Shaohan Hu

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EDUCATION

Ph.D., Computer Science — in progress
University of Illinois at Urbana-Champaign, IL USA
Advisor: Tarek F. Abdelzaher

M.S., Computer Science — June 2011
Dartmouth College, NH USA
Advisor: Andrew T. Campbell

B.S., *magna cum laude*, Computer Science — May 2008
B.S., *magna cum laude*, Mathematics and Statistics — May 2008
University of Massachusetts at Amherst, MA USA

WORK

University of Illinois at Urbana-Champaign, Urbana, IL — January 2012–Present
Research Assistant

Intel Corporation - New Devices Group, Santa Clara, CA — May 2014–September 2014
Graduate Intern Technical

University of Illinois at Urbana-Champaign, Urbana, IL — August 2011–December 2011
Teaching Assistant

Dartmouth College, Hanover, NH — September 2008–September 2010
Teaching Assistant

University of Massachusetts at Amherst, Amherst, MA — January 2008–May 2008
Teaching Assistant

SERVICES

Technical Program Committee
UBICOMM — 2012, 2013, 2014, 2015

Conference Reviewer
SENSYS, ICDCS, ICC, INFOCOM — 2015
ICCVE, MILCOM, SECON — 2014
ICDM, ICCCT — 2013
UBICOMP — 2012

Journal Reviewer
IEEE TRANSACTIONS ON MOBILE COMPUTING (TMC) — 2014, 2015
IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS — 2015
IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS — 2014
IEEE/ACM TRANSACTIONS ON NETWORKING (TON) — 2014
AD HOC & SENSOR WIRELESS NETWORKS — 2013
INTERNATIONAL JOURNAL OF GEO-INFORMATION — 2012

University of Illinois at Urbana-Champaign August 2011–Present
Advisor: Tarek F. Abdelzaher

- **Cost Optimization for Resource-Limited Crowdsensing**
  Funded by U.S. Army Research Laboratory as part of the Network Science Collaborative Technology Alliance, in collaboration with University of Southern California, the City University of New York, Raytheon BBN Technologies, and U.S. Army Research Laboratory, this project aims at building algorithms and systems that are geared towards crowd-sensing under resource-limited post-disaster scenarios, and optimize network resource consumptions while serving multiple concurrent queries with timely requirements (resulting papers published in DCOSS 2015 and RTSS 2015).

- **eNav: Smartphone-based Energy-Efficient Vehicular Navigation**
  In collaboration with Microsoft Research, this project aims at providing low-power reliable real-time road navigation services by taking advantage of the phone's on-board MEMS sensors (accelerometer, gyroscope, etc) to minimize the need for GPS localization, in order to best preserve phone battery to ultimately eliminate the need for carrying extra hardware (car charger, cable, car mount) or dedicated GPS units for navigation (resulting poster received the IPSN 2014 best poster award, full paper published in UbiComp 2015).

- **SmartRoad: Participatory Road Sensing**
  Funded by NSF, Siebel Foundation, this project aims at providing the next generation road services by taking advantage of sensor-packed mobile phones in a vehicular environment. Various applications/services include:

  - Vehicular mobile sensing and communication system, for which we implement and deploy a participatory vehicle mobile sensing system, and study and analyze how to most efficiently carry out car-to-car data sharing when two cars meet, and how to balance among available transmission channels (WiFi, cellular, etc) for server offloading (resulting papers published in Infocom 2013 and 2014).

  - Traffic regulator detection and identification, for which we design, build, and deploy a participatory sensing system that collects and intelligently handles noisy crowd-sourced data, and robustly, efficiently and effectively detects and identifies traffic regulators, such as stop signs and traffic lights, under various energy/bandwidth conditions (resulting work published in IPSN 2013, RTSS 2013, and ACM TOSN).

  - GreenGPS: Fuel-efficient mapping and routing, which aims at providing, in addition to the shortest and fastest, the most fuel-efficient route between any pair of source and destination points on the map. Currently we are in the process of progressively deploying our system to the UIUC Facility & Service department (resulting paper published in IEEE TMC).

- **Resource-Efficient Data Classification in Distributed Sensing Systems**
  This project aims at building a resource-efficient system to classify sensory data distributed over a large number of sensor nodes under stringent network resources. We focus on two aspects of the sensor network nodes: data reliability and data redundancy, where reliability implies the degree to which a sensor node contributes to the classification mission, and redundancy represents the information overlap among different sensor nodes. We formulate and solve an optimization problem that maximizes the reliability of sensory data while eliminating their redundancies under the constraint of network resources (resulting papers published in RTSS 2012 and 2014).

- **NDN: Named Data Networking**
  Funded by NSF, in collaboration with 10 other Universities and PARC. NDN is a recently proposed next-generation networking framework design, which aims at basing addresses on data names instead of machine locations. We aim at taking advantage of the "named data" nature of the NDN network and putting focus on maximizing information coverage rather than just data throughput when designing communication mechanisms under resource constraints (resulting paper published in ICCCN 2013).

Dartmouth College   September 2009–June 2011

Advisor: Andrew T. Campbell

- **Large Scale Activity Recognition using Community Similarity Networks**
  This work targets on building a mobile phone human activity recognition system that can accurately carry out the recognition tasks on diverse populations by exploiting crowd-sourced sensor data, incorporating inter-person similarity measurements, and automatically personalizing classifiers with data contributed from other similar users (resulting paper published in UBICOMP 2011).

- **Bridging Consumer Neural-Headset with Mobile Platforms**
  In this work, we build NeuroPhone, a mobile system that is driven by neural signals, using a newly available off-the-shelf neural headset, for hands-free, silent and effortless human-mobile interaction. We build an address book dialing app on iPhone, which natively runs a lightweight classifier that extracts and detects the P300 brain potential from the EEG signal wirelessly transmitted by the headset (resulting paper published in MOBIHELD 2010).

University of Massachusetts at Amherst   January 2008–May 2008

Advisor: Andrew McCallum

- **Resource-bounded Information Extraction**
  This work aims to design a general framework for the task of extracting specific information "on demand" from a large corpus such as the Web under resource constraints. Given a database with missing or uncertain information, our system automatically formulates queries, issues them to a search interface, selects a subset of the documents, extracts the required information from them, and fills the missing values in the original database (resulting paper published in PAKDD 2010).

TEACHING   **University of Illinois at Urbana-Champaign**

- **Teaching Assistant**
  CS 125: Introduction to Computer Science
  Basic Data Structure, Algorithm, OOP using Java

Dartmouth College

- **Teaching Assistant**
  CS 23: Software Design and Implementation – or, how to be a hacker
  Linux Bash scripting, design and implementation using C: web search (data crawling, indexing, and querying), and embedded Linux environment distributed concurrent system (remote robot control system)

- **Teaching Assistant**
  CS 8: Problem Solving with Computer Science
  Functional programming, Haskell language

- **Teaching Assistant**
  CS 5: Introduction to Computer Science
  Basic Data Structure, OOP using Java

- **Teaching Assistant**
  CS 4: Concepts in Computing
  Overview of computing and computer science, basic programming using html/css/javascript, debugging, design

University of Massachusetts at Amherst

- **Teaching Assistant**
  Math 300: Fundamental Concepts of Mathematics
  Discrete mathematics, number theory, logics, set theory, rigorous proofs

- **Teaching Assistant**
  CS 311: Introduction to Algorithms
  Basic algorithm design, analysis, and implementations, sorting, searching, string processing, graphs

Publications

RTSS 2015	**Shaohan Hu**, Shuochao Yao, Haiming Jin, Yiran Zhao, Yitao Hu, Xiaochen Liu, Nooreddin Naghibolhosseini, Shen Li, Akash Kapoor, William Dron, Lu Su, Amotz Bar-Noy, Pedro Szekely, Ramesh Govindan, Reginald Hobbs, Tarek F. Abdelzaher, *Data Acquisition for Real-time Decision-making under Freshness Constraints*, The 36th IEEE Real-Time Systems Symposium (RTSS 2015), San Antonio, TX USA, December 1–4, 2015.
UbiComp 2015	**Shaohan Hu**, Lu Su, Shen Li, Shiguang Wang, Chenji Pan, Siyu Gu, Md Tanvir Amin, Hengchang Liu, Suman Nath, Romit Roy Choudhury, Tarek F. Abdelzaher, *Experiences with eNav: A Low-power Vehicular Navigation System*, The ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2015), Osaka, Japan, September 7–11, 2015.
TOSN 2015	**Shaohan Hu**, Lu Su, Hengchang Liu, Hongyan Wang, Tarek F. Abdelzaher, *SmartRoad: Smartphone-based Crowd Sensing for Traffic Regulator Detection and Identification*, ACM Transactions on Sensor Networks (ACM TOSN), Volume 11, Issue 4, No. 55, July 2015.
ATC 2015	Shen Li, **Shaohan Hu**, Raghu Ganti, Mudhakar Srivatsa, Tarek Abdelzaher, *Pyro: A Spatial-Temporal Big-Data Storage System for Dynamic Workload Hotspots*, USENIX Annual Technical Conference (USENIX ATC 2015), Santa Clara, CA USA, July 8–10, 2015.
DCOSS 2015	**Shaohan Hu**, Shen Li, Shuochao Yao, Lu Su, Ramesh Govindan, Reginald Hobbs, Tarek F. Abdelzaher, *On Exploiting Logical Dependencies for Minimizing Additive Cost Metrics in Resource-Limited Crowdsensing*, The 11th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS 2015), Fortaleza, Brazil, June 10–12, 2015.
TMC 2015	Fatemeh Saremi, Omid Fatemieh, Hossein Ahmadi, Hongyan Wang, Tarek Abdelzaher, Raghu Ganti, Hengchang Liu, **Shaohan Hu**, Shen Li, Lu Su, *Experiences with GreenGPS – Fuel-Efficient Navigation using Participatory Sensing*, IEEE Transactions on Mobile Computing (IEEE TMC), Vol. PP, No. 99, April 2015.
IPSN 2015	Shiguang Wang, Lu Su, Shen Li, **Shaohan Hu**, Tanvir Amin, Hongwei Wang, Shuochao Yao, Lance Kaplan, Tarek Abdelzaher, *Scalable Social Sensing of Interdependent Phenomena*, The 14th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2015), Seattle, WA USA, April 13–17, 2015.
RTAS 2015	Shen Li, **Shaohan Hu**, Tarek Abdelzaher, *The Packing Server for Real-time Scheduling of MapReduce Workflows*, The 21st IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2015), Seattle, WA USA, April 13–16, 2015.
ICCPS 2015	Yunlong Gao, **Shaohan Hu**, Renato Mancuso, Hongwei Wang, Minje Kim, PoLiang Wu, Lu Su, Lui Sha, Tarek Abdelzaher, *Exploiting Structured Human Interactions to Enhance Estimation Accuracy in Cyber-physical Systems*, The 6th International Conference on Cyber-Physical Systems (ICCPS 2015), Seattle, WA USA, April 14–16, 2015.
RTSS 2014	Lu Su, Qi Li, **Shaohan Hu**, Shiguang Wang, Jing Gao, Hengchang Liu, Tarek Abdelzaher, Jiawei Han, Xue Liu, Yan Gao, Lance Kaplan, *Generalized Decision Aggregation in Distributed Sensing Systems*, The 35th IEEE Real-Time Systems Symposium (RTSS 2014), Rome, Italy, December 2–5, 2014.
ICDCS 2014	Shen Li, **Shaohan Hu**, Shiguang Wang, Lu Su, Tarek F. Abdelzaher, Indranil Gupta, Richard Pace, *WOHA: Deadline-Aware Map-Reduce Workflow Scheduling Framework over Hadoop Cluster*, The 34th International Conference on Distributed Computing Systems (ICDCS 2014), Madrid, Spain. June 30–July 3, 2014.

ICAC 2014   Shen Li, **Shaohan Hu**, Shiguang Wang, Siyu Gu, Chenji Pan, Tarek F. Abdelzaher, *WattValet: Heterogenous Energy Storage Management in Data Centers for Improved Power Capping*, The 11th International Conference on Autonomic Computing (ICAC 2014), Philadelphia, PA USA, June 18–20, 2014.

DCOSS 2014   Siyu Gu, Chenji Pan, Hengchang Liu, Shen Li, **Shaohan Hu**, Lu Su, Shiguang Wang, Dong Wang, Md Tanvir A Amin, Ramesh Govindan, Charu Aggarwal, Raghu Ganti, Mudhakar Srivatsa, Amotz Bar-Noy, Peter Terlecky, Tarek Abdelzaher, *Data Extrapolation in Social Sensing for Disaster Response*, The 10th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS 2014), Marina Del Rey, CA USA, May 26–28, 2014.

UIUC TR 2014b   Dong Wang, Tarek F. Abdelzaher, Lance Kaplan, Raghu Ganti, **Shaohan Hu**, Hengchang Liu, *Reliable Social Sensing with Physical Dependencies: Analytic Bounds and Performance Evaluation*, UIUC Technical Report, May 15, 2014.

Infocom 2014   **Shaohan Hu**, Hengchang Liu, Lu Su, Hongyan Wang, Tarek F. Abdelzaher, Pan Hui, Wei Zheng, Zhiheng Xie, John Stankovic, *Towards Automatic Phone-to-Phone Communication for Vehicular Networking Applications*, The 33rd IEEE International Conference on Computer Communications (INFOCOM 2014), Toronto, Canada, April 27–May 2, 2014.

UIUC TR 2014a   **Shaohan Hu**, Lu Su, Shen Li, Shiguang Wang, Chenji Pan, Siyu Gu, Md Tanvir Amin, Hengchang Liu, Suman Nath, Romit Roy Choudhury, Tarek F. Abdelzaher, *eNav: Smartphone-based Energy Efficient Location Sensing for Low-Power Vehicular Navigation*, UIUC Technical Report, April 25, 2014.

IPSN 2014   **Shaohan Hu**, Lu Su, Shen Li, Shiguang Wang, Chenji Pan, Siyu Gu, Md Tanvir Al Amin, Hengchang Liu, Suman Nath, Romit Roy Choudhury, Tarek F. Abdelzaher, *Poster Abstract: eNav – a Smartphone-based Energy Efficient Vehicular Navigation System*, The 13th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2014), Berlin, Germany, April 15–17, 2014. (**Best poster award**)

PUC 2014   Nicholas D. Lane, Ye Xu, Hong Lu, **Shaohan Hu**, Tanzeem Choudhury, Andrew T. Campbell, Feng Zhao, *Community Similarity Networks*, ACM/Springer Journal of Personal and Ubiquitous Computing (PUC), Special Issue on Cross-Community Mining, February, 2014.

RTSS 2013   Dong Wang, Tarek F. Abdelzaher, Lance Kaplan, Raghu Ganti, **Shaohan Hu**, Hengchang Liu, *Exploitation of Physical Constraints for Reliable Social Sensing*, The 34th IEEE Real-Time Systems Symposium (RTSS 2013), Vancouver, Canada, December 4–6, 2013.

SenSys 2013   Hengchang Liu, Siyu Gu, Chenji Pan, Wei Zheng, Shen Li, **Shaohan Hu**, Shiguang Wang, Dong Wang, Tanvir Amin, Lu Su, Zhiheng Xie, Ramesh Govindan, Charu Aggarwal, Amotz Barnoy, Tarek F. Abdelzaher, *Demo Abstract: Extrapolation from Participatory Sensing Data*, The 11th ACM Conference on Embedded Networked Sensor Systems (SenSys 2013), Rome, Italy, November 11–15, 2013.

UIUC TR 2013c   **Shaohan Hu**, Hengchang Liu, Lu Su, Hongyan Wang, Tarek F. Abdelzaher, *SmartRoad: A Mobile Phone Based Crowd-Sourced Road Sensing System*, UIUC Technical Report, August 30, 2013.

ICCCN 2013   Shiguang Wang, **Shaohan Hu**, Shen Li, Hengchang Liu, Md Yusuf Sarwar Uddin, and Tarek F. Abdelzaher, *MINERVA: Information-Centric Programming for Social Sensing*, The 22nd International Conference on Computer Communications and Networks (ICCCN 2013), Nassau, Bahamas, July 30–August 2, 2013.

ICDCS 2013   Shen Li, Shiguang Wang, Fan Yang, **Shaohan Hu**, Fatemeh Saremi, Tarek F. Abdelzaher, *Proteus: Power Proportional Memory Cache Cluster in Data Centers*, The 33rd International Conference on Distributed Computing Systems (ICDCS 2013), Philadelphia, PA USA, July 8–11, 2013.

UIUC TR 2013B   **Shaohan Hu**, Lu Su, Hengchang Liu, Hongyan Wang, Tarek F. Abdelzaher, *SmartRoad: A Crowd-Sourced Traffic Regulator Detection and Identification System*, UIUC Technical Report, April 18, 2013.

INFOCOM 2013   Hengchang Liu, **Shaohan Hu**, Wei Zheng, Zhiheng Xie, Shiguang Wang, Pan Hui, and Tarek F. Abdelzaher, *Efficient 3G Budget Utilization in Mobile Participatory Sensing Applications*, The 32nd IEEE International Conference on Computer Communications (INFOCOM 2013), Turin, Italy, April 14–19, 2013.

IPSN 2013   **Shaohan Hu**, Lu Su, Hengchang Liu, Hongyan Wang, Tarek F. Abdelzaher, *Poster Abstract: SmartRoad: A Crowd-Sourced Traffic Regulator Detection and Identification System*, The 12th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2013), Philadelphia, PA USA, April 8–11, 2013.

UIUC TR 2013A   Shiguang Wang, **Shaohan Hu**, Shen Li, Hengchang Liu, Md Yusuf Sarwar Uddin, and Tarek F. Abdelzaher, *MINERVA: Information-Centric Programming for Social Sensing*, UIUC, January 15, 2013

RTSS 2012   Lu Su, **Shaohan Hu**, Shen Li, Feng Liang, Jing Gao, Tarek F. Abdelzaher, and Jiawei Han, *Quality of Information based Data Selection and Transmission in Wireless Sensor Networks*, The 33rd IEEE Real-Time Systems Symposium (RTSS 2012), San Juan, Puerto Rico, December 4–7, 2012.

UBICOMP 2011   Nicholas D. Lane, Ye Xu, Hong Lu, **Shaohan Hu**, Tanzeem Choudhury, Andrew T. Campbell, and Feng Zhao, *Enabling Large-scale Human Activity Inference on Smartphones using Community Similarity Networks (CSN)*, The 13th International Conference on Ubiquitous Computing (UbiComp 2011), Beijing, China, September 17–21, 2011. (**Best paper nominee**)

MOBIHELD 2010   Andrew T. Campbell, Tanzeem Choudhury, **Shaohan Hu**, Hong Lu, Matthew K. Mukerjee, Mashfiqui Rabbi, and Rajeev D. S. Raizada, *NeuroPhone: Brain-Mobile Phone Interface using a Wireless EEG Headset*, The 2nd ACM SIGCOMM Workshop on Networking, Systems, and Applications on Mobile Handhelds (MobiHeld 2010), New Delhi, India, August 30, 2010.

PAKDD 2010   Pallika Kanani, Andrew McCallum and **Shaohan Hu**, *Resource-bounded Information Extraction: Acquiring Missing Feature Values On Demand*, The 14th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD 2010),Hyderabad, India. June 21–24, 2010. (**Best student paper runner-up award**)

PRESS   NEWS BUREAU - ILLINOIS, *New mobile app expands the outreach of SAWBO videos*, May 2015
http://news.illinois.edu/news/15/0515SAWBO_app_BarryPittendrigh.html

CBS NEWS, *The Next Step in Bionics*, October 2011
http://www.cbsnews.com/stories/2011/10/09/sunday/main20117796.shtml

THE NEW YORK TIMES, *The Cyborg in Us All*, September 2011
http://www.nytimes.com/2011/09/18/magazine/the-cyborg-in-us-all.html

TECHNOLOGY REVIEW, *Mobile Phone Mind Control*, March 2010
http://www.technologyreview.com/blog/editors/24993/

AWARDS AND HONORS   IPSN Best Poster Award, April 2014

Teachers Rated Excellent, Department of Computer Science, UIUC, March 2012

UBICOMP Best Paper Nominee, September 2011

Best TA, Department of Computer Science, Dartmouth College, September 2010

PAKDD Best Student Paper Runner-up, June 2010

Outstanding Graduate Student Teacher, Dartmouth Center for the Advancement of Learning, Dart-

mouth College, April 2010

CSEM (Computer Science, Engineering and Mathematics) Scholarship, UMass Amherst, January 2005–May 2008

Dean's List Honors, UMass Amherst, January 2005–May 2008

Barkesdale Scholarship, UMass Amherst, March 2007

First Place Winner, Henry Jacob Mathematics Competition, UMass Amherst, March 2006

Second Place Winner, Henry Jacob Mathematics Competition, UMass Amherst, March 2005

Computer Skills   Languages: Python, C/C++, Java, Matlab, LaTeX
Platforms: Linux, Mac OS X, Windows, Android, iOS

Work
Authorization   U.S. Citizen

References

Tarek F. Abdelzaher
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Andrew T. Campbell
Professor
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Lu Su
Assistant Professor
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