

JOSHUA R. SMITH

Curriculum Vitae

Computer Science & Engineering

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EDUCATIONAL HISTORY

Massachusetts Institute of Technology, Cambridge, MA

PhD, Media Arts and Sciences

1999

Electric Field Imaging (advised by Neil Gershenfeld; Citations 118)

Massachusetts Institute of Technology, Cambridge, MA

MS, Media Arts and Sciences

1995

Toward Electric Field Tomography (advised by Neil Gershenfeld)

University of Cambridge, Cambridge, UK

MA, Natural Sciences (Physics and Theoretical Physics)

1997 (originally conferred as BA Hons. 1993)

Information Processing in Fraunhofer Diffraction: A Case Study in the Physics of Information
(advised by David Mackay)

Williams College, Williamstown, MA

BA, Magna Cum Laude, Computer Science, Philosophy

1991

Evolving Dynamical Systems with the Genetic Algorithm (advised by Donald House);
independent study with William Wootters

EMPLOYMENT HISTORY

University of Washington, Seattle, WA

Professor, Allen School of Computer Science and Engineering

Milton and Delia Zeuschel Professor in Entrepreneurial Excellence

Department of Electrical and Computer Engineering, 9/17–

University of Washington

Associate Professor (with tenure)

Department of Computer Science and Engineering & Electrical Engineering, 9/14 – 9/17

University of Washington

Associate Professor without tenure (tenure track)

Department of Computer Science and Engineering & Electrical Engineering, 2/11 – 9/14

Intel Research Seattle
Seattle, WA
Principal Engineer, 4/08 – 1/11
Senior Research Scientist, 7/05 - 4/08
Research Scientist, 7/04 – 7/05

Tiax LLC (formerly Arthur D. Little)
Cambridge, MA
Senior Technologist, 1/04 – 7/04

Escher Group LTD.
Cambridge, MA
Chief Scientist & Director, Escher Labs, 4/01 – 12/03
Vice President & Director, Escher Labs, 4/00 – 4/01
Founding Director, Escher Labs 11/98 – 4/00

Other Research Experience

- **Santa Fe Institute**, Santa Fe, NM & **Los Alamos National Laboratory**, Los Alamos, NM. *Research student*, 6/92-9/92, 7/93-8/93. Created Lattice Gas Automata model of polymer dynamics, with application to origin of life studies.
- **Yale University**, New Haven, CT. *NECUSE Undergraduate research fellow in department of Computer Science*, 6/89 - 8/89. Implemented multigrid method for fast modeling of Hopfield Neural Networks; implemented 3d visualization code. Advised by Eric Mjolsness.
- **SMALL Geometry Research Group**, Williams College, Williamstown, MA. 6/88 – 8/88. *Undergraduate researcher*. Worked on Art Gallery theorems in computational geometry; wrote interactive graph editor.
- **School for Field Studies**, Marine Biology program, St. John, USVI. *Student*. 9/86 – 12/86. Devised and tested underwater method for experimental measurement of fractal dimension of coral.
- **NASA Goddard Institute for Space Studies**, New York, NY. *Graphics Programmer for Global Climate Modeling project*, 6/85-8/85. Wrote visualization software for output of global climate model.

AWARDS AND HONORS

Best Paper Awards

Distinguished Paper (12), “RF Bandid: A Fully-Analog and Passive Wireless Interface for Wearable Sensors,” ACM IMWUT Vol 2, Distinguished paper (8 out of 202 papers), 2018.

Distinguished Paper (11), “LoRa Backscatter: Enabling the Vision of Ubiquitous Connectivity,” ACM IMWUT Vol 1, Distinguished paper, 2017.

Best Paper (10), “Inter-Technology Backscatter: Towards Internet Connectivity for Implanted Devices,” ACM SIGCOMM, Best Paper, August 2016

Best Paper (9), “Passive Wi-Fi: Bringing Low Power to Wi-Fi Transmissions,” USENIX NSDI, Best Paper, March 2016

Best Paper (8), “Sifting Through the Airwaves: Efficient and Scalable Multiband RF Harvesting,” IEEE RFID, April 2014

Best Paper (7), “Ambient Backscatter: Wireless Communication Out of Thin Air,” ACM SIGCOMM, August 2013.

Best student paper award (6), for “Hybrid Analog-Digital Backscatter Platform for High Data Rate, Battery-Free Sensing,” WiSNet 2013, January 2013.

Best Paper award (5), for “An Ultra-Low-Power Human Body Motion Sensor Using Static Electric Field Sensing,” ACM Ubicomp 2012, September 2012.

Sezai Innovation Award (4), for "Promise of unrestricted mobility and freedom with wireless powering of a Ventricular Assist Device (VAD)," at the 19th congress of the International Society of Rotary Blood Pumps, Louisville, KY September 8th to 10th, 2011.

Willem Kolff/Donald B. Olsen Award (3), for most promising research in the development of artificial hearts, for paper “Innovative Free-Range Resonant Electrical Energy Delivery System (Free-D System) for a Ventricular Assist Device Using Wireless Power,” presented at American Society for Artificial Internal Organs (ASAIO), *June 2011*.

Best Paper (2), “A Capacitive Touch Interface for Passive RFID Tags,” *May 2009*, IEEE RFID 2009

Best Demo (1), “RFID Sensor Networks with the Intel WISP,” *Nov. 2008*, ACM Sensys 08

General awards

Fellow of the Institute of Electrical and Electronics Engineers (IEEE), “for contributions to far- and near-field wireless power, backscatter communication, and electric field sensing,” **2020**.

Milton and Delia Zeuschel Professorship, 2017-2022

Amazon Catalyst Fellow, 2017

Ambient Backscatter and Interscatter two of the [Top 10 Technological Inventions of 2016](#) by Money Inc.

GeekWire Seattle 10, WiBotic, a company I co-founded with graduated PhD student Ben Waters, named one of Seattle’s 10 hottest startups for 2016.

Madrona Prize, for “The Next Big Leap in Backscatter Communication,” awarded to research project with most commercial potential at UW CSE Industrial Affiliates Day 2016.

GlaxoSmithKline (GSK) Bioelectronics Innovation Challenge, won \$1.2M (\$200K for Phase I, \$1.0M for Phase II) in world-wide competition to develop a fully wireless platform for neuro-modulation. Currently competing for an additional \$1M. 2016.

MIT Technology Review “Ten Breakthrough Technologies,” for Passive Wi-Fi and Power Over Wi-Fi, 2016

Popular Science “Best of What’s New, for WiFi powered camera, 2015

University of Washington CoMotion Presidential Innovation Fellow, 2015

Allen Distinguished Investigator, for project “A brain-computer interface to re-animate the limbs following spinal injury: Development of a Brain-Computer-Spinal Interface (BCSI),” 2013

Madrona Prize, for “Ambient Backscatter,” awarded to research project with most commercial potential at UW CSE Industrial Affiliates Day 2013.

First Prize, UW Inventor of the Year Poster Contest, for FREE-D, 2013.

Senior Member, IEEE. January 2013.

CIF Postdoctoral Fellow Supervision award, CRA/CCC, 2010-2011

Motorola Fellow, MIT Media Laboratory, 1995 – 1997

Herchel Smith Scholar, Full funding for two years’ tuition, room and board at Emmanuel College, University of Cambridge, 1991 – 1993

Phi Beta Kappa, Williams College, 1991

Sigma Xi, Williams College, 1991

Intel awards

Divisional Recognition Award, Q4 2009, Intel Labs,

- “For rapid resolution of key technical challenges to mobile platform intercept of WREL technology leading to JPF definition with PCCG”*
- Divisional Recognition Award, Q2 2009, Intel Labs,**
“For a team effort on the WISP Challenge that exceeded expectations in creating a thriving WISP Community”
- Special Intel Employee Retention Award, Oct. 2008**
- Divisional Recognition Award, Q4 2008, Corporate Technology Group**
“For delivering first-rate results on aggressive and risky targets to provide three captivating IR technology demonstrations for Justin’s stage demos at IDF”
- Divisional Recognition Award, Q3 2008, Corporate Technology Group,**
“For leading the formation of a new Personal Robotics community by organizing the inaugural Workshop on Personal Robotics, thereby establishing Intel as a leader in this important emerging field”
- Divisional Recognition Award, Q3 2008, Corporate Technology Group**
“For innovation in wireless power with a circuit-based theory that enabled the transmission of 21 watts over 2 feet at 70% efficiency”
- Divisional Recognition Award, Q4 2007, Corporate Technology Group**
“For role modeling customer orientation in developing the first Phase Change Memory prototype that could be read, written, and powered wirelessly with no external antenna”
- Divisional Recognition Award, Q2 2007, Corporate Technology Group**
“For developing a wireless read-write capability for flash memory that led to joint pathfinding with FMG and could lead to wireless capabilities for our future PCM products”
- Best Poster, June 2007, Intel Research Symposium,**
Award for “Electric Field Pretouch for Robotic Grasping”
- Best Short Talk, Dec. 2006, Intel Fellows Mini-Conference on Power**
Award for short talk “RF Power Harvesting for Power Efficiency”

AFFILIATIONS AND OTHER APPOINTMENTS

Affiliate Associate Professor, Computer Science & Engineering and Electrical Engineering,
University of Washington, 7/10-2/11

Affiliate Assistant Professor, Computer Science & Engineering and Electrical Engineering,
University of Washington, 6/06 – 7/10 (CSE), 7/05 – 7/10 (EE)

Graduate Faculty Member, University of Washington, 7/08 – 7/13

PUBLICATIONS

Citations: Total Citations: 16305. H-index: 64. i10-index: 147. Citations listed when 65 or more.
Source: Google Scholar, 7/20/2020. Citation counts for individual papers updated 5/14/2020.

Co-Author Key

- 1: Graduate students under my supervision
- 2: Postdoctoral scholars under my supervision
- 3: Undergraduate students under my supervision
- 4: Graduate student interns under my supervision (mostly at Intel)
- 5: Employees under my supervision

Refereed archival journal publications

- J39 Relacks: Reliable Backscatter Communication in Indoor Environments**, Mohamad Katanbaf,¹ Vivek Jain, Joshua R. Smith, Proceedings of the ACM on Interactive, Mobile, Wearable, and Ubiquitous Technologies, to appear, 2020
- J38 Benchmarking Robot Manipulation with the Rubik's Cube**, Boling Yang,¹ Patrick Lancaster,¹ Siddhartha Srinivasa, Joshua R Smith, IEEE Robotics and Automation Letters, Vol 5, No 2, pp. 2094-2099, 2020.
- J37 Glaze: Overlaying Occupied Spectrum with Downlink IoT Transmissions**, Zerina Kapetanovic,¹ Ali Saffari,¹ Ranveer Chandra, Joshua R Smith, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Vol 3, No 4, pp. 1-21, December 11, 2019.
- J36 Low-cost wireless power efficiency optimization of the NFC tag through switchable receiver antenna**, Yi Zhao,¹ Huaye Li,³ Saman Naderiparizi,¹ Aaron Parks,¹ Joshua R Smith, Wireless Power Transfer, Vol 5, Issue 2, pp. 87-96, September 2018.
- J35 Electrical power to run ventricular assist devices using the Free-range Resonant Electrical Energy Delivery system**, Benjamin H Waters,¹ Jiheum Park, J Christopher Bouwmeester, John Valdovinos, Arnar Geirsson, Alanson P Sample,² Joshua R Smith, Pramod Bonde, The Journal of Heart and Lung Transplantation, August 11, 2018, <https://doi.org/10.1016/j.healun.2018.08.007>.
- J34 IoT communications with M-PSK modulated ambient backscatter: Algorithm, analysis, and implementation**, J Qian,¹ AN Parks,¹ JR Smith, F Gao, S Jin, IEEE Internet of Things Journal, July 31, 2018
- J33 RF Bandid: A Fully-Analog and Passive Wireless Interface for Wearable Sensors**, V Ranganathan,¹ S Gupta, J Lester, JR Smith, D Tan, Proceedings of the ACM on Interactive,

Mobile, Wearable and Ubiquitous Technologies, Vol 2, No 1, pp. 79, July 5, 2018.

Distinguished Paper award winner (given to 8 out of 202 papers)

- J32 LoRa Backscatter: Enabling the Vision of Ubiquitous Connectivity**, Vamsi Talla,² Mehrdad Hesar, Bryce Kellogg, Ali Najafi, Joshua R. Smith, Shyamnath Gollakota, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), September 15, 2017. **Distinguished Paper award winner Citations: 122**
- J31 Battery-Free Cellphone**, Vamsi Talla,² Bryce Kellogg, Shyamnath Gollakota, Joshua R. Smith, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), September 15, 2017. **Citations: 76**
- J30 Powering the Next Billion Devices with Wi-Fi**, Communications of the ACM, Vamsi Talla,² Bryce Kellogg, Benjamin Ransford,² Saman Naderiparizi,¹ Joshua R. Smith, Shyamnath Gollakota, Volume 60 No. 3, pp. 83-91, 10.1145/3041059, March 2017.
- J29 Design and Analysis of a High Bandwidth Rectifying Regulator with PWM and PFM modes**, V Talla,² JR Smith, IEEE Transactions on Circuits and Systems II: Express Briefs 63 (12), pp. 1121-1125, November, 2016
- J28 Passive WI-FI: Bringing Low Power to Wi-Fi Transmissions**, Bryce Kellogg, Vamsi Talla,² Joshua R. Smith, Shyamnath Gollakota, GetMobile: Mobile Computing and Communications: Volume 20 Issue 3, July 2016.
- J27 Unpowering the Internet of Things**, Joshua R. Smith, IQT Quarterly, Special Issue on Internet of Things, (invited) Vol. 8, No. 1, pp. 25-28, Summer 2016.
- J26 A Reconfigurable Resonant Coil for Range Adaptation Wireless Power Transfer**, G Lee,¹ BH Waters,¹ YG Shin, JR Smith, WS Park, IEEE Transactions on Microwave Theory and Techniques, Vol. 64, Issue 2, pp. 624-632, Feb 2016
- J25 Battery-Free Connected Machine Vision with WISPCam**, Saman Naderiparizi,¹ Zerina Kapetanovic,¹ Joshua Smith, GetMobile Quarterly Magazine, Vol. 20, No, 1, Jan 2016
- J24 Power Delivery and Leakage Field Control Using and Adaptive Phased Array Wireless Power System**, Benjamin Waters,¹ Brody Mahoney,¹ Vaishnavi Ranganathan,¹ Joshua R. Smith, IEEE Transactions on Power Electronics, Special Issue on Wireless Power Transfer, Vol 30, No 11, pp. 6298-6309, February 2015.
- J23 Energy transmission and power sources for mechanical circulatory support devices to achieve total implantability**<http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6494255>, JX Wang, JR Smith, P Bonde The Annals of thoracic surgery, Vol 97, Issue 4, pp. 1467-1474, Feb 2014.
- J22 Innovative Free-Range Resonant Electrical Energy Delivery System (FREE-D System) for a Ventricular Assist Device Using Wireless Power**<http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6494255>, Benjamin

- H. Waters¹, Joshua R. Smith, Pramod Bonde, ASAIO Journal Vol. 60, No. 1, pp. 31-37. 2014.
- J21** **The Emergence of RF-Powered Computing**, S. Gollakota, M. Reynolds, J.R. Smith, D. Wetherall, IEEE Computer, Vol. 47, No. 1, pp. 32-39, Jan 2014. **Citations: 98**
- J20** **[Enabling Seamless Wireless Power Delivery in Dynamic Environments](#)**, Alanson P. Sample², Benjamin H. Waters¹, Scott Wisdom¹, Joshua R. Smith, (Invited) Proceedings of the IEEE, Vol 101, Issue 6, pp. 1343-1358, June 2013. **Citations: 254**
- J19** **[Evaluation of Wireless Resonant Power Transfer Systems with Human Electromagnetic Exposure Limits](#)**, Andreas Christ, Mark G. Douglas, John Roman, Emily B. Cooper, Alanson P. Sample¹, Benjamin H. Waters¹, Joshua R. Smith, Niels Kuster, IEEE Transactions on Electromagnetic Compatibility, Vol. 55, Issue 2, pp. 265-275. April 2013. **Citations: 181**
- J18** **[Physical Human Interactive Guidance: Identifying Grasping Principles From Human-Planned Grasps](#)**, Ravi Balasubramanian², Ling Xu⁴, Peter Brook³, Joshua R. Smith, Yoky Matsuoka, IEEE Transactions on Robotics (T-RO), Vol. 28 No. 4, pp. 899-910, Aug. 2012. **Citations: 89**
- J17** **[Powering a Ventricular Assist Device \(VAD\) with the Free-range Resonant Electrical Energy Delivery \(FREE-D\) System](#)**, B. H. Waters¹, A. P. Sample¹, P. Bonde, J.R. Smith. (Invited) Proceedings of the IEEE, vol. 100, No. 1, pp. 138-149, January 2012. **Citations: 137**
- J16** **[Toward Total Implantability Using Free-Range Resonant Electrical Energy Delivery System: Achieving Untethered Ventricular Assist Device Operation Over Large Distances](#)**, Benjamin Waters¹, Alanson Sample¹, Joshua Smith, and Pramod Bonde, Cardiology Clinics, Volume 29, Number 4, pp. 609-625. November 2011.
- J15** **[Wireless strain measurement for structural testing and health monitoring of carbon fiber composites](#)**, Federico Gasco, Paolo Feraboli, Jeff Braun¹, Joshua Smith, Patrick Stickler, Luciano DeOto, Composites: Part A 42, pp. 1263–1274, 2011.
- J14** **[Analysis, Experimental Results, and Range Adaptation of Magnetically Coupled Resonators for Wireless Power Transfer](#)**, Alanson P. Sample¹, David T. Meyer³, Joshua R. Smith, IEEE Transactions on Industrial Electronics, Vol. 58, No. 2, pp 544-554, Feb 2011. **Citations: 1635**
- J13** **[RFID: From Supply Chains to Sensor Nets](#)**, S. Roy, V. Jandhyala, J.R. Smith, D.J. Wetherall, B.P. Otis, R. Chakraborty, M. Buettner¹, D.J. Yeager¹, Y.-C. Ko, A.P. Sample¹, Proceedings of the IEEE, vol.98, no.9, pp.1583-1592, Sept. 2010. **Citations: 99**
- J12** **[NeuralWISP: A Wirelessly Powered Neural Interface with 1-m Range](#)**, Daniel J. Yeager¹, Jeremy Holleman, Richa Prasad, Joshua R. Smith, and Brian Otis, IEEE Transactions on Biomedical Circuits and Systems, Volume 3, Issue 6, pp. 379-387, Oct 2009. **Citations: 92**

- J11** [Design of an RFID-Based Battery-Free Programmable Sensing Platform.](#) A.P. Sample¹, D.J. Yeager¹, P.S. Powledge, A.V. Mamishev, J.R. Smith. IEEE Transactions on Instrumentation and Measurement, Vol. 57, No. 11, Nov. 2008, pp. 2608-2615. **Citations: 762**
- J10** [RFID MAC Performance Evaluation Based on ISO/IEC 18000-6 Type C.](#) You-Chang Ko, Sumit Roy, Joshua R. Smith, Hyong-Woo Lee, and Choong-Ho Cho, IEEE Communications Letters, Vol. 12, No. 6, June 2008.
- J9** [Energy scavenging for inductively coupled passive RFID systems.](#) B. Jiang⁴, J. R. Smith, M. Philipose, S. Roy, K. Sundara-Rajan⁴, and A. Mamishev. IEEE Transactions on Instrumentation and Measurement, February 2007, Vol. 56, No. 1, pp. 118-125. **Citations: 171**
- J8** [RFID-Based Techniques for Human Activity Detection.](#) Joshua R. Smith, Kenneth P. Fishkin, Bing Jiang⁴, Alexander Mamishev, Matthai Philipose, Adam Rea, Sumit Roy, Kishore Sundara-Rajan⁴. Communications of the ACM, v48, no. 9, Sep 2005, pp. 39-44. **Citations: 244**
- J7** [Battery-Free Wireless Identification and Sensing.](#) Matthai Philipose, Joshua R. Smith, Bing Jiang⁴, Kishore Sundara-Rajan⁴, Alexander Mamishev, Sumit Roy. IEEE Pervasive Computing, Vol. 4, No. 1, January-March 2005, pp. 37-45. **Citations: 318**
- J6** [Imperceptible Sensory Channels.](#) Joshua R. Smith, (Invited) IEEE Computer, Vol. 37, No. 6, pp. 84-85, June 2004.
- J5** [Code Division Multiplexing of a Sensor Channel: A Software Implementation.](#) Joshua R. Smith, Christopher Salthouse³, and Neil Gershenfeld. IEEE Journal on Selected Areas in Communications, Vol. 17, No. 4, April 1999, pp 725-731.
- J4** [Distributing Identity.](#) Joshua R. Smith. IEEE Robotics and Automation Magazine, Vol. 6, No. 1, March 1999, pp 49-56.
- J3** [Electric Field Sensing for Graphical Interfaces.](#) Joshua R. Smith, Tom White, Christopher Dodge, David Allport, Joseph Paradiso, and Neil Gershenfeld. Computer Graphics and Applications, Vol. 18, No. 3, 1998, pp 54-61. **Citations: 170**
- J2** [Field Mice: Extracting Hand Geometry From Electric Field Measurements.](#) Joshua R. Smith. IBM Systems Journal, Vol. 35, No. 3&4, 1996, pp 587-608. **Citations: 117**
- J1** [Lattice Polymer Automata](#) Steen Rasmussen and Joshua R. Smith. Berichte der BunsenGesellschaft für Physikalische Chemie 98, No. 9., pp. 1185-1193. 1994, pp 1185-1193.

Conference proceedings and other non-journal articles

- C104** [Contact-less Manipulation of Millimeter-scale Objects via Ultrasonic Levitation,](#) Jared Nakahara,¹ Boling Yang,¹ Joshua R Smith, Proceedings of the 8th IEEE RAS/EMBS

International Conference on Biomedical Robotics and Biomechatronics (BioRob 2020),
November 29, 2020

- C103 Appliqué: A Computationally Efficient Modeling Tool for MultiLayer Printed Inductors, for near Field Wireless Power Transfer**, Brody Mahoney,¹ Joshua R. Smith, European Conference on Antennas and Propagation (EuCAP 2020, March 15-20, 2020).
- C102 High Performance Flexible Protocol for Backscattered-Based Neural Implants**, Laura Arjona,² James Rosenthal, Joshua R Smith, Chet T Moritz, 2019 IEEE-APS Topical Conference on Antennas and Propagation in Wireless Communications (APWC), pp 276-280, September 9, 2019
- C101 Experimental Characterization of Narrowband Power Optimized Waveforms**, Takashi Ikeuchi,¹ Yoshihiro Kawahara, Joshua R Smith, 2019 IEEE Wireless Power Transfer Conference (WPTC), pp 6-11, June 18, 2019
- C100 Improved Proximity, Contact, and Force Sensing via Optimization of Elastomer-Air Interface Geometry**, PE Lancaster,¹ JR Smith, SS Srinivasa, 2019 International Conference on Robotics and Automation (ICRA), May 20-24, 2019
- C99 Battery-Free Wireless Video Streaming Camera System**, Ali Saffari,¹ Mehrdad Hesar, Saman Naderiparizi,¹ Joshua R. Smith, 2019 IEEE International Conference on RFID (IEEE RFID), April 2-4, 2019
- C98 NeuralCLIP: A Modular FPGA-Based Neural Interface for Closed-Loop Operation**, Vaishnavi Ranganathan,¹ Jared Nakahara,¹ Soshi Samejima, Nicholas Tolley, Abed Khorasani, Chet T Moritz, Joshua R Smith, 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER), pp. 791-794, March 20, 2019
- C97 Reconfigurable and Adaptive Coupled Relay Resonator Platform for a Moving Receiver**, Xingyi Shi,¹ Joshua R. Smith, 2019 IEEE International Workshop on Antenna Technology (IEEE IWAT), pp 182-185, March 3-6, 2019
- C96 Visionless Tele-Exploration of 3D Moving Objects**, Kevin Huang, Patrick Lancaster,¹ Joshua R Smith, Howard Jay Chizeck, 2018 IEEE International Conference on Robotics and Biomimetics (ROBIO), pp 2238-2244, December 12, 2018
- C95 Experimental Validation of Anti-Collision Protocols for RFID Sensor Networks**, Laura Arjona,¹ Hugo Landaluce, Asier Perillos, Joshua R Smith, 6th International EURASIP Workshop on RFID Technology (EURFID), pp. 1-8, September 11, 2018
- C94 Multi-level Energy Detection for Ambient Backscatter System with M-PSK Modulation**, Jing Qian,¹ Aaron Parks,¹ Joshua R Smith, Feifei Gao, 2018 IEEE/CIC International Conference on Communications in China (ICCC), pp. 369-373, August 16, 2018
- C93 Wireless Video Streaming for Ultra-low-power Cameras**, Mehrdad Hesar, Saman Naderiparizi,¹ Ye Wang,³ Ali Saffari,¹ Shyamnath Gollakota, Joshua R Smith, Proceedings

of the 16th Annual International Conference on Mobile Systems, Applications, and Services, p. 536, June 10, 2018

- C92 Coil Geometry Optimization for Wireless Power Delivery to Moving Receivers**, Xingyi Shi,¹ Huang Lee, Vivek Jain, Joshua R Smith, 2018 IEEE Wireless Power Transfer Conference (WPTC), pp. 1-4, June 3, 2018
- C91 Wireless Quantization Index Modulation: Enabling Communication Through Existing Signals**, Zerina Kapetanovic,¹ Vamsi Talla,² Aaron N. Parks,¹ Jing Qian,¹ Joshua R. Smith, IEEE RFID, April 2018, Nominated for Best Paper Award
- C90 Towards Battery-Free HD Video Streaming**, S Naderiparizi,¹ M Hesar, V Talla,² S Gollakota, JR Smith, 15th USENIX Symposium on Networked Systems Design and Implementation (NSDI 18), April 9, 2018
- C89 Improved Object Pose Estimation via Deep Pre-touch Sensing**, Patrick Lancaster,¹ Joshua R. Smith, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vancouver, BC, Sep 24-28, 2017.
- C88 Pre-touch Sensing for Sequential Manipulation**, Boling Yang,¹ Patrick Lancaster,¹ Joshua R. Smith, 2017 IEEE/RSJ International Conference on Robotics and Automations (ICRA 2017), May 29-June 3, 2017, Singapore.
- C87 Finding Common Ground: A Survey of Capacitive Sensing in Human-Computer Interaction**, Tobias Grosse-Puppenthal, Christian Holz, Gabe Cohn, Raphael Wimmer, Oskar Bechtold, Steve Hodges, Matthew S. Reynolds, Joshua R. Smith, Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI), Denver, CO, May 6-May 11, 2017. **Citations: 69.**
- C86 Fast Downstream to Many (Computational) RFIDs**, Henko Aantjes, Amjad Y. Majid, Przemyslaw Pawelczak, Jethro Tan, Aaron Parks, Joshua R. Smith. In Proc. IEEE INFOCOM, Atlanta, GA. May 1-4, 2017.
- C85 FM Backscatter: Enabling Connected Cities and Smart Fabrics**, Anran Wang, Vikram Iyer, Vamsi Talla,² Joshua R. Smith, Shyamnath Gollakota, 14th USENIX Symposium on Networked Systems Design and Implementation (NSDI 2017), March 27-29, 2017. **Citations: 101.**
- C84 WISPCam: An RF-Powered Smart Camera for Machine Vision Applications**, Saman Naderiparizi,¹ Zerina Kapetanovic,¹ Joshua R Smith, in Proceedings of ENsys 2016, the 4th International Workshop on Energy Harvesting and Energy-Neutral Sensing Systems, pp. 19-22, November 16, 2016.
- C83 2D and 3D Millimeter-Wave Synthetic Aperture Radar Imaging on a PR2 Platform**, Claire M. Watts, Patrick Lancaster,¹ A Pedross-Engel, Joshua R. Smith, Matthew S. Reynolds, In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Oct 9-14, 2016.

- C82 Inter-Technology Backscatter: Towards Internet Connectivity for Implanted Devices**, Vikram Iyer, Vamsi Talla,² Bryce Kellogg, Shyamnath Gollakota, Joshua R. Smith, Proceedings of the ACM SIGCOMM Conference, 356-369, Aug 22-26, 2016. **Winner, Best Paper Award. Citations: 151.**
- C81 Design and Analysis of Rectifying and Regulating Rectifier with PWM and PFM Modes**, Vamsi Talla,² Joshua R. Smith, IEEE International symposium on circuits and systems (ISCAS), Montreal Canada, May 22-25, 2016.
- C80 Dual Band Wireless Power and Bi-Directional Data Link for Implanted Devices in 65 nm CMOS**. Vamsi Talla,² Vaishnavi Ranganathan,¹ Brody Mahoney,¹ Joshua R. Smith, 2016 IEEE Int'l Symposium on Circuits & Systems (ISCAS), Montreal, Canada, May 22-26, 2016.
- C79 uMonitor: In-situ Energy Monitoring with Microwatt Power Consumption**, Saman Naderiparizi,¹ Aaron Parks,¹ Farshid Salemi Parizi, Joshua R. Smith, IEEE RFID, Orlando, FL, May 3-5, 2016. Nominated for Best Paper award.
- C78 BLISP: Enhancing Backscatter Radio with Active Radio for Computational RFIDs**, Ivar in 't Veen,¹ Qingzhi Liu, Przemysław Pawełczak, Aaron Parks,¹ Joshua R. Smith, IEEE RFID, Orlando, FL, May 3-5, 2016.
- C77 Analysis of a Near Field Communication wireless power system**, Yi Zhao,¹ Brody Mahoney,¹ Joshua R. Smith, IEEE Wireless Power Transfer Conference (WPTC), pp. 1-4, May 5, 2016.
- C76 A high-voltage compliant neural stimulator with HF wireless power and UHF backscatter communication**, Vaishnavi Ranganathan,¹ Brody Mahoney,¹ Eric Pepin, Michael D Sunshine, Chet T Moritz, Jacques C Rudell, Joshua R Smith, IEEE Wireless Power Transfer Conference (WPTC), pp. 1-4, May 5, 2016.
- C75 Wisent: Robust Downstream Communication and Storage for Computational RFIDs**, Jethro Tan, Przemyslaw Pawelczak, Aaron Parks,¹ Joshua R. Smith, In IEEE International Conference on Computer Communications (IEEE INFOCOM), San Francisco, CA, April 10-15, 2016.
- C74 Passive Wi-Fi: Bringing Low Power to Wi-Fi Transmissions**, Bryce Kellogg, Vamsi Talla,¹ Shyamnath Gollakota, Joshua R. Smith, Usenix Symposium on Networked Systems Design and Implementation (NSDI), Santa Clara, CA, March 16-18, 2016. **Winner, Best Paper Award. Citations: 221**
- C73 Large Area Wireless Power via a Planar Array of Coupled Resonators**, Xingyi Shi,¹ Joshua R. Smith, International Workshop on Antenna Technology (IWAT), Cocoa Beach, FL, Feb 29-Mar 2, 2016. (Invited)
- C72 Powering the Next Billion Devices with Wi-Fi**, V Talla,¹ B Kellogg, B Ransford,² S Naderiparizi,¹ S Gollakota, JR Smith, ACM CoNext, Heidelberg, Germany, December 1-4, 2015. Nominated for Best Paper Award. **Citations: 191**

- C71** [Transmissive Optical Pretouch Sensing for Robotic Grasping](#), Di Guo,¹ Patrick Lancaster,¹ Liang-Ting,¹ Jiang, Fuchun Sun, Joshua R Smith, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Hamburg, Germany, September 28-October 2, 2015.
- C70** [Self-Localizing Battery-Free Cameras](#), Saman Naderiparizi,¹ Yi Zhao,¹ James Yongquist,¹ Alanson Sample, Joshua R Smith, Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2015 ACM International Symposium on Wearable Computers (UbiComp). September 2015.
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- C68** **Co-optimization of Efficiency and Load Modulation Data Rate in a Wireless Power Transfer System**, Xingyi Shi,¹ Aaron N. Parks,¹ Benjamin Waters,¹ Joshua R. Smith, ISCAS May 2015.
- C67** **Active Power Summation for Efficient Multiband RF Energy Harvesting**, Aaron N. Parks,¹ Joshua R. Smith, International Microwave Symposium, Phoenix, AZ, May 2015. (Invited)
- C66** **SAR distribution for a Strongly Coupled Resonant Wireless Power Transfer System**, Xingyi Shi,¹ Benjamin Waters,¹ Joshua R. Smith, IEEE Wireless Power Transfer Conference, Boulder, CO, May 2015.
- C65** **Simultaneously Tuning and Powering Multiple Wirelessly Powered Devices**, Benjamin Waters,¹ Peter Fidelman,³ Jeffrey Raines,³ Joshua Smith, IEEE Wireless Power Transfer Conference, Boulder, CO, May 2015.
- C64** **Localization of Receivers using Phased Array WPT**, Vaishnavi Ranganathan,¹ Benjamin Waters,¹ Joshua R. Smith, IEEE Wireless Power Transfer Conference, Boulder, CO, May 2015.
- C63** **Sensor-Aided Teleoperated Grasping of Transparent Objects**, Kevin Huang, Liang-Ting Jiang,¹ Joshua R. Smith and Howard Jay Chizeck, IEEE International Conference on Robotics and Automation (ICRA 2015), Seattle, May 25-30, 2015
- C62** **WISPCam: A Battery-Free RFID Camera**, Saman Naderiparizi,¹ Aaron N. Parks,¹ Zerina Kapetanovic,³ Benjamin Ransford,² Joshua R. Smith, IEEE RFID, April 15-17 2015. Nominated for best paper award. **Citations: 124**
- C61** **NFC-WISP: A Sensing and Computationally Enhanced Near-Field RFID Platform**, Yi Zhao,¹ Joshua R. Smith, Alanson Sample, IEEE RFID, April 15-17 2015. Nominated for best paper award.
- C60** **A Battery-free Object Localization and Motion Sensing Platform**, Yi Zhao¹, Anthony Lamarca, Joshua R. Smith, UbiComp September 2014.

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- C53 [Ambient Backscatter: Wireless Communication out of Thin Air](#)**, Vincent Liu, Aaron Parks¹, Vamsi Talla¹, Shyam Gollakota, David Wetherall, Joshua R. Smith, SIGCOMM 2013. **Citations: 795. *Winner, Best Paper Award.***
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- C47 Design Considerations for Asymmetric Magnetically Coupled Resonators used in Wireless Power Transfer Applications**, Gunbok Lee¹, Benjamin H. Waters¹, Chen Shi³, Wee Sang Park, Joshua R. Smith, 2013 IEEE Topical Conference on Biomedical Wireless Technologies, Networks & Sensing Systems (BioWireless 2013).

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U.S. Patents awarded (last updated 7/29/2020) [USPTO Patent Search](#)

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	Patent number and date	Title	Inventors	Assignee	Citations
P45	US 10,652,073--- 5/12/2020	Backscatter devices and systems providing backscattered signals including OFDM packets	V Talla, JR Smith, S Gollakota, N Kellogg	U. Wash	
P44	US 10,587,445--- 3/10/2020	Apparatuses, systems, and methods for communicating using MIMO and spread spectrum coding in backscatter of ambient signals	S Gollakota, JR Smith, AN Parks, A Liu	U. Wash	
P43	US 10,447,331--- 10/15/2019	Ambient backscatter transceivers, apparatuses, systems, and methods for communicating using backscatter of ambient RF signals	S Gollakota, JR Smith, V Liu, AN Parks, V Tala	U. Wash	
P42	US 10,383,126--- 8/13/2019	Power transmission using wireless communication signals	S Gollakota, V Talla, B Kellogg, B Ransford, S Naderiparizi, JR Smith	U. Wash	
P41	US 10,382,161— 8/13/2019	Wireless networking communication methods, systems, and devices operable using harvested power	S Gollakota, JR Smith, D Wetherall, B Kellogg, AN Parks	U. Wash	
P40	US 10,304,026— 5/28/2019	System for personal mail piece tracking and tracing from multiple	JR Smith, PM Yarin, MJ Murphy,	Escher Group	

		sources by user identifier	AV Sutherland II, E Metois	LTD	
P39	US 10,270,639— 4/23/2019	Apparatuses, systems, and methods for communicating using MIMO and spread spectrum coding in backscatter of ambient signals	S Gollakota, JR Smith, AN Parks, A Liu	U. Wash	
P38	US 10,033,424— 7/24/2018	Ambient backscatter transceivers, apparatuses, systems, and methods for communicating using backscatter of ambient RF signals	S Gollakota, JR Smith, V Liu; AN Parks, V Talla	U. Wash	
P37	US 9,979,240— 5/22/2018	Multiband harvesting systems and methods including switching networks	AN Parks, JR Smith	U. Wash	
P36	US 9,973,367— 5/15/2018	Apparatuses, systems, and methods for communicating using MIMO and spread spectrum coding in backscatter of ambient signals	S Gollakota, JR Smith, AN Parks, A Liu	U. Wash	
P35	US 9,919,088— 3/20/2018	Implantable heart pump controller	P Bonde, S Asgari, JR Smith, B Waters	Yale U., U. Wash.	
P34	US 9,969,260— 6/27/2017	Dynamic wireless power control	J Walsh, JR. Smith, I Kipnis, GA Cain	Intel Corp	
P33	US 9,680,520— 6/13/2017	Ambient backscatter transceivers, apparatuses, systems, and methods for communicating using backscatter of ambient RF signals	S Gollakota JR Smith, V Liu, AN Parks, V Talla	U. Wash.	
P32	US 9,537,346— 1/3/2017	Extendable wireless power delivery for small devices	EB Cooper, Joshua Smith, A Sample, JC Neuman	Intel Corp	
P31	US 9,473,209— 10/18/16	Wireless power transfer apparatus and method thereof	Emily B. Cooper, Joshua R. Smith, Alanson P. Sample	Intel Corp	279
P30	US 9,461,478— 10/4/16	Wireless power transfer apparatus and method thereof	Joshua R. Smith, Alanson P. Sample	Intel Corp	
P29	US 9,199,380 — 12/1/15	Acoustic proximity sensing	Joshua R Smith, LT Jiang	U. Wash.	
P28	US 8,952,571 --- 2/10/2015	Extendable wireless power delivery for small devices	EB Cooper, Joshua Smith, A Sample, JC Neuman	Intel Corp	
P27	US 8,937,530 --- 1/20/2015	Radio frequency identification tags adapted for localization and state indication	Joshua R. Smith, Daniel Yeager Ali Rahimi	Intel Corp	
P26	US 8,874,451 --- 10/28/2014	Personal mail piece and electronic mail tracking system	Joshua R. Smith, Paul M. Yarin, Michael J. Murphy, Andrew V. Sutherland II, Eric Metois	Escher Group LTD	
P25	US 8,827,889 --- 9/9/2014	Method and system for powering implantable devices	Joshua R. Smith, Prmod Bonde,	U. Wash & Yale	

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P24	US 8,643,475 --- 2/4/2014	Radio frequency identification secret handshakes	Tadayoshi Kohno, Alexei Czeskis, Karl Koscher, Joshua R Smith	U. Wash. & Intel Corp.	
P23	US 8,527,284 -- 9/3/2013	System for personal mail piece tracking and tracing from multiple sources by user identifier	Joshua R. Smith, Paul M. Yarin, Michael J. Murphy, Andrew V. Sutherland, Eric Metois	Escher Group	
P22	US 8,502,650 – 8/6/2013	Temporary non-responsive state for RFID tags	Joshua D. Posamentier, Joshua R. Smith	Intel Corp.	
P21	US 8,446,045 – 5/21/2013	Flat, asymmetric, and E-field confined wireless power transfer apparatus and method thereof	Joshua R. Smith, Alanson P. Sample, Emily B. Cooper	Intel Corp.	195
P20	US 8,299,652 – 10/30/2012	Wireless power transfer apparatus and method thereof	Alanson P. Sample, Joshua R. Smith	Intel Corp.	330
P19	US 8,222,996 – 7/17/2012	Radio frequency identification tags adapted for localization and state indication	Joshua R. Smith, Daniel Yeager, Ali Rahimi	Intel Corp.	
P18	US 8,149,120 – 4/3/2012	Temporary non-responsive state for RFID tags	Joshua D. Posamentier, Joshua R. Smith	Intel Corp.	
P17	US 7,956,725 – 6/7/2011	RFID tag with accelerometer	Joshua R. Smith	Intel Corp.	71
P16	US 7,825,776 – 11/2/2010	Device configuration with RFID	Joshua R. Smith and Dirk Haehnel	Intel Corp.	60
P15	US 7,646,214 -- 1/12/10	Power harvesting signal line termination	Joshua R. Smith	Intel Corp.	
P14	US 7,633,025 --- 12/15/09	Inertial switch using fully released and enclosed conductive contact bridge	Joshua R. Smith, Kishore Sundara-Rajan	Intel Corp.	
P13	US 7,411,505 --- 8/12/08	Switch status and RFID tag	Joshua R. Smith, Anthony Lamarca, Matthai Philipose	Intel Corp.	
P12	US 7,336,184 --- 2/26/08	Inertially controlled switch and RFID tag	Joshua R. Smith, Matthai Philipose	Intel Corp.	647
P11	US 7,251,347 --- 7/31/07	System and method for authentication of a workpiece using three dimensional shape recovery	Joshua R. Smith	Escher Group	85
P10	US 7,035,428 --- 4/25/06	Workpiece authentication based upon one or more workpiece images	Joshua R. Smith	Escher Group	
P9	US 6,584,214 --- 6/24/03	Identification and verification using complex, three-dimensional structural features	Ravikanth Pappu, Neil Gershenfeld, Joshua R. Smith	MIT	76
P8	USD 450,759 --- 11/20/01	Postal indicia for an envelope	Will Crosby, Michael J. Murphy, Joshua R. Smith, Andrew	Escher Group	

			Sutherland		
P7	US6,210,771 --- 04/03/01	Electrically active textiles and articles made therefrom	E. Rehmi Post, Margaret Orth, Emily Cooper, Joshua R. Smith	MIT	279
P6	US6,066,954 --- 05/23/00	Apparatus for resolving presence and orientation within a defined space	Neil Gershenfeld, Joshua R. Smith	MIT	
P5	US6,051,981 --- 04/18/00	Method and apparatus for characterizing movement of a mass within a defined space	Neil Gershenfeld, Joshua R. Smith	MIT	
P4	US6,025,726 --- 02/15/00	Method and apparatus for determining three-dimensional position, orientation and mass distribution	Neil Gershenfeld, Joshua R. Smith	MIT	126
P3	US5,936,412 --- 08/10/99	Method for resolving presence, orientation and activity in a defined space	Neil Gershenfeld, Joshua R. Smith	MIT	
P2	US5,914,610 --- 06/22/99	Apparatus and method for characterizing movement of a mass within a defined space	Neil Gershenfeld, Joshua R. Smith	MIT	87
P1	US5,844,415 --- 12/01/98	Method for three-dimensional positions, orientation and mass distribution	Neil Gershenfeld, Joshua R. Smith	MIT	92

Selected Patent Applications

A5	US Patent App 14/402,660	Wireless Power delivery in dynamic environments	JR Smith, BH Waters, S Wisdom, AP Sample	UW	124
A4	US Patent App 13/976,698	Presence and range detection of wireless power receiving devices and method thereof	J Walsh, JR Smith, I Kipnis	Intel	193
A3	US Patent App 12/974,631	Range adaptation mechanism for wireless power transfer	EB Cooper, S Yang, CJ Bonsavage, JR Smith, AP Sample, AS Konanur	Intel	75
A2	US Patent App 12/754,954	Wireless power transfer apparatus and method thereof	JR Smith, AP Sample	Intel	269
A1	US Patent App 12/567,651	Wirelessly Powered Speaker	EB Cooper, JR Smith, AP Sample	Intel	191

Abstracts, letters, non-refereed papers, technical reports

- **Exploration of Backscatter Methods for Wireless Avionics**, Aaron Parks, Vamsi Talla, Bryce Kellogg, Joshua Smith, Shyam Gollakota, NASA/CR—2018–219903, June 1, 2018
- **Physical Human-Robot Adversarial Gameplay**, B Yang, P Lancaster, JR Smith, RSS Workshop on Adversarial Robotics, June 30, 2018
- **Prospects for Combining Task and Motion Planning for Bi-Manual Solution of the Rubik's Cube**, B. Yang, P. Lancaster, J.R. Smith Robotics: Science and Systems 2016 Workshop on Task and Motion Planning, (June 2016, Ann Arbor, MI)
- **uMonitor: a Runtime Energy Monitor for Improved Task Scheduling in IPDs**, Saman Naderiparizi, Aaron Parks, Yi Zhao, Joshua R. Smith, HLPC Workshop, ASPLOS, Atlanta, GA, April 2, 2016
- **WISPCam: An RF-Powered Smart Camera for Machine Vision Applications**, Saman Naderiparizi, Zerina Kapetanovic, Joshua R. Smith, HLPC Workshop, ASPLOS, Atlanta, GA, April 2, 2016
- **[Printed Low Power Amperometric Gas Sensors Employing RF Energy Harvesting](#)**, M.T. Carter, J.R. Stetter, J.R. Smith, A.N. Parks, Y. Zhao, M.W. Findlay, V. Patel. 221st Electrochemical Society Meeting, 2012, Seattle
- **[Physicality: Interacting with the Physical World, From Atoms to Humans](#)**, Joshua R. Smith, Beverly L. Harrison, Xiaofeng Ren, Siddhartha Srinivasa. Intel Technology Journal, Volume 14, Issue 1, pp. 46-61. 2010
- **[Sensors, Tags, and Security](#)**. Joshua R. Smith. In Proceedings of the State of Technology Conference on Mobile Wireless Technologies for Persons with Disabilities, Atlanta, GA, May 11-12 2004, pp. 60-66.

Other significant research dissemination (web sites, software, Wikis, etc.)

- Wisp Challenge: Wisp hardware awarded to qualifying academic applicants. Over 200 groups using Wisp. Community website: wisp.wikispaces.com.
- **[WISP Summit](#)**, a workshop on WISP organized in conjunction with Sensys 2009
- BUGSX artificial evolution software is available free online. It is downloadable through Ubuntu Linux Software Center.

OTHER SCHOLARLY ACTIVITY

Invited lectures and seminars

- L96 Acoustic Levitation, University of Washington Institute of Neuro-engineering (UWIN) Seminar, Seattle, WA, December 11, 2019
- L95 Electric Field Sensing, Pretouch Sensing & Robotics, Class of 1960 Scholars in Computer Science Lecture, Williamstown, MA, September 20, 2019
- L94 Perpetual Computing: Technologies for Banishing Batteries, Class of 1960 Scholars in Computer Science Lecture, Williamstown, MA, September 19, 2019

- L93 Sensing & Wireless Power for EFRI Project “Muscle-like Cellular Architectures and Compliant, Distributed Sensing and Control for Soft Robots”, EFRI Team Meeting, Yale University, New Haven, CT, September 19, 2019
- L92 Sensing, Power, and Communication, Madrona Technology Advisory Board Dinner on Intersection of Digital and Physical, Seattle, WA, September 9, 2019
- L91 Drawing continuous curves with Turtle geometry: From coil design to Spirograph, UW-MSR Summer Institute on The Future of Fabrication, Semiahoo Resort, Blaine, WA, July 23, 2019
- L90 Perpetual Computing: Technologies for Banishing Batteries, US Patent and Trade Office visit to UW CoMotion Headquarters, Seattle, WA, June 27, 2019
- L89 Robotics in the Sensor Systems Lab, UW Robotics Retreat, Seattle, WA, June 7, 2019
- L88 Research in the Sensor Systems Lab, UW-Nantes-French-American Chamber of Commerce of the Pacific Northwest, Seattle, WA, May 30, 2019
- L87 Sensing, power, and communication for soft robots and living systems, Mobicom TPC Mini-Symposium, Seattle, WA, May 16, 2019
- L86 Perpetual Computing: Technologies for Banishing Batteries, Global Innovation Exchange, Bellevue, WA, May 9, 2019
- L85 Perpetual Computing: Technologies for Banishing Batteries (Invited talk), ARM Headquarters, Cambridge, UK, February 8, 2019
- L84 Perpetual Computing: Technologies for Banishing Batteries, Departmental Seminar & Mobile Systems Center Seminar, Department of Computer Science and Technology, University of Cambridge, Cambridge, UK, Feb 6, 2019 Host: Cecelia Mascolo
- L83 Perpetual Computing: Technologies for Banishing Batteries (Invited talk), Fortive Conference on Growth and Innovation, Beaverton, Oregon, October 17, 2018
- L82 A Unified Sensor for Pre-Touch, Touch and Post-Touch Force Measurement (Invited talk), 1st Workshop on Proximity Perception in Robotics, IROS 2018, Madrid Spain, October 1, 2018
- L81 Ambient backscatter Communication and the Internet of Things (Invited talk), IEEE Wireless Power Transfer Conference / Wireless Power Week, June 5, 2018
- L80 Overview of Backscatter (Tutorial), Workshop on Backscattering Techniques, IEEE Wireless Power Transfer Conference / Wireless Power Week, June 3, 2018
- L79 Wireless Power and Information Transfer: Enabling Perpetual Computing, Workshop on Energy Harvesting Wireless Communications, IEEE International Conference on Communications, Kansas City, MO, May 20, 2018
- L78 Battery free cameras with analog backscatter and interactive compression, Information Theory and Applications (ITA) Workshop, San Diego, CA, February 13, 2018.
- L77 Passive Wireless Sensing Workshop, WiSEE 2017 (Wireless Technologies for Space and Extreme Environments), “Passive Radio Technologies from the University of Washington Sensor Systems Lab,” Invited Speaker, Montreal Canada, October 10, 2017.
- L76 IEEE Seattle Section, EMC Society Chapter, Advances in Antenna/EMC/Wireless Test and Measurement, “Perpetual Computing: Technologies for Banishing Batteries,” Museum of Flight, Seattle, WA, May 18, 2017.
- L75 Yale University, Department of Electrical Engineering, “Perpetual Computing: Technologies for Banishing Batteries,” New Haven, CT, January 31, 2017. Host: Leandros Tassioulas.
- L74 Northwestern University Department of Mechanical Engineering, “Sensor Systems Lab & In-Air Electrosense Update”, Evanston, IL, December 15, 2016
- L73 Notre Dame Department of Electrical Engineering Seminar, “Toward Battery-Free Sensing, Computing, and Communication,” South Bend, IN, December 14, 2016

- L72 University of Washington Institute for Neuroengineering (UWIN) Seminar, “Battery-free wireless cameras: A platform for neurally inspired information processing research?” Seattle, WA, November 9, 2016
- L71 Allen Frontiers Symposium, “Brain-Controlled Spinal Interface,” New York Academy of Sciences, New York, NY, October 25, 2016
- L70 Congressional Round Table with Representative Suzan DelBene, “Internet of Things in Healthcare,” Seattle, WA, October 17, 2016.
- L69 Microsoft Faculty Summit, session “Cameras everywhere! Video Analytics at Scale,” Redmond, WA. Host: Ganesh Ananthanarayanan, July 13, 2016.
- L68 In-Q-Tel Tech Focus Day on Ultra Low Power Electronics. My talk: “RF-Powered Sensing, Computing, and Communication”, Tysons Corner, VA, May 26, 2016
- L67 DARPA ISAT Workshop on Bio-Integrated Processing, Sensing, and Storage. My talk: “Thermodynamics of Computation: Past and Future,” Seattle, WA, March 21-22, 2016
- L66 Tech in Focus: Internet of Things panel, Washington Technology Industry Association, Seattle, WA, March 15, 2016.
- L65 International Workshop on Antenna Technology, “Large area wireless power via a planar array of coupled resonators,” Cocoa Beach, FL. Invited by Jenshan Lin (U. Florida). March 2, 2016
- L64 Neural Engineering Seminar (BIOE 498B/599I), “Power and Communication to implanted neural interface devices”, UW CSNE, Feb 3, 2016
- L63 Bosch Research Lab, Palo Alto, CA, “Sensor Systems Lab Update,” January 19, 2016
- L62 Engineering 101 Guest Lecture, “Research in the Sensor Systems Lab”, Kane Hall, UW, December 8, 2015
- L61 Tsinghua University, Department of Automation, Beijing, China, “Ambient Backscatter: Efficient Communication for RF-Powered Platforms.” Host: Prof. Feifei Gao. November 17, 2015
- L60 Starbucks HQ, “Zero Power Sensing and Communication for the Internet of Things,” Starbucks GTxP Internet of Things Workshop, November 12, 2015
- L59 Google Mobile Faculty Summit, “Wireless Power: From Perpetual Sensing To Implanted Electronics, or Abusing RF Signals for Fun and Profit” Google HQ, Mountainview, CA. Host: Matt Welsh, October 9, 2105
- L58 Intel Science and Technology Center for Pervasive Computing Retreat, “Overview talk: Low Power / Sensing,” Intel Jones Farm, Hillsboro OR, August 12, 2015
- L57 Intel Science and Technology Center for Pervasive Computing Retreat, PI Workshop, “Implanted Electronics: The Future of Ubiquitous Computing?” Portland Oregon, August 11, 2015
- L56 Engineering 101 Guest Lecture, “Research in the Sensor Systems Lab”, Kane Hall, UW, June 3, 2015
- L55 Glaxo Smith Kline (GSK) Bioelectronics Challenge Proposers Workshop, “BIONIC: Bidirectional Interface for Organ Nerve Integrated Control” Host: Roy Katso. Los Angeles, CA. May 14, 2015.
- L54 CSNE Industrial Advisory Board, “Wireless Power and Energy Efficient Communication for Neural Engineering and Other Applications,” UW CSNE, May 4, 2015.
- L53 National Academy of Engineering 2015 Regional Meeting and Symposium on Reverse Engineering the Brain. Lecture entitled “Engineering Brain Implants,” one of 3 invited lecturers from UW faculty. March 19, 2015
- L52 Neural Engineering Seminar (BIOE 498B/599I), “Power and Communication to implanted neural interface devices”, UW CSNE, Feb 4, 2015
- L51 Allen Distinguished Investigator Life Science Symposium, Scripps Seaside Forum at UC San Diego. [“A Brain-Computer Interface to Reanimate the Limbs Following Spinal Injury:](#)

- [Development of a Brain-Computer-Spinal Interface](#),” with Chet Moritz and Adrienne Fairhall, Feb 9, 2015.
- L50 UW College of Engineering Lecture Series, Cutting the cord: Wireless power for implanted devices. One of 3 invited lecturers from UW Engineering faculty for 2014. November 18, 2014
- L49 UW CSE Industrial Affiliates, **Invited Keynote**, “Powering the Internet of Things: RF-Powered Sensing, Computing, and Communication,” Seattle, WA. Host: Hank Levy. October 22, 2014.
- L48 IEEE RFID-TA 2014 **Invited Keynote**, “RF-Powered Sensing, Computing and Communication”, Tampere, Finland. Host: Leena Ukkonen and Apostolos Georgiadis. Sept 8, 2014
- L47 Microsoft Faculty Summit, workshop on Ultra-low Power Computing, “RF-Powered Sensing, Computing, and Communication,” July 16, 2014
- L46 Microsoft Technical Community Network Talk, “Powering the Internet of Things: RF-Powered Sensing, Computing, and Communication.” Host: Matthai Philipose. April 8, 2014.
- L45 ASPLOS 2014, Wild and Crazy Ideas session, **Invited Keynote**, “RF-powered computing and communication,” Salt Lake City Utah, Mar 1-5, 2014.
- L44 PowerMEMS School, “Near field wireless power transfer,” London. Hosts: Shad Roundy and Einar Halvorsen. Dec 2-3, 2013.
- L43 NASA Jet Propulsion Laboratory, “RF-Powered Sensor-Actuator Systems,” Pasadena, CA. Host: Thomas Cwik. June 18, 2013
- L42 Stanford University, Electrical Engineering Computer Systems Colloquium (EE380), “Wireless Power Transfer and RF Energy Harvesting: New Options for System Designers,” June 5, 2013.
- L41 Northeastern University, First International Summer School on Green Communications and Networking, “Mapping the Space of Wirelessly Powered Systems.” Host: Wendi Heinzelman (Rochester), May 30, 2013.
- L40 Robotics Institute, Carnegie Mellon University, “Pretouch Sensing for Manipulation,” Pittsburgh, PA. Host: Matt Mason. May 28, 2013
- L39 University of California, Berkeley, Berkeley Institute of Design Seminar, “Mapping the Space of Wirelessly Powered Systems.” Host: John Canny. May 21, 2013.
- L38 Georgia Institute of Technology, “Mapping the Space of Wirelessly Powered Systems,” May 17, 2013.
- L37 IEEE RFID 2013, **Invited keynote**, “Wireless power for Left Ventricular Assist Devices,” Orlando, Fl. Host: Matt Reynolds. May 2, 2013
- L36 University of Notre Dame, Department of Electrical Engineering Systems Seminar, “Mapping the Space of Wirelessly Powered Systems,” South Bend, IN. Host: Alan Seabaugh. April 10, 2013.
- L35 Yale University, Yale School of Medicine, Presentation, “Mapping the Space of Wirelessly Powered Systems,” March 25, 2013.
- L34 International Symposium on Cognitive Neuroscience Robotics, UW Seattle (joint with Osaka University), “Sensor Systems for Robotics,” February 1, 2013.
- L33 UW Robotics Colloquium, UW Seattle, “Robotics Research in The Sensor Systems Lab,” Jan 25, 2013
- L32 Microhams (Microsoft Ham Radio club), Redmond, WA, “Connecting Physical and Digital with Sensor Systems,” January 14, 2013
- L31 IEEE International Conference on RFID-Technology and Applications 2012, **Invited keynote** talk, “Wirelessly powered sensor systems and computational RFID,” Nice, France. Host: Gaetano Marrocco, November 5-7, 2012.

- L30 2012 CMOS Emerging Technologies Conference, **Invited plenary** talk, "Wirelessly powered sensing platforms," July 18-20, 2012, in Vancouver, BC, Canada.
- L29 Semiconductor Research Corporation (SRC) /Science Foundation Ireland (SFI) / National Science Foundation (NSF) Forum on Integrated Sensors for Cybersystems - FISC 2030, "Wirelessly powered sensor systems" March 22-23, Carton House, Maynooth, Co. Kildare, Ireland. Invitation only workshop.
- L28 Western Washington American Society of Mechanical Engineers, "Artificial Hearts," Feb 16, 2012.
- L27 UW EE 592, "Connecting Physical and Digital with Sensor Systems." November 4, 2011.
- L26 Google (Fremont) Colloquium, "Connecting Physical and Digital with Sensor Systems." Host: Matt Welsh. April 27, 2011.
- L25 Northeastern University, Communications and Digital Signal Processing Center (CDSP), Annual CDSP Research Workshop, **Invited keynote** talk: "Connecting Physical and Digital with Sensor Systems", March 25, 2011. Previous (2010) keynote: Russ Tedrake. Host: Kaushik Chowdhury.
- L24 MIT Enterprise Forum, Seattle WA, March 16, 2011. One of 4 invited to participate in panel entitled "The internet of things." Moderated by Brier Dudley of the Seattle Times.
- L23 Georgia Institute of Technology, Robotics and Intelligent Machines (RIM) Seminar, "Connecting Physical and Digital with Sensor Systems", February 2011.
- L22 Columbia University Nanoscale Science and Engineering Center Seminar, "Connecting Physical and Digital with Sensor Systems", January 2011.
- L21 ICySSS conference, Cypress Semiconductor, Lynnwood, WA, **Invited keynote** talk: "Connecting Physical and Digital with Sensor Systems," September 2010
- L20 Google, Mountainview, CA "Connecting Physical and Digital with Sensor Systems," April 2010
- L19 University of Washington, Computer Science and Engineering Colloquium, "Connecting Physical and Digital with Sensor Systems," April 2010
- L18 Seattle Robotics Society, "Wireless Power and Personal Robotics," March 2010
- L17 University of Washington, Electrical Engineering Colloquium, "Mapping the space of wirelessly powered systems," January 2010
- L16 Microsoft Research Colloquium, "Personal Robotics and Wireless Power," February 2009.
- L15 Northwestern University, McCormick Lecture in Mechanical Engineering, "Electric Field Pretouch for Robotic Manipulation," Nov. 2008.
- L14 Seattle Robotics Society, "Personal Robotics at Intel," November 2008
- L13 Semiconductor Research Corporation / National Science Foundation forum on Nanomorphic Systems (invitation only workshop), "Wirelessly-powered platform for sensing and computation: Radiative and resonant-non-radiative wireless power transfer," November 2007. Stanford University, Palo Alto, CA
- L12 University of Washington, Computer Science and Engineering Colloquium, "New Approaches to Identification and Sensing," May 2005.
- L11 Stanford University, "Computational Sensing and Perception," April 2004.
- L10 Intel Corporation, "Computational Sensing and Perception," April 2004.
- L9 Georgia Institute of Technology, "Computational Sensing and Perception," March 2004.
- L8 Olin College, "Computational Sensing and Perception," February 2004.
- L7 MediaLabEurope, "Alien Sensing," January 2004.
- L6 Massachusetts Institute of Technology, AI Lab Colloquium, "Computational Sensing and Perception," April 2003.
- L5 University of Cambridge (UK), Department of Physics, Cavendish Laboratory, Inferential Sciences Colloquium, "Intelligent Documents," May 2001.
- L4 Microsoft Research Colloquium, "Electric Field Imaging," June 1998.
- L3 IBM Research Colloquium, "Electric Field Imaging," June 1998.

- L2 Microsoft Research Colloquium, “Modulation and Information Hiding.” April 1998.
L1 University of Cambridge (UK), Department of Physics, Cavendish Laboratory, Inferential Sciences Colloquium, “Toward Electric Field Imaging,” 1997.

Talks, demonstrations, ads, etc. (not already listed as conference publications)

- “Wireless Resonant Energy Link,” TED Global, Oxford, UK, July 2010.
- “Range adaptation of the Wireless Resonant Energy Link,” student Josh Erickson co-presented demo, Research at Intel Day, Computer Museum, Mountainview, CA, July 2010.
- I am featured by name in several Intel TV ads in Intel’s “Sponsors of Tomorrow” ad campaign. In one, I am identified by name: “Joshua Smith, Pretouch Robotics Inventor.” The ad references my CeBIT demo (described below). [Click here to view Intel television ad referencing my robotics research.](#) (I am played by an actor). Another ad that aired in China features a Chinese actor playing me as an “Intel Rockstar” (this is a version of the popular rockstar ad that was played in the U.S., but localized to China). The text of the ad reads “J. Smith: Pulls power from atmosphere.” [Click here to see Intel television ad referencing my wireless power research.](#)
- “Sponsors of Tomorrow” I appeared in a press conference with Intel CTO Justin Rattner and Intel Fellow Ajay Bhatt (inventor of USB) to discuss my role as a “rockstar” in Intel’s ad campaign, Computer Museum, Mountainview, CA, July 2009.
- “A wirelessly powered speaker,” student David Meyer co-presented demo, Research at Intel Day, Computer Museum, Mountainview, CA, July 2009.
- “Launching CeBIT with E-Field Pretouch,” robotics demonstration with Chancellor of Germany Angela Merkel, Governor of California Arnold Schwarzenegger, and Intel Chairman Craig Barrett. Our robot “Marvin” helped the VIPs cut the ribbon to launch the CeBIT tradeshow. [Click here to view video.](#) Student Brian Mayton participated in demo. CeBIT, Hannover, Germany, March 2009.
- “Robotics: Progress and Prospects,” Presentation to Intel CEO Paul Otellini, February 2009.
- “Wireless Resonant Energy Link,” Intel Developer Forum, San Francisco, CA, Intel CTO Justin Rattner demos WREL in his keynote, Aug 2008. Student Alanson Sample included in demo. IDF Taipei, Demo repeated in research keynote, Oct 2008.
- “Electric Field Pretouch,” Intel Developer Forum, San Francisco, CA, Intel CTO Justin Rattner demos E-Field Pretouch in his keynote, Aug 2008. IDF Taipei, Demo repeated in research keynote, Oct 2008.
- “Personal Robotics at Intel,” Presentation to leading academic roboticists at Intel Personal Robotics workshop, which I organized. Santa Clara, CA, July 2008.
- “Electric Field Pretouch for Robotic Grasping,” student Ryan Wistort co-presented his novel robot hand design. Research at Intel Day, Computer Museum, Mountainview, CA, July 2008.
- “E-Field Pretouch Robotic Grasper,” demonstrated to Intel CEO and Management Committee as part of Technology Strategic Long Range Plan presentation on Computational Perception. October 2007.
- “Personal Robotics,” Corporate Technology Group Strategic Staff, October 2007.
- “Wispi,” demonstration at Intel Developer Forum (IDF) San Francisco. Student Dan Yeager co-presented, September 2007.

- “Futures for RFID in Healthcare,” Federal Trade Commission’s “Protecting Consumers in the Next Tech-ade,” Washington, D.C. November 6-8 2006.
- “WISP,” U.W. Department of Computer Science and Engineering Industrial Affiliates Day, Oct. 2006.
- “Wisp” Research at Intel Day, Santa Clara, CA June 2006.
- Intel Capital / Intel Corporate Technology Group Oregon Venture Capital Day “WISP,” demo. October 2005.
- Intel Country Fair, Jones Farm, OR, “WISP v0: RFID + 1 bit accelerometer,” August 2004.
- PostExpo, Hamburg Germany, “New Technologies for postage.” October 2001.
- America’s Millennium (U.S. National Millennium Celebration), Hirschorn Museum, Smithsonian Institution, “FiberFingerprint technology.” December 2000.
- “FiberFingerprint technology,” demonstration in keynote of US Postal Service CTO Norm Lorenz, National Postal Forum, Chicago, IL, September 1999.

Presentations given at conferences (not already listed as conference publications).

- **Brian Mayton**, Eric Garcia, Louis LeGrand, Joshua R. Smith, “Electric Field Pretouch: Towards Mobile Manipulation,” RSS 2009 Workshop on Mobile Manipulation in Human Environments
- **Joshua R. Smith**, Ryan Wistort, “Controlling a minimal dynamically stable structure.” Poster presentation, *Dynamic Walking*, Delft, Netherlands, May 2008.
- **Joshua R. Smith**, Neil Gershenfeld. “Activating Space with Electric Field Sensing,” Talk, *Siggraph Technical Sketches*, Los Angeles, August 1995.
- **Joshua R. Smith** and Donald House, “Evolving Models of Dynamical Systems with a Genetic Algorithm.” Poster presentation, *Artificial Life 3*, Santa Fe, New Mexico, June 1992.

Professional society memberships.

IEEE Fellow, 2020-
IEEE Senior Member, 2013-2019
IEEE Member, 1999-2012
ACM, 2004-Present

Selected Press Coverage

Technology Review, 7/29/2016, [First Wi-Fi-Enabled Smart Contact Lens Prototype](#)
Wired, 3/5/16, [The Future of Wi-Fi Is 10,000 Times More Energy Efficient](#)
Economist, 3/5/16, [Passive Voice: Redesigning Wi-Fi may let devices communicate more easily](#)
MIT Technology Review, 2/24/2016, 10 Breakthrough Technologies 2016, [Power from the Air](#)
Popular Science, 11/18/15, Best of What’s New 2015, [A Camera Powered by Wi-Fi](#)
BBC Radio, 9/16/15, UW robotics researchers Dieter Fox, Joshua Smith and Maya Cakmak discuss the future of robotics, AI and [teaching a robot how to solve a Rubik's Cube](#) (story begins at 23:46 mark)
Economist, 6/27/15, [Wireless Charging: Coiled and ready to strike](#)
Wired, 6/7/15, [Wi-Fi that charges your gadgets is closer than you think](#)
BBC News, 6/5/15, [Power beamed to camera via ambient wi-fi signals](#)
Technology Review, 6/3/15, [First Demonstration of a Surveillance Camera Powered by Ordinary Wi-Fi Broadcasts](#)

Foreign Policy, 5/20/15, [Innovations: Are Potholes a Thing of the Past?](#)
New York Times, 2/2/14, [Building a Better Battery](#)
Time, 8/15/13, [From the Future: Wireless Devices that Don't Require Batteries](#)
NBC News, 8/13/13, [No batteries! Wireless tech recycles airborne radio waves](#)
The Register (UK), 8/14/13, [Boffins harvest TV, mobile signals for BATTERY-FREE comms](#)
Technology Review, 8/14/13, [Devices Connect with Borrowed TV Signals and Need No Power Source](#)
Fox News, 8/17/13, [No Battery Required for This Wireless Device](#)
The Discovery Channel, 8/17/13, [No Battery Required for This Wireless Device](#)
Wired, 8/18/13, [Ambient Backscatter for battery-free object communication](#), by Bruce Sterling
Scientific American, 8/19/13, [Will TV Stations Power the Internet of Things?](#)
Slashdot, 8/14/13, [Wireless Devices Go Battery-Free With New Communication Technique](#)
Gizmodo, 8/13/13, [Battery-Free Wireless Devices Let You Send Texts After Your Phone Dies](#)
Total 16 National & International Stories, 73 Tech & Specialty Sites from 8/13/2013 – 9/19/2013
International stories include stories in North America, South America, Europe, Africa, Middle East, Asia, and Australia.

Earlier Press Coverage

Daily Disruption, June 2012, [Disruptor of the Day: Joshua Smith – A Researcher on The Cutting Edge of Sensor Technology \[Q&A\]](#).
Technology Review, April 2012, [The Computing Trend that Will Change Everything](#).
GreenBiz, March 2012, [What innovations are possible with ultra-efficient sensors?](#)
IEEE Spectrum, March 2012, [Is There a Moore's Law for Energy Efficiency?](#)
Technology Review, July 2011, [A Heart Pump Without a Cord](#).
Economist, Print: June 4th 2011, online: April 12, 2011. [A wireless heart](#)
New York Times, June 18, 2010. [Bye-Bye Batteries: Radio Waves as a Low-Power Source](#)
Economist, June 10, 2010. [Power from thin air](#)
New York Times, January 30, 2010. [Smart Dust? Not Quite, but We're Getting There](#)
The Times (UK), January 25, 2010. [Meet Marvin, the robot that can plug itself in](#)
Technology Review, November 25, 2009. [A Battery-Free Implantable Neural Sensor](#)
Seattle Times, June 15, 2009. [Intel aims to capture wild electricity](#)
New York Times, August 20, 2008. [Intel Moves to Free Gadgets of Their Recharging Cords](#)
on WREL & EF Pretouch. Many other press & blog stories were generated along with this one.
TechnologyReview.com, September 17, 2007. [Robots That Sense Before They Touch](#) on EF Pretouch Grasping.
CNET News.Com, May 24, 2006. [Sensors: Living off scraps of energy](#). Story covers WISP.
TechnologyReview.com, May 15, 2006. [Sensors without batteries](#). Story on WISP.
New York Times Magazine, June 11, 2000. [The Document That Can't Be Forged](#). Story on FiberFingerprint.
CBS, The Early Show TV coverage of NEC's Occupant Position Detection System.

COURSES TAUGHT

Courses Taught

Course	Title	Qtr
CSE 490W	Wireless Communication	Spr 2020
CSE-EE 371	Design of Digital Circuits and Systems	Spr 2018
EE 205	Intro. To Signal Conditioning	Win 2018
CSE-EE 371	Design of Digital Circuits and Systems	Spr 2017
EE 205	Intro. To Signal Conditioning	Win 2017
CSE / EE 475	Embedded Systems Capstone	Spr 2016
EE 205	Intro. To Signal Conditioning	Win 2016
CSE 352	Hardware Design and Implementation	Spr 2015
EE 205	Intro. To Signal Conditioning	Win 2015
CSE 352	Hardware Design and Implementation	Spr 2014
EE 205	Intro. To Signal Conditioning	Win 2014
CSE 599D / EE 590A	Physics of Computation	Au 2013
EE 205	Intro. To Signal Conditioning	Win 2013
CSE 466	Software for Embedded Systems	Aut 2012
CSE 599 J	Personal Robotics	Spr 2012
EE 205	Intro. To Signal Conditioning	Win 2012
CSE 466	Software for Embedded Systems	Aut 2011
EE 205	Intro. To Signal Conditioning	Spr 2011

SERVICE

University service

- GIX Master of Science in Technology Innovation (MSTI) Interdisciplinary Faculty Group (IFG). This group of 5 faculty functions as a “Department Chair” for the GIX MSTI program. 2016-
- GIX MSTI Curriculum Committee, 2015
- CoMotion Presidential Innovation Fellow, 2015
- Thrust Leader, Communications and Interface, NSF Engineering Research Center for Sensorimotor Neural Engineering (CSNE), 2012 - present
- Leader, Low Power Sensing and Communication theme, Intel Science and Technology Center for Pervasive Computing (ISTC-PC), 2012-2015.

College of Engineering Service

- IP Committee Member, 2018

Departmental service

- Faculty Coordinator, ECE Professional Programs, 2014-Present. I manage an organization with its own P&L that brought in \$2M in revenue to the department in 2017-2018 and \$2.5M in 2018-2019.
- Member, CSE Graduate Admissions Committee, 2016.
- Member CSE Majors Admission Committee, 2014
- Member CSE 5th year Masters Admissions Committee, 2012-2013
- Member of EE Professional Masters Committee, 2011-Present.
- Member of search committee for EE Department 2010-2011 Molecular Engineering faculty search.
- EE Direct Freshman Admits Committee, 2011-2012
- Engineering Discovery Days: 2011--2016 (April). Demonstrations of robotics and wireless power.

Professional society and other service

- ACM Ubicomp 2020, 2021 Sponsorship & Industrial Relationships Co-Chair
- IEEE RFID 2019, **General Chair**; member of Technical Program Committee
- ACM MobiCom 2020 Technical Program Committee
- ACM MobiCom 2019 Technical Program Committee
- ACM MobiCom 2017 Technical Program Committee
- Sigcomm 2016 Program Committee. Invited by Sachin Katti and Amin Vahdat.
- UIST 2016 Program Committee. Invited by Jake Wobbrock and Daniel Avrahami.
- Sensys 2016 Program Committee. Invited by Lama Nachman.
- Ubicomp 2013 Program Committee,. Invited by John Canny.
- IEEE RFID 2014, 2013, 2012, Technical Program Committee Chair for Power Harvesting track,
- Editorial Board member, Wireless Power Transfer journal, Cambridge University Press, January 2013 – 2019.
- Associate Editor, IEEE RFID Virtual Journal. 2013 – 2016.
- Selection panel for NSF CISE Computer Systems Research grant panel, Arlington, VA 4/11/12—4/12/12.

- Selection panel for NIH NHLBI SBIR grants on Novel Technologies for Powering Ventricular Assist Devices, Bethesda, MD, 3/8/2012.
- Member of [CCC/CRA Study on Robotics](#) (Professional and Service Robotics panel, 7-8 Aug. 2008, San Francisco, CA), creating [15 year U.S. National roadmap for robotics research](#), which has been presented to the U.S. Congress in a series of briefings; a photo of my EF Pretouch research appears on the cover of the report. Aug 2012: Member of panel updating Robotics Roadmap. Aug 2016: Invited to join Roadmap update panel again; declined because of schedule conflict.
- Program Committee member for IEEE RFID 2016, 2013, 2012, 2011, 2010, 2009, MedCOMM 2012 (workshop on Medical Communication in conjunction with SigCOMM), Internet of Things (IoT) 2012, RFIDSec 2011, Ubiquitous Computing Systems (UCS) 2010, 2009, RFID Data Management 2008 (RFDM 08), UCS 2007, Pervasive Computing 2006.
- Reviewer for ICRA, IROS, RSS, Ubicomp, IEEE Pervasive Computing Magazine, UIST Conference, CHI conference, IEEE Transactions on Image Processing, Eurasip Journal on Applied Signal Processing, Cambridge University Press (Physics section and Engineering section). Chaired Tactile Sensing Session at IROS in 2008 and in 2007.

International, national or governmental service

- Federal Trade Commission, "[Protecting consumers in the next Techade](#)". Testified on the future of RFID and sensing. Other speakers included Vint Cerf (Google), Eric Horvitz (Microsoft) 2006.
- United States Postal Service, Mail Technology Strategy Council, Member 2003-2008
- [U.S. President's Commission on the Postal Service](#). My testimony led to new U.S. "Personalized Postage" with custom photographs. Examples of my prototypes are found on pp. 24 and 179 of the report, 2003
- United States Postal Service, Intelligent Document Task Force, Member, 1999-2003
- United States Postal Service, Intelligence on Mail for Security Task Force, Industry co-chair for Technology and Infrastructure Sub-Committee, 10/01 – 5/02
- Smithsonian Institution, National Postal Museum. Appointed Member of the Council of Advisors (Board of directors), National Postal Museum, 2002-2004

Industrial service/Intel Service

Wireless Strategic Patent Team

2007 – 2010

Sets patent filing targets for the two Intel Corporation IP committees covering wireless technologies. Membership normally restricted to grade P.E. and above.

Wireless Platform Technologies IP Committee

2006 – 2010

Votes to reject or file patent applications on invention disclosures for Intel Corporation in wireless technology.

Physicality Theme, Intel Research

2006 – 2010

Leader of one of Intel Research's 5 content themes.

Entrepreneurship

Proprio (formerly eLoupes Inc): Cofounder, Observer, Board of Directors. Co-founders include Ken Denman (serial entrepreneur), Dr. Sam Browd (neurosurgeon and serial entrepreneur) and UW students. Founded 2016.

Wibotic Inc: Cofounder, member of Board of Directors. Co-founded with former PhD student Ben Waters. Company named one of Seattle's hottest startups in 2016. Founded 2015.

Jeeva Wireless Inc: Cofounder, member of Board of Directors. Co-founders Shyamnath Gollakota (UW CSE faculty) and student colleagues. Founded 2015.