Josiah D. Hester

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Research Interests

My goal is to make **sophisticated batteryless sensing** a reality. I explore and develop new hardware designs, software techniques, tools, and programming abstractions so that developers can easily design, debug, and deploy intricate batteryless applications that work in spite of frequent power failures. This enables the scale and vision of the Internet-of-Things, where trillions of invisible sensors sense and communicate for applications in wearables, space exploration, smart homes, infrastructure monitoring and wildlife tracking.

My work has received a **Best Paper Award**, two **Best Poster Awards**, and has consistently appeared in top conferences like ACM SenSys, and top journals like ACM TECS.

Education

Clemson University **May 2017**
Ph.D. in Computer Science
Dissertation Title: *Sophisticated Batteryless Sensing*
Advisor: Jacob M. Sorber

Clemson University **2011**
Calhoun Honors College, *General and Departmental Honors*
B.S. in Computer Science, *Cum Laude*

Awards

Best Paper Award, 12th ACM Conference on Embedded Networked Sensor Systems (SenSys'14)

Outstanding Ph.D. Student in Computer Science for 2016, School of Computing, Clemson Univ.[1]

Best Poster Award, 13th ACM Conference on Embedded Networked Sensor Systems (SenSys'15)

Best Poster Award, IEEE International Conference on Sensing, Communication, and Networking (SECON'13)

Student Travel Grants, SenSys'16, HLPC'16, SenSys'15

Clemson Graduate Student Government Professional Enrichment Grants, 2015, 2016

[1] One award per year, voted by SoC faculty.

Publications

Refereed Conference Papers

Amulet: An Energy-Efficient, Multi-Application Wearable Platform
J. Hester, T. Yun, T. Peters, R. Peterson, J. Skinner, B. Golla, K. Storer, S. Hearndon, K. Freeman, S. Lord, R. Halter, D. Kotz, J. Sorber
14th ACM Conference on Embedded Networked Sensor Systems (SenSys'16)
[17.6% acceptance rate]

Tragedy of the Coulombs: Federating Energy Storage for Tiny, Intermittently-Powered Sensors
J. Hester, L. Sitanayah, J. Sorber
13th ACM Conference on Embedded Networked Sensor Systems (SenSys'15)
[19.8% acceptance rate]

Ekho: Realistic and Repeatable Experimentation for Tiny Energy-Harvesting Sensors
J. Hester, T. Scott, J. Sorber
12th ACM Conference on Embedded Networked Sensor Systems (SenSys'14)
[**Best Paper Award**, 17.9% acceptance rate]

Refereed Journal Publications

Realistic and Repeatable Emulation of Energy Harvesting Environments
J. Hester, L. Sitanayah, T. Scott, J. Sorber
ACM Transactions on Sensor Networks (TOSN), (Accepted for Publication)

Shoulder Angel: An Open Platform for Reprogramming Wayward Wireless Sensors
N. Tobias, M. Bolton, J. Hester, J. Sorber
IEEE Embedded Systems Letters, Volume 8, Issue 4 (December 2016)

Persistent Clocks for Batteryless Sensing Devices
J. Hester, N. Tobias, A. Rahmati, L. Sitanayah, D. Holcomb, K. Fu, W. Burleson, J. Sorber
ACM Transactions on Embedded Computing (TECS), 15, 4, Article 77 (August 2016)

uRespond: iPad as Interactive, Personal Response System
S. Bryfczynski, R. Brown, J. Hester, A. Herrmann, D. Koch, M. Cooper, N. Grove
Journal of Chemical Education 2014 91 (3), 357-363

Refereed Workshop Papers

Realistic Simulation for Tiny Batteryless Sensors
M. Furlong, J. Hester, K. Storer, J. Sorber
4th International Workshop on Energy Harvesting & Energy Neutral Sensing Systems (ENSsys'16)

Towards A Language and Runtime for Intermittently Powered Devices
J. Hester, K. Storer, L. Sitanayah, J. Sorber
1st Workshop on Hilariously Low-Power Computing (HLPC'16)

Book Chapters

Classroom Uses for BeSocratic
S. Bryfczynski, R. Brown, J. Hester, A. Herrmann, D. Koch, M. Cooper, N. Grove
The Impact of Pen and Touch Technology on Education, Springer, 2015, 127-136

Other Refereed Works

The Amulet Wearable Platform
J. Hester, T. Yun, T. Peters, R. Peterson, J. Skinner, B. Golla, S. Hearndon, K. Storer,
S. Lord, R. Halter, D. Kotz, J. Sorber
14th ACM Conference on Embedded Networked Sensor Systems (SenSys), November 2016 (Demo)

Sophisticated Sensing on Transient Power
J. Hester
13th ACM Conference on Embedded Networked Sensor Systems (SenSys), November 2015 (PhD Forum)

Towards Robust Reprogrammability for Wireless Sensors
N. Tobias, C. Bolton, J. Hester, L. Sitanayah, J. Sorber
13th ACM Conference on Embedded Networked Sensor Systems (SenSys), November 2015 (Poster)
[**Best Poster Award**]

A Hardware Platform for Separating Energy Concerns in Tiny, Intermittently-Powered Sensors
J. Hester, L. Sitanayah, J. Sorber
13th ACM Conference on Embedded Networked Sensor Systems (SenSys), November 2015 (Demo)

Ekho: Realistic And Repeatable Experimentation For Tiny Energy-harvesting Sensors
J. Hester, T. Scott, J. Sorber
12th ACM Conference on Embedded Networked Sensor Systems (SenSys), November 2014 (Demo)

Enabling Sustainable Sensing in Adverse Environments
J. Hester, L. King, J. Propst, K. Piratla, J. Sorber
IEEE International Conference on Sensing, Communication, and Networking (SECON), June 2013 (Poster)
[**Best Poster Award**]

Research Experience

Research Assistant **2013 – Present**
School of Computing, Clemson University
Advisor: Jacob M. Sorber
Leading a research agenda investigating tools, hardware platforms, and language techniques to make batteryless sensing mainstream. Additionally creating long lived, secure, privacy preserving wearable platforms and tools for the research community.

Research Assistant **2012 – 2013**
Department of Chemistry and the School of Computing, Clemson University
Advisor: Melanie M. Cooper
Developed beSocratic, a tablet and web based program for teaching organic chemistry using a touch interface, and uRespond, an advanced clicker system that allows freeform question and answers in the classroom using images, hand drawn chemical structures, and text.

Research Artifacts

Amulet Wearable Platform
An open source, open hardware wearable platform and toolchain for developing energy and resource-efficient applications on multi-application, extremely long lived, wearable devices.
`https://github.com/AmuletGroup/amulet-project`

Ekho
Ekho is an emulator capable of recording energy harvesting conditions and accurately recreating those conditions in the lab. This makes it possible to conduct realistic and repeatable experiments involving energy harvesting devices. Ekho is a general-purpose, mobile tool that supports any harvesting technology.
`https://github.com/jhester/ekho`

Presentations

Towards A Language and Runtime for Intermittently Powered Devices
1st Workshop on Hilariously Low-Power Computing (HLPC'16)

Tragedy of the Coulombs: Federating Energy Storage for Tiny, Intermittently-Powered Sensors
13th ACM Conference on Embedded Networked Sensor Systems (SenSys'15)

Ekho: Realistic and Repeatable Experimentation for Tiny Energy-Harvesting Sensors
12th ACM Conference on Embedded Networked Sensor Systems (SenSys'14)

Teaching Experience

CPSC 4820/6820: Embedded Systems Prototyping (Clemson University)
Instructor and Course Designer, Fall 2015

CPSC 3220: Operating Systems (Clemson University)
Guest Lecturer, Spring 2015

CPSC 2150: Software Development Foundations (Clemson University)
Teaching Assistant, Spring 2012

Undergraduate Mentoring

Taylor Hardin, *PERSIST Lab 2015-2016*, now at Dartmouth College

Connor Bolton, *PERSIST Lab 2015-2016*, now at Univ. of Michigan, Ann Arbor

Austin Anderson, *PERSIST Lab 2016*, now at Google

Matthew Furlong, *PERSIST Lab 2014-2016*, now at Univ. of Michigan, Ann Arbor

Diana Zhang, *REU 2014*, now at Carnegie Mellon University

Kyle McGuigan, *PERSIST Lab 2013-2014*, now at SPARC

Service and Professional Development

Invited Attendee, *2016 NextProf Fall Engineering Workshop at the University of Michigan in Ann Arbor*[2], 2016

Publicity Chair, *Workshop on Energy Harvesting & Energy Neutral Sensing Systems (ENSsys)*, 2016

TPC Member, *Workshop on Energy Harvesting & Energy Neutral Sensing Systems (ENSsys)*, 2016

Shadow TPC Member, *Information Processing in Sensor Networks (IPSN)*, 2015 and 2016

Member, *College of Engineering and Science Student Advisory Board (CESSAB), at Clemson Univ.*, 2015

Secretary, *School of Computing Graduate Student Association at Clemson Univ.*, 2014

Chairman, *Student Advisory Board for Online Education at Clemson Univ.*, 2012-2013

Memberships

Member, *Institute of Electrical and Electronics Engineers (IEEE)*, 2016-

Member, *Association for Computing Machinery (ACM)*, 2015-

Member, *PERSIST Lab MakerSpace*, 2016-

Member, *Upsilon Pi Epsilon, National Computer Science Honorary Society*, 2013-

[2] NextProf candidates must go through a competitive selection process.

Consulting Experience

International ThermoDyne
Development of miniaturized Ekho device for energy harvesting profiling , 2015

Penton Media
Development of Android / iOS media platform , 2013-2014

References Available Upon Request