

AARON S. CRANDALL

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EDUCATION

Washington State University, Pullman, WA

- Ph.D., Computer Science February 2011
 - Dissertation Topic: “*Behaviometrics for Multiple Residents in a Smart Environment*”
 - Advisor: Diane J. Cook

Oregon Health & Science University, Portland, OR

- M.S., Computer Science March 2007

University of Portland, Portland, OR

- B.S., Electrical Engineering December 2000

RESEARCH

Research Interests:

- Artificial Intelligence, Smart Environments, Behaviometrics, Gerontechnology, Engineering of Ubiquitous Computing, Big & Behavioral Data, User Experience

PUBLICATIONS

Citation Metrics as of Fall 2013:

h-index: 7 || g-index: 13

DISSERTATION

Aaron S. Crandall. *Behaviometrics for Multiple Residents in a Smart Environment*. PhD thesis, Washington State University, 2011.

ARTICLES IN REFEREED SCIENTIFIC JOURNALS

Brian L. Thomas, Aaron S. Crandall, and Diane J. Cook. An exploration of motion detector sensor placement in smart environments. *Journal of Ambient Intelligence and Smart Environments*, 2014. [To Appear].

Diane J. Cook, Aaron S. Crandall, Brian L. Thomas, and Narayanan C. Krishnan. CASAS: A smart home in a box. In *Computer*, volume 46, pages 26–33. IEEE, 2013.

Adriana M. Seelye, Maureen Schmitter-Edgecombe, Diane J. Cook, and Aaron Crandall. Naturalistic assessment of everyday activities and prompting technologies in mild cognitive impairment. *Journal of the International Neuropsychological Society*, 19(4):442–452, 2013.

Chao Chen, Diane J. Cook, and Aaron S. Crandall. The user side of sustainability: Modeling behavior and energy usage in the home. *Pervasive and Mobile Computing*, 9(1):161–175, 2013.

Diane J. Cook, Aaron S. Crandall, Geetika Singla, and Brian Thomas. Detection of social interaction in smart spaces. *Cybernetics and Systems: An International Journal*, 41(2):90–104, 2010.

Aaron S. Crandall and Diane J. Cook. Coping with multiple residents in a smart environment. *Journal of Ambient Intelligence and Smart Environments*, 1(4):323–334, 2009.

ARTICLES IN REFEREED SCIENTIFIC VOLUMES AND CONFERENCE PROCEEDINGS

Leah Zulas, Aaron S. Crandall, and Maureen Schmitter-Edgecombe. Caregiver needs from elder care assistive smart homes: Children of elder adults assessment. In *Human Factors and Ergonomics Society*, 2014. [Under Review].

Aaron S. Crandall, Leah Zulas, Kyle Feuz, Narayanan Chatapuram Krishnan, and Diane J. Cook. Visualizing your ward: Bringing smart home data to caregivers. In *Emerging Technologies for Healthcare and Aging Workshop in the Proceedings of Computer Human Interaction, CHI'12*, 2012.

Leah Zulas, Aaron S. Crandall, Maureen Schmitter-Edgecombe, and Diane J. Cook. Caregiver needs from elder care assistive smart homes: Nursing assessment. In *Human Factors and Ergonomics Society*, volume 56, pages 125–129, 2012.

Aaron S. Crandall and Diane J. Cook. Smart home in a box: A large scale smart home deployment. In *Workshop on Large Scale Intelligent Environments, WOLSIE'12*, pages 169–178, 2012.

Brian L. Thomas and Aaron S. Crandall. A demonstration of PyViz, a flexible smart home visualization tool. In *IEEE International Conference on Pervasive Computing and Communications Workshops, PerCom Workshops*, pages 304–306, March 2011.

Aaron S. Crandall and Diane J. Cook. Using a Hidden Markov Model for resident identification. In *Proceedings of the International Conference on Intelligent Environments, IE'10*, pages 74–79, 2010.

Diane Cook, Maureen Schmitter-Edgecombe, Aaron Crandall, Chad Sanders, and Brian Thomas. Collecting and disseminating smart home sensor data in the casas project. In *CHI Workshop on Developing Shared Home Behavior Datasets to Advance HCI and Ubiquitous Computing Research, CHI '09*, 2009.

Aaron S. Crandall and Diane J. Cook. Attributing events to individuals in multi-inhabitant environments. In *IET International Conference on Intelligent Environments, IE '08*, pages 1–8, Amsterdam, The Netherlands, 2008a. IOS Press.

Aaron S. Crandall and Diane J. Cook. Resident and caregiver: Handling multiple people in a smart care facility. In *AI in Eldercare: New Solutions to Old Problems*, pages 39–47, Menlo Park, California, USA, 2008b. AAAI Press.

Vikramaditya R. Jakkula, Aaron S. Crandall, and Diane J. Cook. Knowledge discovery in entity based smart environment resident data using temporal relation based data mining. In *Proceedings of the IEEE International Conference on Data Mining Workshops, ICDM'07*, pages 625–630, Washington, DC, USA, October 2007a. IEEE Computer Society.

Vikramaditya R. Jakkula and Diane J. Cook. Using temporal relations in smart environment data for activity prediction. In *Proceedings of the 24th International Conference on Machine Learning*, 2007.

Vikramaditya Jakkula, Diane J. Cook, and Aaron S. Crandall. Temporal pattern discovery for anomaly detection in a smart home. In *The IET International Conference on Intelligent Environments, IE '07*, pages 339–345, September 2007b.

MONOGRAPHS AND BOOK CHAPTERS

- A. Leah Zulas and Aaron S. Crandall. Assessing professional caregiver needs in assistive smart homes. In *Handbook of Smart Homes, Health Care and Well-being*. 2014. [To Appear].
- Aaron S. Crandall and Diane J. Cook. Behaviometrics for multiple residents in a smart environment. In *Human Aspects in Ambient Intelligence*, pages 55–71. Springer, 2013.
- Aaron S. Crandall and Diane J. Cook. Tracking systems for multiple smart home residents. In B. Gottfried and H. Aghajan, editors, *Behaviour Monitoring and Interpretation*, volume 9 of *Ambient Intelligence and Smart Environments*. IOS Press, Nieuwe Hemweg 6B, 1013 BG Amsterdam, The Netherlands, April 2011.
- Aaron S. Crandall and Diane J. Cook. Learning activity models for multiple agents in a smart space. In Hideyuki Nakashima, Hamid Aghajan, and Juan Carlos Augusto, editors, *Handbook of Ambient Intelligence and Smart Environments*, pages 751–769. Springer US, 2010a.
- Aaron S. Crandall and Diane J. Cook. Tracking systems for multiple smart home residents. In *Ambient Intelligence and Smart Environments*, pages 65–82. IGI Global, 2010b.
- Vikramaditya R. Jakkula, Aaron S. Crandall, and Diane J. Cook. Enhancing anomaly detection using temporal pattern discovery. In Achilles D. Kameas, Victor Callagan, Hani Hagrass, Michael Weber, and Wolfgang Minker, editors, *Advanced Intelligent Environments*, pages 175–194. Springer US, 2009.
- Aaron S. Crandall. Survive catastrophic internet loss (hack #45). In *BSD Hacks*. O’Reilly Media, 2004.

OTHER SCIENTIFIC PUBLICATIONS

- Aaron S. Crandall, Brian L. Thomas, and Diane J. Cook. Exploring smart home sensor placement algorithms. In *Washington State University Academic Showcase*, 2012.
- Aaron S. Crandall and Diane J. Cook. Bayesian updating for individual tracking in smart homes. In *Washington State University Academic Showcase*, 2010.
- Aaron S. Crandall and Diane J. Cook. Smart home resident detection and identification using simple sensors. In *Washington State University Academic Showcase*, 2008.
- Aaron S. Crandall, Diane J. Cook, Jim Kusznir, and Brian Thomas. CASAS project: A comprehensive smart home research testbed. In *Washington State University Academic Showcase*, 2008.

SUPPORT

Funding expected shortly:

- Training Program for Undergraduate Gerontechnologists (CO-Investigator with Diane Cook and Maureen Schmitter-Edgecombe), HHS, NIH R-25 Education Grants (Score: 11), \$1,604,828

Submitted, Under Review:

- Quantifying and Forecasting Functional Independence for Rehabilitation Using Ambient Intelligence (PI), NSF SCH, \$636,016
- Technology to improve well-being in people with movement disorders, (Senior Personnel), NSF SCH, \$733,135
- Student Server “Mini Condos” (PI), J.L. Stubblefield Trust, \$20,000
- Better Seats for Better Engineers: Computer Lab Upgrades (PI), J.L. Stubblefield Trust, \$20,000

SOLICITED DONATIONS

- Student Server Mini “Condos,” Private Donations: \$2,500 2013
 - Kinect Sensors for Senior Capstone Project, Microsoft: \$1,000 2013
 - MedMinder Intelligent Pill System, MedMinder: \$650 2013
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PATENTS

USPTO:

- Activity Recognition in Multi-Entity Environments (US 13/538,882)
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TEACHING EXPERIENCE

Instructor:

- Security Basics, *CptS 499, WSU* Fall 2012 & 2013
Hands-on lecture and workshop course to introduce students to the security of computers, systems, and networks.
- Linux IT Basics, *CptS 499, WSU* Spring 2012
Developed a hands-on lecture and workshop course to introduce students to using Linux as a platform to provide network services.

Co-Instructor:

- Special Topics in Machine Learning, *CptS 580, WSU* Fall 2011
Developed materials on: Neural Networks, Evolutionary Computation, Clustering, and Self-Organizing Maps
- Advanced Distributed Systems, *CptS 580, WSU* Spring 2011

Guest Lecturer: Lectured in place of the primary instructor on an as-needed basis.

- Gerontechnology, *CptS 580 / Psych 507, WSU* 2012
Developed course material on topics of: sensors, data, and smart home technologies
- Programming Tools, *CptS 224, WSU* 2009–2011
Developed course material on topics of: source control, debugging, and Make
- Distributed Systems, *CptS 464, WSU* 2010
Developed course material on topics of: pervasive computing
- Introduction to Artificial Intelligence, *CptS 440, WSU* 2009

Teaching Assistant:

- Concurrent Programming, *CptS 483/580, WSU* Fall 2009
- Introduction to Artificial Intelligence, *CptS 440/540, WSU* Spring 2008, Fall 2009
- Program Design and Development, *CptS 121, WSU* Fall 2008
- Computer Security, *CptS 427/527, WSU* Spring 2008
- Parallel Processing, *CptS 580, WSU* Spring 2008
- Neural Networks, *CptS 434/534, WSU* Fall 2007 & 2008

Lab Section Instructor:

- Program Design and Development, *CptS 121, WSU* Fall 2008
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PROFESSIONAL EXPERIENCE

- Assistant Research Professor**, Washington State University Summer 2012–Present
- WSU’s School of Electrical Engineering and Computer science and the Center for Advanced Studies in Adaptive Systems (CASAS)
 - Research areas include advanced machine learning approaches, human factors for smart home technologies, and large scale smart home deployments
- Postdoctoral Research Associate**, Washington State University Spring 2011–Summer 2012
- Research included novel approaches to sensor placement, gerontechnology user needs surveying, and continued research on tracking and identification
 - Work included construction and maintenance of a large scale smart home research testbed (19 homes), development of research software infrastructure, department recruiting efforts, and senior capstone project advising
- Research Assistant or Teaching Assistant**, Washington State University Fall 2006–December 2010
- Research assistant for WSU’s CASAS research center developing smart homes
 - Teaching assistant for a wide variety of computer science courses, as detailed in the teaching section of this vitae
- R&D Software Engineering Internship**, Schweitzer Engineering Laboratories Summer 2007
- Architected and implemented a C37.118 Synchrophasor network server
- Systems Engineer**, Adaptx Fall 2005–Fall 2006
- IT and software engineer for a growing startup company
- Research Systems Engineer**, Oregon Graduate Institute / OHSU Summer 2002–Summer 2005
- Win32, Solaris, Linux servers, desktops. Wireless network planning and support
- IT Consultant**, Wilco Farmers March 2002
- Windows workstation support and development of sales reporting tools
- Power & Lighting Engineer**, PAE Consulting Engineers Summer 2001–Fall 2001
- Building-scale power design, site surveys and illumination engineering
- Co-Op**, Cypress Semiconductor Summer 2000–Summer 2001
- Ported place and route software from Solaris to Linux
- Telecommunications Student Worker**, The University of Portland Spring 1999–Summer 2000
- Phone, network, and student support. Developed web-based computer registration systems
- Engineering Internship**, Nabisco Co. Summer 1998
- Built network backup systems, networked HVAC controls, and web-based inventory reporting

INVITED TALKS

- Alzheimer’s Association, Heart of America Chapter**, Prairie Village, Kansas
- “Smart Environments for Monitoring Cognitive Decline,” Defining Hope Conference Fall 2013
- Oregon Health & Science University**, Portland, Oregon
- “Smart Environments and Behaviometrics,” Biomedical Eng. & ORCATECH Spring 2012
- Washington State University**, Pullman, Washington
- “WSU CASAS Commercialization Efforts,” WSU i3 Fall 2013
 - “Virtual Currency Technologies and Bitcoin,” Computer Security Group Fall 2013
 - “Smart Environments and Behaviometrics,” WSU Vancouver, ENCS Spring 2012

- “Using SSH,” Linux User’s Group WSU Fall 2010 & 2011
 - “Introduction to Linux,” Linux User’s Group WSU Fall 2010 & 2011
 - “Identification and Tracking of Smart Home Residents,” (Preliminary Exam) Fall 2010
 - “Introduction to Smart Homes,” IEEE Palouse Chapter Fall 2009
 - “Linux Security Fundamentals,” WSU Computer Security Group Fall 2009
- Oregon State University**, Corvallis, Oregon
- “The CASAS Smart Home Research Project,” Computer Science Colloquium Fall 2011
- Cypress Semiconductor**, Beaverton, Oregon
- “Smart Home Technologies,” Cypress Technical Talk Series Fall 2011
- University of Portland**, Portland, Oregon
- “Smart Home Technologies and Elder Care,” ACM Student Chapter Summer 2011
- University College Dublin**, Dublin, Ireland
- “CASAS Smart Homes for Tracking and Behaviometrics Technologies,” CASL Colloquium Summer 2009

AWARDS AND FELLOWSHIPS

- Washington State University**, Pullman, WA
- Computer Science Ph.D. Student of the Year 2008–2009

DEPARTMENTAL SERVICES

- Student Club Advisor: Computer Security Group**, Washington State University 2012–Present
- Serve as faculty advisor for the student group.
- Student Club Advisor: Ham Radio Club**, Washington State University 2013–Present
- Serve as faculty advisor for the student group.
- Senior Capstone Faculty Advisor**, Washington State University 2009, 2010, 2012, & 2013
- Participated in the engineering school’s senior capstone project process by being the faculty advisor to senior design teams.
- Student Recruiting**, Washington State University 2007–Present
- Volunteer to assist during university and departmental recruiting events. These events have included tours of the department research labs, introducing prospective new students to either the undergrad or grad programs.
- College Research Promotional Events**, Washington State University 2008–Present
- Present past and ongoing research within the department to visitors from industry, alumni, fellow research insitutions, and prospective students.

COMMUNITY DEVELOPMENT

- High School Capstone Advisor**, Colfax and Pullman High Schools 2009–2011
- Duties included one on one sessions with local high school seniors interested in a computer science career. The sessions included guided instruction in programming projects, real-world engineering preparation and group work.
- Linux User’s Group WSU**, WSU 2007–2014

- Participated in the LUG student group for events, advocacy and help desk work
 - Served as the group's elected Treasurer for the 2009 & 2010 school years
 - Reconciled group financials with university
 - Spearheaded fund raising for over \$1000/year to fund events
 - Worked on the group's biannual computer gaming events
- Washington State University Computer Security Group, WSU** 2009–2012
- Member of this student group, focused on exploring computer and network security

PROFESSIONAL SOCIETIES AND ACTIVITIES

Lead Guest Editor:

- Journal of Artificial Intelligence and Smart Environments
Thematic Issue on Challenges in Engineering Smart Environments 2014

Demos and Videos Track Committee:

- International Conference on Intelligent Environments (IE) 2014

Advertising Committee:

- International Conference on Intelligent Environments (IE) 2013

Workshop Committee:

- SmartHealthSys (UbiComp) 2014
- Workshop On Large Scale Intelligent Environments (WOLSIE) 2013

Program Committee:

- International Conference on Tools with Artificial Intelligence (ICTAI) 2012 & 2013
- International Workshop on Situation, Activity and Goal Awareness (SAGAware) 2012
- International Conference on Computational Informatics
and Technology Enhanced Education (ICCITEE) 2012 & 2013

Professional Memberships:

- Association for Computing Machinery, Member 2009–present
- Institute of Electrical and Electronics Engineers, Member 2010–present

Society Memberships:

- Lions International, Member 2008–present
- Boy Scouts of America, Eagle Scout

SCIENTIFIC PUBLICATION REVIEWING

Journals:

- North American Power Association (NAPS) 2014
- Pervasive and Mobile Computing 2011–2014
- International Journal of Ad Hoc and ubiquitous Computing 2013
- Computing 2012
- International Journal of Computer Engineering Research (IJER) 2012
- ACM Transactions on Autonomous and Adaptive Systems (TAAS) 2012
- ACM Transactions on Intelligent Systems and Technology (ACM-TIST) 2012
- International Journal of Computer Engineering Research 2012
- Journal of Computer Science and Technology 2010

Conferences:

- Pervasive Computing (PerCom) 2014
- Ubiquitous Computing (UbiComp) 2014
- International Conference on Intelligent Environments 2010 & 2014
- IEEE International Conference on Tools with Artificial Intelligence (ICTAI) 2013
- ACM SIGKDD Conference on Knowledge Discovery and Data Mining 2012
- International Workshop on Situation, Activity and Goal Awareness (SAGAware) 2012
- IEEE SmartGridComm Symposium on Wide-Area Monitoring,
Protection & Control (WAMPAC) 2012
- PerCom Workshop on the Impact of Human Mobility on Pervasive Systems (PerMoby) 2012
- International Conference on Advances in Computing, Comm. and Informatics (ICACCI) 2012
- SeaCube International Workshop Series 2011
- IEEE PerCom Workshop on Smart Environments (SmartE) 2010
- IEEE International Conference on Tools with Artificial Intelligence (ICTAI) 2010
- IEEE Consumer Communications and Networking Conference 2010