

Pei Zhang CV

CONTACT INFORMATION	Carnegie Mellon University NASA Research Park Building 23 Moffett Field, CA 94035	<i>E-mail:</i> peizhang@cmu.edu <i>Phone:</i> (609) 356-2525 http://www.ece.cmu.edu/~peizhang/
CURRENT STATUS	Assistant Research Professor Dept. of Elec. and Comp. Eng., INI, Cylab, Silicon Valley Carnegie Mellon University	Oct 2008 – Present
RESEARCH AREAS	Collaboration in Embedded Systems and Mobile Sensor Networks <ul style="list-style-type: none">- Wireless ad-hoc mobile sensor networks- Distributed sensing and processing in heterogeneous devices- Interactions between heterogeneous embedded systems- Controlled mobility in mobile networked systems- Failure tolerance	
EDUCATION	Ph.D. Princeton University , Princeton NJ Computer Engineering, Dept. of Electrical Engineering Advisor: Margaret Martonosi Thesis Title: <i>“Collaboration and Adaptation for the Longevity of Mobile Delay-Tolerant Sensor Systems”</i>	Sep 2004 – Aug 2008
	M.A. Princeton University , Princeton NJ Electrical Engineering Advisor: Margaret Martonosi	Sep 2002 - May 2004
	B.S. California Institute of Technology , Pasadena CA Electrical Engineering (Graduated with Honors)	Sep 1998 - May 2002
HONORS AND AWARDS	Career Award: SensorFly: Minimalistic Dynamic Sensing and Organization in Groups of Semi-Controllable Mobile Sensing Devices (National Science Foundation)	2012
	Best Demo Award, 13th International Conference on Ubiquitous Computing (UBICOMP'11).	2011
	Best Demo Award, The Seventh ACM Conference on Embedded Networked Sensor Systems (Sensys'09).	2009
	Wu Prize for Excellence, Awarded by the School of Engineering and Applied Science (SEAS) of Princeton University for upper-year graduate students who have performed at the highest level of courses, research and teaching.	2007
	Outstanding Teaching Assistant Award, by the Department of Electrical Engineering Princeton University,	2005
	Co-winner of the Global Photonics Energy Corporation's (GPEC) Edith and Martin B. Stein Solar Energy Innovation Award,	2005
	Winner 3 rd International Low Power Design Contest ACM/IEEE International Symposium on Low-Power Electronics and Design (ISLPED)	2003

	Graduate Fellowship, Princeton University, Department of Electrical Engineering	2002 - 2003
	Named Caltech Summer Undergraduate Research Fellowship (SURF)	2000
	Caltech Summer Undergraduate Research Fellowship (SURF)	1999
CURRENT RESEARCH PROJECTS	SensorFly – Micro helicopter based in-door mobile sensor network. Virtual Medical Assistant (VMA) – Distributed far-field audio event recognition in low-cost systems.	
GRANTS	2012-2017 NSF- CNS1149611 CAREER: SensorFly: Minimalistic Dynamic Sensing and Organization in Groups of Semi-Controllable Mobile Sensing Devices, \$400,000.	
	2011 Intel Inc. Energy Aware Spaces. \$70,000.	
	2011-2014 NSF- CNS1135874 CPS: Medium: Collaborative Research: Efficient Mapping and Management of Applications onto Cyber-Physical Systems, \$392,011.	
	2011 Nokia Inc. 3D Swipe - Natural Cross Device Interactions and Interoperability Using Gestures 20,000euros.	
	2011 Nokia Inc. UbiShare: Ubiquitous Sharing on Smart Windows for Casual Collaborations \$100,000.	
	2011 Nokia Inc. BodyNet: An Accurate Body Position/motion Sensing and Understanding System \$50,000.	
	2011-2014 DARPA CSSG RA-10-76: SensorFly: A Controlled-Mobile Aerial Sensor Network for In-door Scouting. \$1,000,000.	
	2010 Nokia Inc. Distributed Meeting Recording \$35,000.	
	2009-2011 CyLab/ARO. VMA: Dynamic and Secure Heterogeneous System for Elder Care. \$150,000.	
	2009-2010 CyLab/ARO. Collaborative Mobile Sensor Network Control. \$23,000.	
	2008 Intel Inc. Sensing Systems. \$20,000.	
BOOK CHAPTERS	Pei Zhang “SensorFly: A Flying Pervasive Sensor Network”. <u>Chapter in Pervasive Adaptation, The Next Generation Pervasive Computing Research Agenda</u> , Alois Ferscha, Institute for Pervasive Computing, Johannes Kepler University Linz. June 2011	
	Pei Zhang, Margaret Martonosi. “LOCALE: Collaborative Localization Estimation for Sparse Mobile Sensor Networks”. <u>Chapter in Handbook of Research on Mobile Software Engineering: Design Implementation and Emergent Applications</u> , Paulo S.C. Alencar, Donald Cowan (editors), IGI Global, March 2010.	
	Pei Zhang, Chris Sadler, Ting Liu, Ilya Fischhoff, Margaret Martonosi, Stephen A. Lyon, Daniel I. Rubenstein. Habitat Monitoring with ZebraNet: Design and Experiences. <u>Chapter in Wireless Sensor Networks: A Systems Perspective</u> , N. Bulusu and S. Jha (editors),	

Artech House, 2005.

ARCHIVED
PUBLICATIONS

Pei Zhang, "SensorFly: A Minimalistic Approach for Situational Awareness in an Emergency", Awareness Magazine, 2012.

Zheng Sun, Aveek Purohit, Shijia Pan, Frank Mokaya, Raja Bose, and Pei Zhang, "Polaris: Getting Accurate Indoor Orientations for Mobile Devices Using Ubiquitous Visual Patterns on Ceilings". (HotMobile 2012), February 2012.

Zheng Sun, Aveek Purohit, Kaifei Chen, Shijia Pan, Trevor Pering, and Pei Zhang: PANDAA: Physical Arrangement Detection of Networked Devices through Ambient-Sound Awareness. 13th International Conference on Ubiquitous Computing (UBICOMP 2011), September 2011.

Pei Zhang, and Aveek Purohit: The Cloud Meets the Crowd: Framework for Distributed Cloud Sensing. Mobile Sensing: Challenges, Opportunities and Future Directions September 2011.

Frank Mokaya, Eric Chen, Ian Zhang, Pei Zhang, "A Communication Framework For Enabling Control of Groups of Resource Constrained Robots", NASA Conference on Space Mission Challenges in Information Technology (SMC-IT), August 2011

Zheng Sun, Aveek Purohit, Philippe DeWagter, Irina Brinster, Chorom Hamm, and Pei Zhang, "(Demo abstract) PANDAA: A Physical Arrangement Detection Technique for Networked Devices through Ambient-Sound Awareness". In the conference of the ACM Special Interest Group on Data Communication (SIGCOMM) 2011, Toronto, ON, Canada, August 2011.

Aveek Purohit and Pei Zhang, Controlled-Mobile Sensing Simulator for Indoor Fire Monitoring. In the First IEEE Workshop on Design, Modeling and Evaluation of Cyber Physical Systems (CyPhy'11), Istanbul, Turkey, July 2011.

Zheng Sun, Aveek Purohit, Kathleen Yang, Neha Pattan, Dan Siewiorek, Asim Smailagic, Ian Lane, and Pei Zhang. "CoughLoc: Location-Aware Indoor Acoustic Sensing for Non-Intrusive Cough Detection". In the International Workshop on Emerging Mobile Sensing Technologies, Systems, and Applications. Mobisense 2011 in conjunction with Pervasive, San Francisco, CA, June 2011.

Aveek Purohit, Zheng Sun, Frank Mokaya, Pei Zhang, SensorFly: Controlled-mobile Sensing Platform for Indoor Emergency Response Applications. 10th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), April 2011.

Heng-Tze, Zheng Sun, Pei Zhang, Imirok: Real-Time Imitative Robotic Arm Control for Home Robot Applications, Ninth Annual IEEE International Conference on Pervasive Computing and Communications, PerCom March 2011.

Pei Zhang, SensorFly: A Collaborative Lightweight Rapidly Deployable Aerial Sensing System. NSF Workshop on Pervasive Computing at Scale (PeCS). Jan 2011.

Pei Zhang and M. Martonosi, CA-TSL: Energy Adaptation for Targeted System Lifetime in Mobile Ad-Hoc Networks. IEEE Transactions on Mobile Computing. Vol. 9, issue 12, pp. 1794-1808, December 2010

Lin-Shung Huang, Feng-Tso Sun, Pei Zhang, Demo: TouchAble - A Camera-Based Multitouch System, The 8th ACM Conference on Embedded Networked Sensor Systems.

SenSys November 2010.

Z. Sun, A. Purohit, Kathleen Yang, N. Pattan, D. Siewiorek, A. Smailagic, I. Lane, P. Zhang, VMA: An Inexpensive Indoor Acoustic Sensing Platform for In-home Patient Monitoring, The 8th International Conference on Mobile Systems, Applications, and Services. June, 2010.

Aveek Purohit and Pei Zhang. "SensorFly: A Controlled-Mobile Aerial Sensor Network". SenSys 2009. The Seventh ACM Conference on Embedded Networked Sensor Systems. Demo Session Nov, 2009. (best demo award)

Omar Abdul Baki, Tony Lin, Martin Griss, Joy Zhang and Pei Zhang. "A Mobile Application to Detect of Abnormal Patterns of Activity". In The First Annual International Conference on Mobile Computing, Applications, and Services (MobiCASE 2009).

Hari, Pradip; Ko, Kevin; Koukoumidis, Emmanouil; Kremer, Ulrich; Martonosi, Margaret; Ottoni, Desiree; Peh, Li-Shiuan; Zhang, Pei. "SARANA: language, compiler and run-time system support for spatially aware and resource-aware mobile computing". Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, vol. 366, issue 1881, pp. 3699-3708, Oct. 2008.

Pei Zhang and Margaret Martonosi. "LOCALE: Collaborative Localization Estimation for Sparse Mobile Sensor Networks", The International Conference on Information Processing in Sensor Networks (IPSN 2008), Apr 2008.

Vincent Lenders, Emmanouil Koukoumidis, Pei Zhang and Margaret Martonosi. "Location-based Trust for Mobile User-Generated Contents: Applications, Challenges and Implementations". The 9th IEEE Workshop on Mobile Computing Systems and Applications (HotMobile 2008), Feb 2008.

Yong Wang, Pei Zhang, Ting Liu, Chris Sadler and Margaret Martonosi. "Movement Data Traces from Princeton ZebraNet Deployments". CRAWDDAD Database. <http://crawdad.cs.dartmouth.edu/>. 2007.

Trevor Pering, Pei Zhang, Rohit Chaudhri, Yaw Anokwa and Roy Want. "The PSI Board: Realizing a Phone-Centric Body Sensor Network", 4th International Workshop on Wearable and Implantable Body Sensor Networks (BSN2007). Mar, 2007.

Pei Zhang, Chris Sadler and Margaret Martonosi. "Middleware for Long-term Deployment of Delay-tolerant Sensor Networks", The First International Workshop on Middleware for Sensor Networks (MidSens'06). Nov, 2006.

Pei Zhang and Margaret Martonosi. "Energy Adaptation Techniques to Optimize Data Delivery in Store-and-Forward Sensor Networks", The Fourth ACM Conference on Embedded Networked Sensor Systems. Nov, 2006.

Pei Zhang, Christopher M. Sadler, Steve A. Lyon, and Margaret Martonosi. "Hardware Design Experiences in ZebraNet", SenSys 2004. The Second ACM Conference on Embedded Networked Sensor Systems. Nov, 2004.

T. Liu, C. Sadler, P. Zhang, and M. Martonosi. "Implementing Software on Resource-Constrained Mobile Sensors: Experiences with Impala and ZebraNet", Mobisys 2004. The Second International Conference on Mobile Systems, Applications, and Services. June, 2004.

Pei Zhang, Zheng Sun, Aveek Purohit, Trevor Pering. PANDAA: A Physical Arrangement

PATENT ACTIVITY	Detection Technique for Networked Devices through Ambient-Sound. (Invention Disclosure submitted) Dec 2011.	
MEDIA COVERAGE	<p>“SensorFly”, CBS Interactive, April 2011. http://www.smartplanet.com/video/carnegie-mellons-flying-robots-could-assist-firefighters-in-search-and-rescue/6215982</p> <p>“Michio Kaku's Sci Fi Science: Physics of the Impossible”, Discovery’s Science Channel, Sep 2010. http://science.discovery.com/videos/sci-fi-science-ii-cheap-exploration.html</p> <p>“SensorFly”, Spigot Science Magazine for Kids and Classrooms July 2010.</p> <p>“Swarm Bots”, BBC Focus Magazine, Mar 2010</p> <p>“Aerobot Invasion : World’s Newest & Most Spectacular Unmanned Aircraft”, POPULAR SCIENCE, Mar 2010</p> <p>“Networked surveillance minicopters can't be kept down”, NEW SCIENTIST, Nov 2009</p> <p>“SensorFly robots hunt in packs and can take a battering”, WIRED, Nov 2009</p> <p>“Self-righting autonomous swarming robots”, MAKEZINE, Nov 2009</p> <p>“SensorFly survives racket beatdown”, BOT JUNKIE, Nov 2009</p> <p>“SensorFly Wins Best Demo at SenSys 2009”, Carnegie Mellon CIT Feature, Nov 2009</p> <p>“SensorFly for Hazardous Situations”, Carnegie Mellon Homepage Stories, Aug 2009</p>	
PRIOR PROFESSIONAL EXPERIENCE	Princeton University, Department of Electrical Engineering, <i>Research Assistant</i> , The ZebraNet and SARANA projects, Prof. Margaret Martonosi	2002 - 2008
	<p><i>ZebraNet</i></p> <ul style="list-style-type: none"> • Designed the ZebraNet hardware, a lightweight, infrastructure-less, mobile node customized for wildlife tracking. • Developed a variety of novel hardware/software energy reduction/scavenging techniques. • Designed the second-generation middleware, with software/protocol for minimizing power consumption in sparse mobile networks. • First real-world deployment of sparse mobile sensor network. Two deployments in central Kenya in Jan 2004 and June 2005. • Developed a delayed-collaboration that utilizes both hardware and software for system-wide localization, energy management. <p><i>SARANA</i></p> <ul style="list-style-type: none"> • Developed a history based energy policy that actively predicts energy usage of applications. • Developed a usage-based methodology for device to throttle their energy usage. • Investigating the portability issues related with mobile phone implementation of the SARANA system, to allow for cross platform collaborations. 	
	Microsoft Research India, Bangalore, India <i>Summer Intern</i> (with Dr. Venkat Padmanabhan)	Summer 2007
	<ul style="list-style-type: none"> • Design and implementation of distributed operating system (DOS) for mobile phones, which enable dynamic distributed application deployment. 	

- Designed a centralized server to distribute sensor applications, and decentralized techniques for a central sever to contact the devices while maintaining user privacy.
- Explored novel collaborative, disruption-tolerant localization techniques from imperfect mobile phone information.

Intel Inc. Santa Clara, CA Summer 2006
Summer Intern (with Dr. Roy Want)

- Participate in designing of a phone interface board which added a number of sensors, enabling novel human-computer interactions.
- Work on the development of driving applications for ubiquitous computing using our mobile phone attachments.
- Explore and designed peripherals to support near field communication (NFC) in mobile phones.

Flarion Technologies, Inc., Summer 2005
Summer Intern (with Frank Lane)

- Power analysis of the Flarion magnemite ASIC
- Develop power model for baseband and RF chipset
- Formulation of micro-architecture design guidelines for low power operation

California Institute of Technology, Pasadena, CA Summer 2002
Research Staff in the Department of Eng. and Applied Science (Professor Theodore Wu)

- Design of experiments for validation of mathematical results of non-linear soliton wave induced long-shore currents.
- Analysis of wave interactions, and induced currents, near inclined beaches

California Institute of Technology, Pasadena, CA Jan 2001 - Jun 2002
Summer Researcher in the Department of Electrical Engineering (Professor Pietro Perona)

- Investigated techniques for inexpensive arsenic detection.
- Design of an inexpensive arsenic-meter for rural water well testing in Bangladesh.
- Involving inexpensive chemical testing along with high accuracy, environmental insensitive, optical measurements to produce a simple to understand indicator.

Boeing Satellite Systems, El Segundo, CA Summer 2001
Summer Intern in the Power Electronics group

- Design and implemented power supply testing equipments.
- Analysis of tapped inductor switching power supply.
- Analysis of various electronic failure modes specific to zero-G and high-G environments.

California Institute of Technology, Pasadena, CA Summer 2000
Summer Researcher in the Department of Electrical Engineering (Professor Glen George)

- Designed and implemented digitally controlled buck-boost (fly-back) power converters.
- Experienced with high speed digital feedback systems.

California Institute of Technology, Pasadena, CA Summer 1999
Summer Researcher in the Department of Eng. and Applied Science (Professor Theodore Wu)

- Designed and ran wave experiments on long-shore current induced by obliquely incident waves.
- Used digital particle image velocimetry system, with algorithm developing for image analysis.
- Written programs for image analysis in C to calculate vector fields.

TESLAcO, Irvine, CA Summer 1998
Summer Intern, (Professor Slobodan Ćuk)

- Constructed customized, high-power power supplies.
- Experience with various switching power supplies including, bang-bang, buck, boost, fly-back, and Ćuk converters.
- Power supply performance and specification testing.

TEACHING
EXPERIENCE

18847 Special Topics in Computer Systems: Mobile Hardware for Software Engineers Spring 09, 10; Fall 10, 11

18843 Mobile and Pervasive Computing Fall 09; Spring 11, 12

Invited Professor, GUCAS Summer 2011
 Mobile and Pervasive Computing

Assistant Instructor, Princeton University Spring 04,05
 ELE 302 System Design and Analysis

Head Teaching Assistant, California Institute of Technology Spring 2002
 EE 90 Analog Electronics Laboratory

Head Teaching Assistant, California Institute of Technology Spring 2002
 EE 105 Application-Specific Computers

Dean's Tutor, California Institute of Technology Spring 2002
 EE/CS 52 Microprocessor Systems Laboratory.

Head Teaching Assistant, California Institute of Technology Winter 2001
 EE 91b Experimental Projects in Electronic Circuits.

Dean's Tutor, California Institute of Technology Winter 2001
 EE/CS 51 Principles of Microprocessor Systems.

Head Teaching Assistant, California Institute of Technology Fall 2001
 EE 91a Experimental Projects in Electronic Circuits.

Dean's Tutor, California Institute of Technology Fall 2001
 EE 50 Advanced Digital Design.

Teaching Assistant, California Institute of Technology Fall 2001
 EE 4 Fundamentals of Digital Systems

Teaching Assistant, California Institute of Technology Spring 2001
 EE 90 Analog Electronics Laboratory

Teaching Assistant, California Institute of Technology Winter 2000
 EE 91b Experimental Projects in Electronic Circuits.

Teaching Assistant, California Institute of Technology Fall 2000

EE 91a Experimental Projects in Electronic Circuits.

RESEARCH COMMUNITY SERVICE	Technical Program Committee: Mobile Sensing: From Smartphones and Wearables to Big Data, Workshop co-located with IPSN '12 and CPSWEEK	2012
	Poster Chair: The 11th ACM/IEEE Conference on Information Processing in Sensor Networks (IPSN)	2012
	Technical Program Committee, Invited Panelist: Mobile Sensing: Challenges, Opportunities and Future Directions	2011
	Technical Program Committee: IEEE Pervasive Computing and Communication (PerCom)	2011
	Panel: SenSys 2011 Doctoral Colloquium	2011
	Invited Panelist: International Workshop on Emerging Mobile Sensing Technologies, Systems, and Applications. In Conjunction with Pervasive 2011	2011
	Technical Program Committee: International Workshop on Emerging Mobile Sensing Technologies, Systems, and Applications. In Conjunction with Pervasive Mobisense 2011	2011
	Session Chair: (Programming and optimization) The 10th International Conference on Information Processing in Sensor Networks (IPSN) 2011	2011
	Technical Program Committee: The 20th International Conference on Computer Communications and Networks (ICCCN 2011)	2011
	Program Committee: International Conference on Wireless Technologies for Humanitarian Relief (ACWR2011)	2011
	Technical Program Committee: The 6th IEEE International Conference on Networking, Architecture, and Storage (NAS 2011)	2011
	Invited Attendee: NSF Workshop on Pervasive Computing at Scale (PeCS)	2011
	Technical Program Committee: ACM MobiCom Workshop on Challenged Networks (CHANTS 2010)	2010
	Demo Chair: The 8th ACM Conference on Embedded Networked Sensor	2010

Systems (SenSys'10)

Editorial Review Board: International Journal of Handheld Computing Research (IJHCR)	2009-present
Technical Program Committee: 16th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2010)	2010
Technical Program Committee: The Fifth International Wireless Internet Conference (WiCON 2010) MAC track	2010
Publicity Chair: 7th European Conference on Wireless Sensor Networks (EWSN 2010)	2010
Poster/Demo Chair: The 11th Workshop on Mobile Computing Systems and Applications (HotMobile'10)	2010
Technical Program Committee: The 19th International Conference on Computer Communications and Networks (ICCCN 2010) WNET track	2010
Publicity Chair: The 7th ACM Conference on Embedded Networked Sensor Systems (SenSys'09)	2009
Demo Chair: The 11th International Conference on Ubiquitous Computing (UbiComp'09)	2009
Technical Program Committee: The 18th International Conference on Computer Communications and Networks (ICCCN 2009) Track on Wireless Ad-hoc and Sensor Networks (WASN)	2009

INVITED TALKS

Cylab Seminar Series, 02/06/2012
Army Research Lab, 11/10/2011
Keynote Speaker, China Computer Federation (CCF) Advanced Disciplines Lectures
(ADL) on the Internet of Things, 09/24/2011
Naval Research Lab 09/28/2011
Shenzhen Institute of Advanced Technology, Chinese Academy of Science 06/27/2011
Tsinghua University 07/06/2011
University of Science and Technology of China 7/4/2011
University of California, Merced 9/9/2011
"Getting to SensorFly: the Path to Swarm Computing" September 9 2010, Nokia Research
Center.
"SensorFly: the Path to Swarm Computing" September 2 2010, AMRITA Center for
Wireless Networks & Applications, AMRITA University.
"Getting to SensorFly: the Path to Swarm Computing", August 10 2010, Microsoft
Research.
"SensorFly: the Path to Swarm Computing" Cylab Partners Conference, 11/12/2010
"Open Floor Display for Firefighter Tracking" Web 2.0 Mapping and Social Networking,

February 16, 2010.

“SensorFly: A Flying Sensor Network” Tsinghua University, 01/05/2010

“SensorFly: A Flying Sensor Network” Harvard University, 10/30/2009

“SensorFly: A Flying Sensor Network” Cylab Partners Conference, 10/15/2009

“SensorFly: A Flying Sensor Network” ARO Review Meeting, 08/17/2009

“Zebras and Swarms: Collaboration in Mobile Sensor Networks” Sun Microsystems,
05/07/2009

UNIVERSITY SERVICE	Faculty Advisor: MSIT Mobility Track	2009-Present
	ECE Graduate Studies Committee	2009-Present
	USTC/CMU-SV Summer Undergraduate Program Chair	2010-Present
	Practicum Faculty Advisor	2010

ADVISING ROLES

Current Ph.D. Students:

Frank Mokaya

Aveek Purohit

Zheng Sun

Master Students

Kathleen Yang

Neha Pattan

Memo Salas

Shuchen Li

Xun Zhou

Kanupriya Tavri

Hong Guo

Divya Vavili

Dilip Gudlur

Qi Zheng

Fabian Popa

Graduated 2009

Graduated 2010

Graduated 2011

Research Interns

Shijia Pan

Kaifei Chen

Cen Chen

2010-2011

2011-2012

Faculty Advisor for MSIT Mobility program students

SOCIETIES AND
AFFILIATIONS

ACM, IEEE Member

ACSSPU Executive Committee,

ACSSPU Vice President (2003-2005)

ACSSPU Social Chair (2002-2003)

2007 - Present

2005 - 2008

2003 - 2005

2002 - 2003

Reviewer for: UbiComp, IEEE Transactions on Mobile Computing, ACM Transactions on Sensor Networks, IEEE Pervasive Computing magazine, Pervasive and Mobile Computing, NSDI, SenSys, MobiSys, MidSen, ICCCN,

