions on Mobile Computing (**TMC**), 2016.
- [J4] **Desheng Zhang**, Juanjuan Zhao, Fan Zhang, and Tian He.  
*Heterogeneous Model Integration for Multi-Source Infrastructure Data*.  
In ACM Transactions on Cyber-Physical Systems (**TCPS**), 2016.
- [J5] **Desheng Zhang**, Juanjuan Zhao, Fan Zhang, Ruobing Jiang and Tian He.  
*Last-Mile Transit Service with Urban Infrastructure Data*.  
In ACM Transactions on Cyber-Physical Systems (**TCPS**), 2016.
- [J6] **Desheng Zhang**, Fan Zhang, Ming Lu, Yunhuai Liu, and Tian He.  
*Carpool Service for Large-Scale Taxicab Networks*.  
In ACM Transactions on Sensor Networks (**TOSN**), 2016.
- [J7] **Desheng Zhang**, Tian He, Yunhuai Liu, Yu Gu, Fan Ye, Raghu K. Ganti, and Hui Lei.  
*Generic Neighbor Discovery in Mobile Applications*.  
In ACM Transactions on Sensor Networks (**TOSN**), 2015.
- [J8] **Desheng Zhang**, Tian He, Lin Shan, Sirajum Munir, and John A. Stankovic.  
*Online Cruising Mile Reduction for Large-Scale Taxicab Networks*.  
In the IEEE Transactions on Parallel and Distributed Systems (**TPDS**), 2015.
- [J9] **Desheng Zhang**, Tian He, Yunhuai Liu, and John A. Stankovic.  
*A Unified Recommendation System for Carpooling and Regular Taxicab Services*.  
In the IEEE Transactions on Emerging Topics in Computing (**TETC**), 2014.

### **Conference Poster Publications**

- [P1] **Desheng Zhang**, and Tian He.  
*USN: an Extremely Large Sensor Network based on Urban Infrastructures for Smart Cities*  
In the 14<sup>th</sup> ACM Conference on Embedded Networked Sensor Systems (**SenSys'16**).
- [P2] F.Miao, S.Han, S.Lin, J.Stankovic, Q.Wang, **Desheng Zhang**, T.He and George Pappas  
*Data-Driven Robust Taxi Dispatch Approaches*  
In ACM/IEEE International Conference on Cyber-Physical Systems (**ICCPS'16**).
- [P3] **Desheng Zhang**, and Tian He.  
*Improving Efficiency of Metropolitan-Scale Transit Systems with Multi-Mode Data Feeds*.  
In the 12<sup>th</sup> ACM Conference on Mobile Systems, Applications, and Services (**MobiSys'14**).
- [P4] **Desheng Zhang**, Tian He, Yunhuai Liu, Yu Gu, Fan Ye, and Raghu K. Ganti.  
*Neighbor Discovery with Distributed Quorum System*.  
In the 9<sup>th</sup> ACM Conference on Embedded Networked Sensor Systems (**SenSys'11**).
- [P5] **Desheng Zhang**, Tian He, Fan Ye, Raghu K. Ganti and Hui Lei.  
*Where Is the Crowd?: Crowdedness Detection Scheme for Mobile Crowdsensing Applications*.  
In the IEEE Conference on Computer Communication (**INFOCOM'11**). **Best Poster Award**.

## Research Experiences

**Highlights:** Unique experiences built upon urban data from **10 urban systems** including cellphone, smartcard, taxi, bus, truck, subway, bike, personal vehicle, electric vehicle, and road networks in **7 cities** across **3 continents** with **30 million** urban residents involved.

*Research Associate in University of Minnesota (UMN)* 10.2015-8.2016

- Focused on extremely-large-scale real-time data analysis and modeling from heterogeneous data sources, e.g., transportation systems and telecommunication networks for smart cities applications.
- Contributions led to two research grant proposals and a few papers under reviews.

*Doctoral Dissertation Fellow in University of Minnesota (UMN)* 8.2014-9.2015

- Designed on a real-world urban platform for a service to predict urban bus arrival time, used by 100-thousand users every day in a metropolitan area.
- Studied electric and personal vehicle OBD data and loop detector data for traffic morning.
- Investigated Capital Bike System in Washington D.C. with District Department of Transportation.
- Contributions led to one thesis research travel award, and four first-author papers in ACM SIGSPATIAL, ACM IPSN, ACM/IEEE ICCPS, TPDS and TETC.

*Research Assistant in University of Minnesota (UMN)* 9.2012-9.2015

- Served as a leading student for the one-million collaborative NSF project: CPS: Multiple-level Predictive Control of Mobile Cyber Physical Systems with Correlated Context.
- Built applications upon spatiotemporal dynamics in streaming data from 42 thousand vehicles, 10 million cellphones and 16 million smartcards.
- Attracted a company to commercialize my carpooling application in the Dallas/Fort Worth area.
- Contributions led to one government award, five first-author papers and one pending submission.

*Research Associate in Chinese Academy of Sciences (CAS)* 11.2013-5.2014

- Led an urban mobility project in Shenzhen Institutes of Advanced Technology of CAS.
- Conducted analyses and modeling on one of the largest heterogeneous datasets collected for academia experiments including taxicabs, bus, subway, truck, and smartcard networks.
- Organized an interdisciplinary project with a civil-engineering research group to analyze cellphone data from three carriers involving 15 million users.
- Engineered a field study to evaluate proposed applications and collected data for 30 days.
- Contributions led to two first-author papers in MobiCom and SenSys, as well as an invited fast-tracked journal article to Proceedings of the IEEE.

*ADC Research Fellow in Digital Technology Center of UMN* 9.2011-9.2012

- Pioneered a concept using taxicabs as roving sensors in six cities on three continents.
- Contributions led to two first-author papers in RTSS and ICDCS, and maintained the most diverse dataset of taxicab networks for research community.

*Research Assistant for IBM Open Collaboration Research* 1.2011-12.2011

- Performed as a leading student for Mobile Crowdsensing project of IBM Research.
- Formulated and implemented distributed communication protocols for mobile Crowdsensing.
- Contributions led to two papers in SenSys and ICDCS along with a best poster award in Infocom.

*Research Associate in Provincial Key Computing Laboratory in HLJU* 4.2008-6.2011

- Committed as the leading and informal managing researcher in Heilongjiang University.
- Contributions led to more than 20 papers in Chinese and international conferences such as MSN, ICPADS, IPCCC, UIC, EUC, GlobeCom, and CyberC.
- Research results led to three proposals, two excellent thesis awards, and two best paper awards.

## **Grants & Proposals**

[G1] Oversea Talents Grant from Chinese Academy of Sciences, Proposal: <i>Urban Cyber-Physical Systems</i>	10.2015 <b>¥ 30,000</b>
[G2] NSF CPS: Cyber-Physical Systems Program, Proposal: <i>Improving Transportation Systems with Data-Driven Cyber-Control</i>	4.2015 <b>\$500,000</b>
[G3] Doctoral Dissertation Grant from University of Minnesota Proposal: <i>Improving Efficiency of Transportation Systems with Online Data Feeds</i>	3.2014 <b>\$30,000</b>
[G4] Thesis Research Travel Grant from University of Minnesota Proposal: <i>a Novel System Architecture for Heterogeneous Big Transportation Data</i>	11.2013 <b>\$5,000</b>
[G5] Chinese Government Scholarship from China Scholarship Council Proposal: <i>Big Data Applications for Intelligent Transportation Systems</i>	10.2013 <b>\$6,000</b>
[G6] ADC Fellowship from Digital Technology Center in UMN Proposal: <i>Communication Protocols for Wireless Sensor Networks</i>	4.2011 <b>\$50,000</b>
[G7] Provincial Excellent Thesis Grant from Heilongjiang Department of Education Proposal: <i>Study on Multi-channel MAC protocols in Wireless Sensor Networks</i>	10. 2010 <b>¥ 10,000</b>

## **Professional Activities**

### *Invited Research Talk*

Urban Cyber-Physical Systems: University of Maryland	5.2016
Urban Cyber-Physical Systems: University of Oregon	5.2016
Urban Cyber-Physical Systems: University of Illinois	4.2016
Urban Cyber-Physical Systems: Indiana University	4.2016
Urban Cyber-Physical Systems: Carnegie Mellon University (Computer Science)	3.2016
Urban Cyber-Physical Systems: University of Texas	3.2016
Urban Cyber-Physical Systems: Rutgers University	3.2016
Urban Cyber-Physical Systems: Case Western Reserve University	3.2016
Urban Cyber-Physical Systems: Vanderbilt University	3.2016
Urban Cyber-Physical Systems: Georgia Tech	2.2016
Urban Cyber-Physical Systems: Florida State University	2.2016
Urban Cyber-Physical Systems: University of Mississippi	2.2016
Urban Cyber-Physical Systems: University of California	2.2016
Urban Cyber-Physical Systems: Carnegie Mellon University (Heinz College)	2.2016
Urban Cyber-Physical Systems: Virginia Tech	2.2016
Urban Cyber-Physical Systems: University of Georgia	2.2016
Urban Cyber-Physical Systems: University of Alabama	1.2016
Urban Cyber-Physical Systems: Case Western Reserve University	1.2016
Urban Cyber-Physical Systems: Georgia State University	1.2016
Urban Cyber-Physical Systems: University of Memphis	1.2016
Urban Cyber-Physical Systems: City University of New York	12.2015
Mobile Cyber-Physical Systems: University at Buffalo	9.2015
Mobile Cyber-Physical Systems: Hong Kong Polytechnic University	9.2015
Mobile Cyber-Physical Systems: Tsinghua University	8.2015
Mobile Cyber-Physical Systems: Peking University	8.2015
Mobile Cyber-Physical Systems: Chinese Academy of Sciences	8.2015

Mobile Cyber-Physical Systems: New York University	6.2015
Mobile Cyber-Physical Systems: IBM Research	6.2015
Mobile Cyber-Physical Systems: MIT	5.2015
Mobile Cyber-Physical Systems: Northeastern University	5.2015
Mobile Cyber-Physical Systems: Boston University	5.2015
Mobile Cyber-Physical Systems: Microsoft Research	4.2015
International Conference on Collaboration Technologies and Systems	5.2014

#### *Paper Review*

IEEE/ACM Transactions on Networking ( <b>IEEE ToN</b> )	9.2016
IEEE Transactions on Mobile Computing ( <b>IEEE TMC</b> )	9.2015
IEEE Transactions on Parallel and Distributed Systems ( <b>IEEE TPDS</b> )	1.2014
IEEE Transactions on Intelligent Transportation Systems ( <b>IEEE ITS</b> )	9.2016
IEEE Transactions on Services Computing ( <b>IEEE TSC</b> )	5.2016
IEEE Transactions on Emerging Topics in Computing ( <b>IEEE TETC</b> )	2.2016
IEEE Internet of Things Journal ( <b>IEEE IoT</b> )	11.2014
IEEE Conference on Computer Communications ( <b>INFOCOM 15,16,17</b> )	9.14/8.15/9.16
IEEE International Conference on Distributed Computing Systems ( <b>ICDCS 11&amp;14</b> )	1.2011/1.2014
Computer Networks Journal of Elsevier ( <b>COMNET</b> )	6.2014
International Journal of Sensor Networks (IJSNet)	6.2010

#### *Program Committee*

The ACM Symposium on Applied Computing ( <b>SAC</b> )	8.2016
International Conference On Embedded Wireless Systems and Networks ( <b>EWSN</b> )	5.2016
IEEE Workshop on Smart Service Systems ( <b>SmartSys</b> )	12.2015
International Conference on Computational and Network Technologies ( <b>ICCNT</b> )	2.2014
International Wireless Sensor Networks Workshop ( <b>IWSN</b> )	8.2012
International Symposium on Personal, Indoor and Mobile Radio ( <b>PIMRC</b> )	2.2012

#### *Conference Presentation*

38 Professional Research Presentations in 7 Years	2009-2016
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### **Teaching Experiences**

● Mentored three undergraduate students in UMN for a data visualization project.	9.2014
● Assisted teaching for graduate-level course: Advanced Computer Architecture.	9.2010
● Informally advised six master students with weekly meetings.	9.2015

### **References**

**Tian He**, Professor (Thesis Advisor)  
 Department of Computer Science and Engineering  
 University of Minnesota, USA  
 Email: [tianhe@cs.umn.edu](mailto:tianhe@cs.umn.edu)  
 Office Phone: 612-626-1281

**Fan Ye**, Assistant Professor  
 Department of Electrical and Computer Engineering  
 Stony Brook University, USA  
 Email: [fan.ye@stonybrook.edu](mailto:fan.ye@stonybrook.edu)  
 Office Phone: 631-632-8393

**John A. Stankovic**, BP America Professor  
 Department of Computer Science  
 University of Virginia, USA  
 Email: [stankovic@cs.virginia.edu](mailto:stankovic@cs.virginia.edu)  
 Office Phone: 434-982-2275

**Hui Lei**, Director & Chief Technology Officer  
 Watson Health Cloud  
 IBM T.J. Watson Research Center, USA  
 Email: [hlei@us.ibm.com](mailto:hlei@us.ibm.com)  
 Office Phone: 914-945-1833