

Sean K. Barker

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INTERESTS I am an experimental computer scientist with interests in energy, buildings, and distributed systems.

EDUCATION

- ◇ **University of Massachusetts Amherst**, Ph.D. in Computer Science, September 2014
 - Co-advisors: Prashant Shenoy and David Irwin
 - Dissertation: “Model-Driven Analytics of Energy Meter Data in Smart Homes”
- ◇ **University of Massachusetts Amherst**, M.S. in Computer Science, February 2012
- ◇ **Williams College**, B.A. with Honors in Computer Science, June 2009
 - Advisor: Jeannie Albrecht
 - Thesis: “Kudzu: A Decentralized and Self-Organizing P2P File Transfer System”

PROFESSIONAL ◇ **Assistant Professor, Bowdoin College**

APPOINTMENTS *Department of Computer Science*, Fall 2016 – Present

- ◇ **Visiting Assistant Professor, Bowdoin College**
Department of Computer Science, Fall 2014 – Spring 2016
- ◇ **Teaching Associate, University of Massachusetts Amherst**
School of Computer Science, Spring 2014
- ◇ **Research Assistant, University of Massachusetts Amherst**
School of Computer Science, Fall 2009 – Spring 2014
- ◇ **Research Intern, NEC Laboratories America**
Data Management Department, Summer 2011 and Summer 2012
- ◇ **IT Consultant, Graduate Employee Organization**
University of Massachusetts Amherst, Fall 2010 – August 2017
- ◇ **Engineering Intern, Google**
Developer Operations Team, Summer 2008
- ◇ **Network Programmer, Williams College**
Networks & Systems Team, Summer 2006

HONORS & AWARDS

- ◇ **BuildSys '14 paper** chosen as Best Paper Award runner-up (top 3 of 59 submissions), 2014
- ◇ **PerCom '12 paper** chosen as Best Paper Award runner-up (top 3 of 150 submissions), 2012
- ◇ **ASPLOS '11 paper** chosen as IEEE Sustainable Computing Register Pick of the Month, 2012
- ◇ **NSF Graduate Research Fellowship Honorable Mention**, 2010, 2011

JOURNAL
ARTICLES

Refereed, archival journal articles. Acceptance ratios listed where known.

1. **Building Virtual Power Meters for Online Load Tracking**
Sean Barker, Sandeep Kalra, David Irwin, and Prashant Shenoy. *ACM Transactions on Cyber-Physical Systems (ACM TCPS)*, vol. 3, no. 2, pp. 23:1-23:24, March 2019. 24 pages.
2. **Pervasive Energy Monitoring and Control through Low-Bandwidth Power Line Communication**
Sean Barker, David Irwin, and Prashant Shenoy. *IEEE Internet of Things Journal (IEEE IoT)*, vol. 4, no. 5, pp. 1349-1359, October 2017. 10 pages.
3. **Managing Server Clusters on Intermittent Power**
Navin Sharma, Dilip Krishnappa, Sean Barker, David Irwin, and Prashant Shenoy. *PeerJ Computer Science (PeerJ)* 1:e34, December 2015. 50 pages.
4. **Empirical Characterization, Modeling, and Analysis of Smart Meter Data**
Sean Barker, Sandeep Kalra, David Irwin, and Prashant Shenoy. *IEEE Journal on Selected Areas in Communications (IEEE J-SAC)*, vol. 32, no. 7, pp. 1312-1327, June 2014. 15 pages. Acceptance ratio: $16/57 = 28\%$.

CONFERENCE
PUBLICATIONS

Refereed conference and workshop publications. Underlined coauthors denote Bowdoin undergraduates. Acceptance ratios listed where known.

5. **Powerstrip: High-Performance Compression for Energy Data**
John R. Ward and Sean K. Barker. *Proceedings of the 11th ACM International Conference on Future Energy Systems (ACM e-Energy 2020)*, Virtual Event, Australia, June 2020. 11 pages. Acceptance ratio: $39/125 = 31\%$.
6. **Exploiting Breadth in Energy Datasets for Automated Device Identification**
Sean Barker, Kyle Morrison, and Tucker Williams. *Proceedings of the 10th IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (IEEE SmartGridComm 2019) - Workshop on AI in Energy Systems, Beijing, China, October 2019*. 6 pages.
7. **PowerPlay: Creating Virtual Power Meters through Online Load Tracking**
Sean Barker, Sandeep Kalra, David Irwin, and Prashant Shenoy. *Proceedings of the 1st ACM International Conference on Embedded Systems for Energy-Efficient Buildings (ACM BuildSys 2014)*, Memphis, TN, November 2014. 10 pages. Acceptance ratio: $15/59 = 25\%$. **Best Paper Award runner-up.**
8. **Non-Intrusive Load Identification for Smart Outlets**
Sean Barker, Moaj Musthag, David Irwin, and Prashant Shenoy. *Proceedings of the 5th IEEE International Conference on Smart Grid Communications (IEEE SmartGridComm 2014)*, Venice, Italy, November 2014. 6 pages. Acceptance ratio: $166/399 = 42\%$.
9. **ShuttleDB: Database-Aware Elasticity in the Cloud**
Sean Barker, Yun Chi, Hakan Hacigumus, Prashant Shenoy, and Emmanuel Cecchet. *Proceedings of the 11th IEEE International Conference on Autonomic Computing (IEEE ICAC 2014)*, Philadelphia, PA, June 2014. 11 pages. Acceptance ratio: $12/53 = 22\%$.
10. **Improving the Scalability of Search in Networks Through Multiple Random Walks**
Mark S. Squillante, Don Towsley, and Sean Barker. *Proceedings of the 16th Workshop on Mathematical performance Modeling and Analysis (MAMA 2014)*, Austin, TX, June 2014. 3 pages.
11. **NILM Redux: The Case for Emphasizing Applications over Accuracy**
Sean Barker, Sandeep Kalra, David Irwin, and Prashant Shenoy. *Proceedings of the 2nd International Workshop on Non-Intrusive Load Monitoring (NILM 2014)*, Austin, TX, June 2014. 4 pages.
12. **Non-Intrusive Occupancy Monitoring using Smart Meters**
Dong Chen, Sean Barker, Adarsh Subbaswamy, David Irwin, and Prashant Shenoy. *Proceedings of the 5th ACM Workshop on Embedded Systems for Energy-Efficiency in Buildings (ACM BuildSys 2013)*, Rome, Italy, November 2013. 8 pages. Acceptance ratio: $22/57 = 39\%$.

- CONFERENCE PUBLICATIONS (CONTINUED)
13. **Empirical Characterization and Modeling of Electrical Loads in Smart Homes**
Sean Barker, Sandeep Kalra, David Irwin, and Prashant Shenoy. *Proceedings of the 2013 International Green Computing Conference (IGCC 2013), Arlington, VA, June 2013*. 10 pages.
 14. **Smart*: An Open Data Set and Tools for Enabling Research in Sustainable Homes**
Sean Barker, Aditya Mishra, David Irwin, Emmanuel Cecchet, Prashant Shenoy, and Jeannie Albrecht. *Proceedings of the 2012 Workshop on Data Mining Applications in Sustainability (SustKDD 2012), Beijing, China, August 2012*. 6 pages.
 15. **An Empirical Study of Memory Sharing in Virtual Machines**
Sean Barker, Timothy Wood, Prashant Shenoy, and Ramesh Sitaraman. *Proceedings of the 2012 USENIX Annual Technical Conference (USENIX ATC 2012), Boston, MA, June 2012*. 12 pages. Acceptance ratio: 33/234 = 14%.
 16. **“Cut Me Some Slack”: Latency-Aware Live Migration for Databases**
Sean Barker, Yun Chi, Hyun Jin Moon, Hakan Hacigumus, and Prashant Shenoy. *Proceedings of the 15th International Conference on Extending Database Technology (EDBT 2012), Berlin, Germany, March 2012*. 12 pages. Acceptance ratio: 43/193 = 22%.
 17. **SmartCap: Flattening Peak Electricity Demand in Smart Homes**
Sean Barker, Aditya Mishra, David Irwin, Prashant Shenoy, and Jeannie Albrecht. *Proceedings of the 10th IEEE International Conference on Pervasive Computing and Communications (IEEE PerCom 2012), Lugano, Switzerland, March 2012*. 9 pages. Acceptance ratio: 16/150 = 11%. **Best Paper Award runner-up.**
 18. **Exploiting Home Automation Protocols for Load Monitoring in Smart Buildings**
David Irwin, Anthony Wu, Sean Barker, Aditya Mishra, Prashant Shenoy, and Jeannie Albrecht. *Proceedings of the 3rd ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings (ACM BuildSys 2011), Seattle, WA, November 2011*. 6 pages. Acceptance ratio: 10/29 = 35%.
 19. **Blink: Managing Server Clusters on Intermittent Power**
Navin Sharma, Sean Barker, David Irwin, and Prashant Shenoy. *Proceedings of the 16th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ACM ASPLOS 2011), Newport Beach, CA, March 2011*. 14 pages. Acceptance ratio: 35/152 = 21%. **IEEE Sustainable Computing Register Pick of the Month, June 2012.**
 20. **Empirical Evaluation of Latency-sensitive Application Performance in the Cloud**
Sean K. Barker and Prashant Shenoy. *Proceedings of the 1st ACM Multimedia Systems Conference (ACM MMSys 2010), Scottsdale, AZ, February 2010*. 12 pages. Acceptance ratio: 25/59 = 42%.
- OTHER WORK
21. **Model-Driven Analytics of Energy Meter Data in Smart Homes**
Sean Barker. *Doctoral dissertation, University of Massachusetts Amherst, June 2014*. 122 pages.
 22. **Kudzu: A Decentralized and Self-Organizing Peer-to-Peer File Transfer System**
Sean Barker. *Honors thesis, Williams College, May 2009*. 78 pages.
 23. **Kudzu: A Self Balancing P2P File Transfer System**
Sean Barker, Marius Catalin Iordan, Jeannie Albrecht, and Barath Raghavan. *Poster session of the 3rd Workshop on Tackling Computer Systems Problems with Machine Learning Techniques (SysML 2008), San Diego, CA, December 2008*.
- TECHNICAL TALKS
- ◇ “Powerstrip: High-Performance Compression for Energy Data” at e-Energy 2020.
 - ◇ “Exploiting Breadth in Energy Datasets for Automated Device Identification,” SmartGridComm 2019.
 - ◇ “Energy Analytics for Sustainable Smart Buildings” at Bowdoin, 2016.

- TECHNICAL TALKS (CONTINUED)
- ◇ “Non-Intrusive Load Identification for Smart Outlets” at SmartGridComm 2014.
 - ◇ “NILM Redux: The Case for Emphasizing Applications over Accuracy” at NILM 2014.
 - ◇ “Empirical Characterization and Modeling of Electrical Loads in Smart Homes” at IGCC 2013.
 - ◇ “Smart*: An Open Data Set and Tools for Enabling Research in Sustainable Homes” at SustKDD 2012.
 - ◇ “An Empirical Study of Memory Sharing in Virtual Machines” at USENIX 2012.
 - ◇ “Cut Me Some Slack: Latency-Aware Live Migration for Databases” at EDBT 2012.
 - ◇ “SmartCap: Flattening Peak Electricity Demand in Smart Homes” at PerCom 2012.
 - ◇ “Exploiting Home Automation Protocols for Load Monitoring in Smart Buildings” at BuildSys 2011.
 - ◇ “Empirical Evaluation of Latency-sensitive Application Performance in the Cloud” at MMSys 2010.
- PROFESSIONAL SERVICE
- ◇ Technical Program Committee member:
 - ACM e-Energy (2021, 2020, 2018)
 - ACM BuildSys (2019, 2018, 2017, 2016)
 - NILM (2020, 2016)
 - ◇ Journal reviewer:
 - ACM Transactions on Cyber-Physical Systems (TCPS)
 - ACM Transactions on Internet of Things (TIOT)
 - ACM Transactions on Sensor Networks (TOSN)
 - ACM Transactions on Storage (TOS)
 - IEEE Transactions on Cloud Computing (TCC)
 - IEEE Transactions on Sustainable Computing (T-SUSC)
 - IEEE Journal on Selected Areas in Communication (J-SAC)
 - IEEE Internet of Things Journal (IoT)
 - IEEE Computer Architecture Letters
 - Elsevier Pervasive and Mobile Computing
 - Elsevier Applied Energy
 - Springer Journal of Cloud Computing
- COLLEGE SERVICE
- ◇ Bowdoin committee work:
 - Trustee Beyond Bowdoin Committee (2021)
 - Search Committee for Computer Science (2019, 2016)
 - Curriculum Implementation Committee (CIC) (2017–2019)
 - Executive Director of Career Planning Search Committee (2018)
 - Ad Hoc Committee for Economics (2018)
 - ◇ Bowdoin Science Experience (BSE) faculty mentor (2021, 2015)
 - ◇ Bowdoin Advising in Support of Excellent (BASE) advisor (2021)
- FUNDING
- ◇ Gibbons Program summer fellowship (2021)
 - ◇ Bowdoin Course Development Award for Distributed Systems (2015)
 - ◇ Travel grants: NSF MERIF (2019), USENIX ATC (2012), IEEE PerCom (2012), EDBT (2012)

BOWDOIN
STUDENTS

- ◇ Honors Thesis Supervision
 - Jack Beckitt-Marshall (2020) – “Improving Energy Efficiency through Compiler Optimizations”
 - John (Jack) Ward (2019) – “Powerstrip: Fast, Low-Error Compression of Smart Outlet Data”
 - Dylan Parsons (2018) – “WATTcher: A Low-Configuration Energy Sensing Platform”
- ◇ Summer Research Supervision
 - Charlotte Gehrs (2021) – “Applications of Energy Data Compression in Smart Cities”
 - Nhi Nguyen (2021) – “Impact of Background Devices on Modern Energy Disaggregation”
 - Kyle Morrison (2018) – “Exploring Depth and Breadth in Energy Datasets”
 - Dylan Parsons (2017) – “A Low-Configuration Sensing Platform for Single Electronic Devices”
 - Tucker Williams (2017) – “Machine Learning for Generalization of Appliances in Smart Homes”
 - Ben Wolf (2017) – “Energy Dataset Standardization and Preprocessing”
 - Bridget Went (2016) – “SymmetryWorks! A Computational Approach to Artful Symmetry”
 - Son Ngo (2016) – “SymmetryWorks! A Computational Approach to Artful Symmetry”
 - Lyle (Bo) Bleckel (2016) – “Constructing Models of Building Energy Consumption”
 - James Boyle (2016) – “Automatic Appliance Energy Usage Modeling”
- ◇ Independent Study Supervision
 - Will deBruynKops (2019) – “Exploring Background Device Impact in Energy Disaggregation”
 - Kyle Morrison (2019) – “Exploring Depth and Breadth in Energy Datasets”
 - Demi Feder (2017) – “Visualization Tools for Energy Data”
 - Chris Lu (2016) – “Web and Mobile App Development”

COURSES
TAUGHT

- ◇ Introduction to Computer Science (CSCI 1101) – F16, S16, F15, S15, F14
- ◇ Data Structures (CSCI 2101) – F21, F18, F17
- ◇ Foundations of Computer Systems (CSCI 2330) – F21, S21, F19, F18, S18, S17, S16
- ◇ Operating Systems (CSCI 3310) – S21, S18, F15, F14, S14 (at UMass)
- ◇ Distributed Systems (CSCI 3325) – S19, S15