Shane B. Eisenman

Contact Information

Email: shane@ee.columbia.edu
Web: www.ee.columbia.edu/∼shane

Summary of Qualifications

Ph.D. in Electrical Engineering with a concentration of knowledge in wireless computer networking. Six years of research experience designing wireless communication architectures and protocols for embedded sensor networks. Eight years of professional experience developing products in the wireless/cellular industry.

Education

Columbia University, The Fu Foundation SEAS, New York, NY

- Ph. D. Electrical Engineering (10/2008)
  Thesis: "People-Centric Mobile Sensing Networks"
- M. Ph. Electrical Engineering (02/2007), GPA: 4.0 (30 credits)
- M. Sc. Electrical Engineering (02/2003), GPA: 3.9 (30 credits)
  Concentration in Multimedia Networks

Binghamton University, Thomas J. Watson School, Binghamton, NY

- B. Sc. Electrical Engineering (05/1998), GPA: 3.2 (152 credits)

Industry Experience

11/2008 - Present ⋄ Harris Corporation, RF Communications ⋄ Rochester, NY
Electrical Engineer - Networking and Advanced Development

- **Engineering Manager (2012)**

  - Drive strategic direction of ANW2 software product. Evaluate intersection of new capability push and market pull via consultation with Sales, Product Management and the customer base.
  - Manage budget and staffing for a team of 15 engineers across multiple software development projects and product releases.

- **Principal Engineer (2010)**

  - Provide day-to-day technical leadership of 8 person software development team.
  - Accountable for quality and schedule across multi-feature, multi-product software releases. Create, maintain and track project status via MS Project and JIRA.

- **Senior Engineer (2008)**

  - Lead feature design, development and verification for an ad hoc networking software product. Development using C/C++. Code Collaborator to drive quality via peer review.
  - Support marketing and sales via product demonstration to internal and external customers.

06/2005 - 09/2005 ⋄ Intel Corporation, Intel Research - SNO ⋄ Hillsboro, OR
Intern, under the mentorship of Mark D. Yarvis

- Development, using C and nesC, of a mechanism for management of configuration parameters in a sensor network, in support of a trial customer deployment.

- Evaluation of problems and options for cross-platform software development in sensor networks, in particular for networks comprising Intel Mote 2 and Stargate hardware platforms.

- Increased the modularity and coverage of performance measurement currently in use in the organization.

06/2004 - 08/2004 ⋄ Telcordia Technologies, Applied Research ⋄ Piscataway, NJ
Intern, under the mentorship of Mark W. Garrett

- Study of the challenges designing a service architecture for a DiffServ-enabled network, including determination of the appropriate number of service classes and choice of queueing disciplines.

- Development, using C, of a network topology generator compatible with the OpNet network simulator. The software utility takes node aggregation and geographical granularity into consideration.

- Configuration of routers/switches (CISCO IOS) and product feature enhancement in support of an application layer quality of service project.

01/2000 - 09/2001 ⋄ Lucent Technologies, Wireless Networks ⋄ Mt.Olive, NJ
Test Engineer - Software/Hardware Development

- 3G Wideband CDMA system test strategy and platform development for the Radio Network Controller and Multimedia Processing Environment network components. These provide base station control and multimedia signal processing capabilities. Customer demonstration of platform/strategy implementation to NTT DoCoMo.

- 3G Wideband CDMA software and hardware realization for digital circuit functional test, using LabVIEW and C for application development.

- Design and implementation of a suite of self-test routines for the Digital Test Platform, an internal product for functional test of base station digital circuit packs.

06/1998 - 12/1999 ⋄ Harris Corporation, RF Communications ⋄ Rochester, NY
Test Engineer - Software/Hardware Support

- Factory-floor manufacturing test software and hardware support for manpack and vehicle-mounted multiband military radios.

- Circuit/System-level test software and hardware development, using LabVIEW for application development.

- Circuit-level test auditing to pinpoint and minimize test escapes and reduce test time.

Research Experience

1/2003 - 10/2008 ⋄ Columbia University, COMET Group ⋄ New York, NY
Graduate Research Assistant - Developing communication and resource management algorithms and protocols for experimental systems of wirelessly networked sensors under the supervision of Prof. Andrew Campbell.

- **MetroSense Project**
  Mobile Sensing Architecture: Design of the **MetroSense (WICON'06)** architecture for mobile people-centric sensing. The architecture uses an opportunistic sensor networking paradigm that leverages the uncontrolled mobility of people and vehicles, providing coverage of the sensor custodians and their environments with a relatively sparse deployment of sensors. MetroSense aims to symbiotically utilize existing networking, computation and sensing infrastructure and devices (e.g., cellular phones), exploit resource asymmetry, and focus on localized interaction to contain the complexity inherent in a mobile network. We have analyzed the paradigm in the context of **BikeNet (SenSys'07)**, a mobile sensing system for cyclist experience mapping.

Mobile Sensor Sharing: Node heterogeneity in terms of sensing capability and variable sampling context require an adaptive approach to answering application queries. Using opportunistic *in situ* sensor sharing, nodes can return higher fidelity data to applications while also relaxing constraints on query assignment to mobile sensors.

Mobile Sensor Reachability: Reliance on uncontrolled human mobility can lead to higher delay in answering queries, which may be inconvenient for delay-aware applications that need data by a deadline for it to be of greatest value. **Halo (DCOSS'10)** efficiently, in terms of packet overhead and mobile sensor energy, provides improved delay performance by managing mobile node interactions and applying mobility-informed scheduling to query assignment and data collection operations.

- **The Armstrong Project**
  Medium Access Control: Design and analysis of **q-MAC (IPSN'06)** a channel access scheme to eliminate packet collisions in wireless sensor networks due to the idle channel detection delay and the hidden transmitter problem. Design, test bed implementation and evaluation of **E-CSMA (INFOCOM'07)**, which aims to enhance the de facto state of carrier sensing-based MACs in wireless sensor networks by using low cost channel feedback combined with a learning approach to try to better predict the probability of a successful reception, on a per-receiver basis. Used TinyOS software with Mica2 mote hardware.

  Congestion Control: Experimental test bed implementation and evaluation of a congestion control framework for wireless sensor networks including **CODA (SenSys'03)**, a set of informed rate-control algorithms, and **Siphon (SenSys'05)**, a fidelity-enhancing on-demand overlay service. Used TinyOS software with Rene2, Mica and Mica2 mote hardware platforms. CODA TinyOS code is freely available for download from the Armstrong Project web page.

  Reliable Transport: NS-2 simulation development, experimental test bed implementation and evaluation of a reliable transport protocol for wireless sensor networks called **PSFQ (JSAC'05)** (pump slowly, fetch quickly). Used TinyOS software with the Rene2 and Mica mote hardware platforms. TinyOS code is freely available for download from the Armstrong Project web page.

  Experimental demonstration of the integration of the Armstrong Project's resilient transport components, **PSFQ**, **CODA** and **Siphon** shown at ACM SenSys 2004.

Publications

Chieh-Yih Wan, Shane B. Eisenman and Andrew T. Campbell, "Energy-Efficient Congestion Detection and Avoidance in Sensor Networks," In *ACM Transactions on Sensor Networks*, Vol. 7, Iss. 4, November 2011.

Nicholas D. Lane, Ye Xu, Hong Lu, Shane B. Eisenman, Tanzeem Choudhury and Andrew T. Campbell, "Cooperative Communities (CoCo): Exploiting Social Networks for Large-scale Modeling of Human Behavior," In *IEEE Pervasive Computing*, Vol. 10, Iss. 4, pp. 45-53, October 2011.

Shane B. Eisenman, Hong Lu and Andrew T. Campbell, "Halo: Managing Node Rendezvous in Opportunistic Sensor Networks", In *Proc. of the 6th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS '10)*, Santa Barbara, June 21-23, 2010.

Hong Lu, Nicholas D. Lane, Shane B. Eisenman and Andrew T. Campbell, "Bubble Sensing: Binding Tasks to the Physical World," In *Elsevier Pervasive and Mobile Computing*, Vol. 6, Iss. 1, pp. 58–71, February 2010.

Shane B. Eisenman, Emiliano Miluzzo, Nicholas D. Lane, Ronald A. Peterson, Gahng-Seop Ahn, and Andrew T. Campbell, "BikeNet: A Mobile Sensing System for Cyclist Experience Mapping," In *ACM Transactions on Sensor Networks*, Vol. 6, Iss. 1, pp. 1–39, December 2009.

Mirco Musolesi, Emiliano Miluzzo, Nicholas D. Lane, Shane B. Eisenman, Tanzeem Choudhury and Andrew T. Campbell, "Integrating Real-world Experience in Virtual Worlds using Mobile Phones" (Demo Abstract), In *Proc. of the 6th ACM International Conference on Embedded Networked Sensor Systems (SENSYS '08)*, Raleigh, November 5-7, 2008.

Andrew T. Campbell, Shane B. Eisenman, Kristóf Fodor, Nicholas D. Lane, Hong Lu, Emiliano Miluzzo, Mirco Musolesi, Ronald A. Peterson and Xiao Zheng, "Transforming the Social Networking Experience with Sensing Presence from Mobile Phones" (Demo Abstract), In *Proc. of the 6th ACM International Conference on Embedded Networked Sensor Systems (SENSYS '08)*, Raleigh, November 5-7, 2008.

Andrew T. Campbell, Shane B. Eisenman, Kristóf Fodor, Nicholas D. Lane, Hong Lu, Emiliano Miluzzo, Mirco Musolesi, Ronald A. Peterson and Xiao Zheng, "Sensing Meets Mobile Social Networks: The Design, Implementation and Evaluation of the CenceMe Application," In *Proc. of the 6th ACM International Conference on Embedded Networked Sensor Systems (SENSYS '08)*, Raleigh, November 5-7, 2008.

Shane B. Eisenman, "People-Centric Mobile Sensing Networks," *Ph.D. Dissertation, Columbia University*, October 2008.

Andrew T. Campbell, Shane B. Eisenman, Nicholas D. Lane, Emiliano Miluzzo, Ronald A. Peterson, Hong Lu, Xiao Zheng, Mirco Musolesi, Kristóf Fodor, and Gahng-Seop Ahn, "The Rise of People-Centric Sensing", In *IEEE Internet Computing: Mesh Networking*, pp. 12-21, July/August, 2008.

Shane B. Eisenman, Nicholas D. Lane and Andrew T. Campbell, "Techniques for Improving Opportunistic Sensor Networking Performance", In *Proc. of the 4th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS '08)*, pp. 157-175, Santorini, June 11-14, 2008.

Mirco Musolesi, Emiliano Miluzzo, Nicholas D. Lane, Shane B. Eisenman, Tanzeem Choudhury and Andrew T. Campbell, "The Second Life of a Sensor Integrating Real-world Experience in Virtual Worlds using Mobile Phones", In *Proc. of the 5th Workshop on Embedded Sensor Networks (HotEmNets '08)*, Charlottesville, June 2-3, 2008.

Andrew T. Campbell, Shane B. Eisenman, Kristóf Fodor, Nicholas D. Lane, Hong Lu, Emiliano Miluzzo, Mirco Musolesi, Ronald A. Peterson and Xiao Zheng, "CenceMe: Injecting Sensing Presence into Social Network Applications using Mobile Phones" (Demo Abstract), In *Proc. of ACM 9th International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc'08)*, Hong Kong, May 26-30, 2008.

Nicholas D. Lane, Hong Lu, Shane B. Eisenman, Andrew T. Campbell, "Cooperative Techniques Supporting Sensor-based People-centric Inferencing," In *Proc. of Sixth Conf. on Pervasive Computing*, pp. 75-92, Sydney, May 19-22, 2008.

Hong Lu, Nicholas D. Lane, Shane B. Eisenman, and Andrew T. Campbell, "Bubble-Sensing: A New Paradigm for Binding a Sensing Task to the Physical World using Mobile Phones", In *Proc. of International Workshop on Mobile Devices and Urban Sensing*, St. Louis, April 21, 2008.

Andrew T. Campbell, Shane B. Eisenman, Kristóf Fodor, Nicholas D. Lane, Hong Lu, Emiliano Miluzzo, Mirco Musolesi, Ronald A. Peterson, and Xiao Zheng, "CenceMe: Injecting Sensing Presence into Social Network Applications using Mobile Phones" (Demo Abstract), Presented at *Ninth Workshop on Mobile Computing Systems and Applications (HotMobile 2008)*, Napa Valley, February 25-26, 2008.

Nicholas D. Lane, Shane B. Eisenman, Mirco Musolesi, Emiliano Miluzzo, Andrew T. Campbell, "Urban Sensing Systems: Opportunistic or Participatory?," In *Proc. of Ninth Workshop on Mobile Computing Systems and Applications (HotMobile 2008)*, pp. 11-16, Napa Valley, February 25-26, 2008.

Shane B. Eisenman, Emiliano Miluzzo, Nicholas D. Lane, Ronald A. Peterson, Gahng-Seop Ahn, and Andrew T. Campbell, "The BikeNet Mobile Sensing System for Cyclist Experience Mapping," In *Proc. of Fifth ACM Conference on Embedded Networked Sensor Systems (SenSys 2007)*, pp. 87-101, Sydney, November 6-9, 2007.

Nicholas D. Lane, Shane B. Eisenman, Mirco Musolesi, Emiliano Miluzzo, Andrew T. Campbell, "Urban Sensing: Opportunistic or Participatory? (Extended Abstract)", Presented at *Workshop on Sensing on Everyday Mobile Phones in Support of Participatory Research*, Sydney, November 6, 2007.

Emiliano Miluzzo, Nicholas D. Lane, Shane B. Eisenman, Andrew T. Campbell, "CenceMe - Injecting Sensing Presence into Social Networking Applications" (Invited paper), In *Proc. of Second European Conference on Smart Sensing and Context (EuroSSC 2007)*, pp. 1-28, Kendall, UK, October 23-25, 2007.

Chieh-Yih Wan, Shane B. Eisenman, Andrew T. Campbell and Jon Crowcroft, "Overload Traffic Management for Sensor Networks," In *ACM Transactions on Sensor Networks*, Vol. 3, Iss. 4, pp. 1-35, November 2007.

Shane B. Eisenman and Andrew T. Campbell, "E-CSMA: Supporting Enhanced CSMA Performance in Experimental Sensor Networks using Per-neighbor Transmission Probability Threshold", In *Proc. of 26th IEEE INFOCOM*, pp. 1208-1216, Anchorage, May 6-12, 2007.

Shane B. Eisenman, Nicholas D. Lane, Emiliano Miluzzo, Ronald A. Peterson, Gahng-Seop Ahn and Andrew T. Campbell, "MetroSense Project: People-Centric Sensing at Scale," In *Proc. of Workshop on World-Sensor-Web (WSW 2006)*, pp. 6-11, Boulder, October 31, 2006.

Shane B. Eisenman and Andrew T. Campbell, "SkiScape Sensing" (poster abstract), In *Proc. of Fourth ACM Conference on Embedded Networked Sensor Systems (SenSys 2006)*, pp. 401-402, Boulder, November 1-3, 2006.

Andrew T. Campbell, Shane B. Eisenman, Nicholas D. Lane, Emiliano Miluzzo and Ronald A. Peterson, "People-Centric Urban Sensing" (Invited Paper), In *Proc. of Second ACM/IEEE International Conference on Wireless Internet (WiCon 2006), ACM Int'l Conf. Proc. Series*, Vol. 220, No. 18, Boston, August 2-5, 2006.

Shane B. Eisenman and Andrew T. Campbell, "Structuring Contention-based Channel Access in Wireless Sensor Networks," In *Proc. of Fifth International Conference on Information Processing in Sensor Networks (IPSN 2006)*, pp. 226-234, Nashville, April 19-21, 2006.

Chieh-Yih Wan, Shane B. Eisenman and Andrew T. Campbell, "Siphon: Overload Traffic Management using Multi-Radio Virtual Sinks," In *Proc. of Third ACM Conference on Embedded Networked Sensor Systems (SenSys 2005)*, pp. 116-129, San Diego, November 2-4, 2005.

Chieh-Yih Wan, Shane B. Eisenman and Andrew T. Campbell, "CODA + PSFQ + Virtual Sinks = Enabling Technologies for Resilient Sensor Networking" (Demo Abstract), In *Proc. of Second ACM Conference on Embedded Networked Sensor Systems (SenSys 2004)*, pp. 308, Baltimore, November 3-5, 2004.

Shane B. Eisenman, Chieh-Yih Wan and Andrew T. Campbell, "PSFQ++: Critique and Suggestions for Sources-to-Sink Reliable Transport," *Technical Report CU/EE/TAP-TR-2004-11-002*, November 10, 2004.

Shane B. Eisenman and Chieh-Yih Wan, "Possibility for Collision Detection using a Single Radio Channel", *Technical Report CU/EE/TAP-TR-2004-05-001*, May 13, 2004.

Chieh-Yih Wan, Shane B. Eisenman and Andrew T. Campbell, "CODA: Congestion Detection and Avoidance in Sensor Networks", In *Proc. of First ACM Conference on Embedded Networked Sensor Systems (SenSys 2003)*, pp. 266-279, Los Angeles, November 5-7, 2003.

Teaching Experience

01/2004 - 05/2004 ⋄ Columbia University ⋄ New York, NY
Teaching Assistant for the undergraduate course Digital Systems Laboratory (3082) in the Electrical Engineering department. Received the Outstanding Teaching Assistant Award for this course.

09/2003 - 12/2003 ⋄ Columbia University ⋄ New York, NY
Teaching Assistant for the graduate course Wireless and Mobile Networking I (6950) in the Electrical Engineering department.

07/2003 - 08/2003 ⋄ Columbia University ⋄ New York, NY
Teaching Assistant for the undergraduate course Introduction to Cryptography (3995) in the Computer Science department.

Accreditations, Awards and Activities

New York State Fundamentals of Engineering Certificate.

IEEE Member since 1996, Communications Society Member.

Dean's Honors List, Fall 1997 and Spring 1998.

Outstanding Teaching Assistant award, Columbia University, Spring 2004.

Reviewer for:

- ACM: Communications magazine, Distributed Computing in Sensor Systems, Mobile Computing and Communications Review, Transactions on Sensor Networks, Human Factors in Computing Systems
- IEEE: Communications Letters, Globecom, INFOCOM, Information Processing in Sensor Networks, International Conference on Communications, Internet Computing Magazine, MILCOM, Transactions on Wireless Communications, Wearable Computing Symposium, Wireless Communications magazine, WCNC, WoWMoM
- Other: Elsevier Computer Networks, European Conference on Sensor Networks, USENIX Symposium on Networks Systems Design and Implementation