

Shantanu Chakrabartty

Clifford W. Murphy Professor
Department of Electrical and Systems Engineering
Washington University in St. Louis.
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RESEARCH INTERESTS

Analog computing and Analog integrated circuits with focus on: (a) Energy scavenging and self-powered sensors, circuits and systems; (b) biomedical and implantable circuits and systems; (c) neuromorphic engineering; (d) neuromorphic systems; (e) floating-gate circuits and systems.

EDUCATION

The Johns Hopkins University, Baltimore, MD

Ph.D., Electrical and Computer Engineering, 2004.

Dissertation: Design and Implementation of Ultra-low-power Pattern Recognizers and Sequence Decoders;

Advisor: Gert Cauwenberghs

The Johns Hopkins University, Baltimore MD

M.S., Electrical and Computer Engineering, 2001.

Indian Institute of Technology, New Delhi

B.Tech, Electrical Engineering, 1996.

PROFESSIONAL EXPERIENCE

Washington University, St. Louis, MO

7/2022 – Present

Vice Dean for Research and Graduate Education, McKelvey School of Engineering

Washington University, St. Louis, MO

7/2015 – Present

Clifford W. Murphy Professor, Department of Electrical and Systems Engineering

Professor, Division of Biology and Biomedical Sciences (Neurosciences)

Professor (by courtesy), Department of Biomedical Engineering

Professor (by courtesy), Department of Computer Science and Engineering

Washington University, St. Louis, MO

7/2022 – Present

McDonnell International Scholars Academy Ambassador to Indian Institute of Sciences, Bengaluru, India.

Michigan State University, East Lansing, MI

7/2010 – 6/2015

Associate Professor, Department of Electrical and Computer Engineering

Michigan State University, East Lansing, MI

1/2012 – 6/2015

Adjunct Professor, Department of Biosystems Engineering

Piezonix LLC., East Lansing, MI <i>Co-founder and Chief Scientific Officer</i>	5/2013 – Present
Infrastructure Analytics Company Inc., Wyoming, <i>Co-founder and Board Member</i>	5/2020 – Present
Michigan State University, East Lansing, MI <i>Assistant Professor, Department of Electrical and Computer Engineering</i>	8/2004 – 6/2010
The Johns Hopkins University, Baltimore, MD <i>Research Assistant, Electrical and Computer Engineering</i>	5/1999 – 8/2004
University of Tokyo, Tokyo, Japan <i>Visiting Researcher, Department of Informatics</i>	9/2002 - 12/2002
Qualcomm Incorporated, San Diego, CA <i>Engineer, Network and Switching Subsystem Group</i>	1/1996 – 5/1999

AWARDS AND HONORS

- *Fellow, American Institute of Medical and Biological Engineering (AIMBE)*
- *Keynote Speaker, IEEE CIBCB 2018.*
- *MSU Innovation of the Year Award, 2012.*
- *NSF CAREER Award, 2010.*
- *MSU Teacher-Scholar Award, 2011.*
- *Alumni, U.S. National Academy Frontiers of Engineering.*
- *Honorary Mention, Best Paper Award, IEEE ISCAS 2015.*
- *Best Paper Award in Sensory Systems, IEEE ISCAS 2014.*
- *Best Paper Award in Sensory Systems, IEEE ISCAS 2013.*
- *Honorary Mention, Best Paper Award, IEEE ISCAS 2012.*
- *Honorary Mention, Best Paper Award, IEEE ISCAS 2011.*
- *Invited Member, Defense Science Research Council, USA, 2006.*
- *Catalyst Foundation Fellow, 1999-2004.*
- *Academic Frontiers Student Exchange Scholarship (Japanese Govt.), 2002.*
- *Best Undergraduate Thesis, IIT Delhi, 1996.*
- *National Talent Search Scholarship Recipient, India, 1990.*
- *Junior Talent Search Scholarship Recipient, India, 1989.*

TEACHING

Average Student Instructional Rating Score (Washington University): 6.5/7.00

Average Student Instructional Rating Score (Michigan State University): 3.84/4.00

Courses:

- Analog Integrated Circuits, Spring 2009, Spring 2010, 2012, 2014.
- Introduction to Mixed-signal Integrated Circuits, Fall 2007,2008,2009,2010,2011,2012,2014.
- Biomedical Instrumentation, Fall 2007.

- Low-power analog and mixed-signal VLSI systems, Michigan State University, Fall 2004, Spring 2006, Spring 2007. Spring 2008
- Mixed-signal Prototyping and Testing, Michigan State University, Spring 2005.
- Algorithms of Circuit Design, Michigan State University, Fall 2005, Fall 2006.
- Introduction to Electronic Instrumentation, Washington University, Spring 2016,2017.
- Analog Integrated Circuits, Washington University, Fall 2015,2016,2017,2018,2019, 2020, 2021,2022,2023.
- Fundamentals of Hardware for Machine Learning, Washington University, Fall 2021.

INVITED PRESENTATIONS

- *Learning-in-Memory*, Telluride Neuromorphic and Cognition Engineering Workshop, June 2023.
- *Quantum Tunneling, Synaptic Intelligence and Learning-in-Memory*, Invited Speaker, Neuromorphic Engineering Workshop at 50th year DESE Celebration, Indian Institute of Sciences, January 2024.
- *Sense Now Test Later - Hypothesis Testing in Self-powered Sensors*, Washington University Statistics Colloquium, Nov 2022.
- *Neuromorphic Design using Energy-harvesting Principles*, IOP Webinar, October 2022.
- *Quantum Tunneling, Synaptic Intelligence and Continual Learning*, Invited Speaker, Telluride Neuromorphic and Cognitive Engineering Workshop, June 2022.
- *Analog Computing and Dynamical Systems – from simple to complex*, Distinguished Seminar Series, University of Mizzouri, Columbia, Oct 22, 2021.
- *Of Insects and Cyborgs*, Washington University Parent’s Council, St. Louis, October 30 2019.
- *Growth transform neural network: A scalable neuromorphic learning framework to address neuron-to-network performance gap*, Brain Computing and Learning Workshop, Indian Institute of Sciences, Bengaluru, India, July 2019.
- *IoT Security Solution based on Zero-power Timer Technology*, Cybersecurity TTP Workshop, Chicago, June 19, 2019.
- *Expeditions in Self-powered Computing*, Graduate Seminar Series, Saint Louis University, MO, USA, April 9, 2019.
- *Hardware Form Factors/System Design for Sustained Usage and Data Gathering: Wireless devices, body area networks, online services, ``Workshop on Reconfigurable Sensor Systems Integrated with Artificial Intelligence and Data Harnessing to Enable Personalized Medicine.”* March 7-8, 2019, National Science Foundation, Alexandria, VA
- *Neuromorphic Computing at Crossroads*, Brain, Computing and Learning Workshop, Indian Institute of Science, Bangalore, India, Jan. 2019 (Host: Chetan Thakur).
- *Self-powered Dynamic Signatures for Authentication of Passive IoTs*, TAME Workshop, Columbus, Ohio, Nov. 2018 (Host: Mark Tehranipour).
- *Spiking, Bursting, Noise-shaping and Population Dynamics in a Network of Growth Transform Neurons*, Brain, Computing and Learning Workshop, Indian Institute of Science, Bangalore, India, Jan. 2018 (Host: Chetan Thakur).
- *Towards a Universal Analog Computing Paradigm*, Department of Mathematics and Computer Science Colloquium, University of Missouri, St. Louis, MO, Nov. 2017 (Host:

Ravindra Giraviru).

- *Expeditions in Self-powered Sensing*, Air Force Research Laboratory, Dayton, OH, Oct. 2017 (Host: Jeremy Ward).
- *Zero-power Dynamic Signature for Trust Verification of Passive Sensors and Tags*, Internet2 Cybersecurity Symposium, Indianapolis, Oct. 2017 (Host: Emily Nichols).
- *Zero-power Dynamic Signature for Trust Verification of Passive Sensors and Tags*, Global Research Consortium, Bangalore, India, Jan. 2016 (Host: William Joyner Jr.).
- *Expeditions in Self-powered Sensing, Computing and Imaging*, Department of Biomedical Engineering, Washington University in St. Louis, MO, Nov. 2015 (Host: Prof. Baranidharan Raman).
- *Expeditions in Floating-gate Circuits and Systems: Self-powered sensing and computing*, Department of Electrical and Computer Engineering, Stony Brook University, NY, Dec. 2013 (Host: Prof. Milutin Stanacevic).
- *Expeditions in Floating-gate Circuits and Systems: Self-powered sensing and computing*, Department of Electrical and Computer Engineering, Tufts University, MA, Nov. 2013 (Host: Prof. Valencia Koomson).
- *Expeditions in Floating-gate Circuits and Systems: From Self-powered sensors to nano-watt analog processors*, Department of Electrical and Computer Engineering, University of Toronto, Canada, Nov. 2013 (Host: Prof. Roman Genov).
- *Expeditions in Floating-gate Circuits and Systems: From Self-powered sensors to nano-watt analog processors*, Department of Computer Science and Engineering, Washington University, St. Louis, Oct. 2013 (Host: Prof. Viktor Gruev).
- *Approaching limits of sensing using neuromorphic noise-exploitation principles*, SPIE, San Diego, Mar. 2013 (Host: Prof. R.J. Martin-Palma)
- *Reproducing Kernel-based Methods for Extracting and Identifying Noise-robust Speech Features*, IEEE Asilomar Conference on Signal, Systems and Computers, Nov. 2012. (Host: Ghassan Alregib)
- *Noise-exploitation and Adaptation in Neuromorphic Sensors*, SPIE, San Diego, Mar. 2012 (Host: Prof. Akhlesh Lakhtakia).
- *Grand Challenge: Sensing-to-learn and Learning-to-sense – Exploiting biological symbiosis of sensing, computing, memory and adaptation for designing the next-generation of smart sensors*, NSF sponsored US-Japan Joint Workshop on Bioinspired Sensing and Actuation, Berkeley, Nov 12-13, 2011.
- *Morphing, Synthesis and Monitoring: Exploring the trinity of Hybrid Analog Integrated Circuits*, Department of Engineering Mechanics, Penn State University, Apr. 2011 (Host: Prof. Akhlesh Lakhtakia).
- *CMOS Integrated Circuits for Energy Scavenging and Self-powered Sensors*, IEEE Biomedical Circuits and Systems Conference, Paphos, Cyprus, Nov, 2010 (Host: Dr. Jennifer Blain)
- *Designing Microsystems that Learn: Algorithms and Hardware, Pattern Recognition and Machine Intelligence (PReMI09)*, Indian Institute of Technology, Delhi, Dec. 2009 (Host:

Prof. Jayadeva).

- *Forward error-correcting biosensors: Hybrid bio-CMOS circuits and systems*, CMOS Emerging Technologies Workshop, Sep. 2009 (Host: Dr. Kris Iniewski).
- *Design of Neuromorphic Data Converters*, Telluride Neuromorphic and Cognitive Workshop, Telluride, Colorado, Jul. 2009 (Host: Prof. John G. Harris).
- *Sigma-Delta Learning: Bridging the gap between neuromorphic systems, machine learning and mixed-signal processing*, Department of Informatics, University of Tokyo, Japan, June 2009 (Host: Prof. Toshihiko Yamasaki).
- *Sensors and Processors for Structural Health Monitoring*, VDEC, University of Tokyo, Japan, June 2009 (Host: Prof. Tadashi Shibata).
- *Operating below the sub-microwatt barrier – Explorations in Analog Computing*, Invited Presentation, Wireless Integrated Microsystems (WIMS), University of Michigan, Ann Arbor, April 2009 (Host: Prof. Jerome K. Lynch).
- *CMOS Circuits for Biomechanical Implants*, Invited Presentation, CMOS Emerging Technologies Workshop, Vancouver, August 2008 (Host: Dr. Kris Iniewski).
- *Sub-microwatt Sensors for Structural Health Monitoring of Biomechanical Implants*, Invited Presentation, Department of Bioengineering, University of California, San Diego, August 2008 (Host: Prof. Gert Cauwenberghs).
- *Towards Reliable Multi-pathogen Biosensors using High-dimensional Encoding and Decoding Techniques*, Invited Presentation, SPIE Symposium on NanoScience+Engineering, CA 2008 (Host: Prof. Gert Cauwenberghs, UCSD) .
- *High-dimensional Encoding-Decoding Techniques for Reliable Pathogen Detection*, Invited Presentation, Hunter College, City University of New York, Feb 2008 (Host: Prof. Hiroshi Matsui).
- *Mixed-signal data mining on microphone array hearing aids*, Invited Presentation, Radio-Frequency Integrated Circuits Symposium, Atlanta Georgia, July, 2008 (Host: Sudipto Chakraborty, Texas Instruments).
- *Trainable Mixed-signal Interfaces*, Invited Presentation, Defense Science Research Council (DSRC) Adaptive Electronics Workshop, Arlington VA, Nov 28th 2006 (Host: Prof. Peter Asbeck, UCSD).
- *Micro-power Speaker Verification System-on-chip*, Invited Presentation, Applied Physics Laboratory, Laurel, MD, July 2005 (Host: Dr. Chris P. Diehl).
- *Sequence Learning and Decoding in Margin Propagation Networks*, Invited Presentation, Snowbird Learning Workshop, Snowbird, Utah, April 2005 (Host: Dr. Yoshua Bengio).
- *Hardware-Algorithm Tradeoffs in Implementing Support Vector Machines in Silicon*, PRIP Seminar Series, Michigan State University, 2004 (Host: Prof. Anil Jain).
- *Design of a floating-gate CMOS kernel machine for speech recognition*, Tutorial on Floating Gate Technology, IEEE International Symposium on Circuits and Systems, Phoenix AZ, 2002 (Host: Prof. Paul Hasler, Georgia Tech).
- *A hybrid HMM/SVM speech recognition system*, IEEE Midwest Symposium on Circuits and

RESEARCH GRANTS AND CONTRACTS

Current Grants and Contracts

- [G1] Co-Principal Investigator, NSF Convergence Accelerator track L: Translating insect olfaction principles into practical and robust chemical sensing platforms, **National Science Foundation**, 01/2024-01/2025, \$650,000.
- [G2] Co-Principal Investigator, NCS-FR: Insect-based brain-machine interfaces and robots for understanding odor-driven navigation, **National Science Foundation**, 09/2023-08/2028, \$4,300,000.
- [G3] Principal Investigator, *RCN-SC: Research Coordination Network for Design and Testing of Neuromorphic Integrated Circuits*, **National Science Foundation**, 09/2023-08/2026, \$900,000.
- [G4] Co-Principal Investigator, Scaling Friendly Analog Correlators based on Charge-based Margin-propagation, **DARPA (FA8650-23-2-7309)**, 03/2023 – 11/2024, \$667,153.
- [G5] Principal Investigator, *EAGER: Exploiting Quantum-tunneling for Zero Side-channel Key Generation and Distribution*, **National Science Foundation**, 10/2022-09/2024, \$300,000.
- [G6] Principal Investigator, *Collaborative Research: FET: Medium: Energy-Efficient Persistent Learning-in-Memory with Quantum Tunneling Dynamic Synapses*, **National Science Foundation**, 10/2022-09/2025, \$618,159.
- [G7] Co-Investigator, *A self-capacitance driven wearable electromyometrial imaging system for maternal and fetal monitoring during pregnancy and labor*, **National Institute of Health 1R01HD105905-01A1**, 07/2022-06/2027, \$1,693,125 (Credit 30%).
- [G8] Co-Principal Investigator, *Benchmarking and enhancing the performance of the insect-based chemical sensing biorobotic platforms*, **Office of Naval Research**, N000142112343, 04/30/2021-04/30/2024 \$750,000 (Credit 30%).
- [G9] Co-principal Investigator, *Electromyometrial Imaging System Designed for Multi-site Clinical Trial in USA*, **Bill and Melinda Gates Foundation**, 7/7/2021 - 8/31/2024, \$2,265,644 (Credit 15%).
- [G10] Principal Investigator, *Addressing neuron-to-network energy-efficiency gap by investigating neuromorphic processors as a unified dynamical system*, **National Science Foundation**, **1935073**, 09/15/2019-09/14/2022, \$380,000.

Completed Grants and Contracts

- [G11] Multi-Principal Investigator, *Development of a Wireless Biosensor to Track Bone Resorption in Periodontitis*, **National Institute of Health 1R01DE02709801**, 09/01/2017-08/31/2021, \$1,525,000 (Credit 30%).
- [G12] Principal Investigator, *CPS:TTP Option: Synergy: Collaborative Research: Internet of Self-powered Sensors - Towards a Scalable Long-term Condition-based Monitoring and Maintenance of Civil Infrastructure*, **National Science Foundation CNS1646380**, 09/01/2016-08/31/2020, \$1,100,000.
- [G13] Co-Principal Investigator, *Real-time Chemical Sensing in Complex Environments with Insect Olfaction*, **Office of Naval Research**, **N000141912049**, 01/01/2019-12/31/2021 \$750,000 (Credit 25%).
- [G14] Multi-Principal Investigator, *Wireless Self-powered Sensors for Continuous and Long-term Monitoring of Spinal fusion process*, **National Institute of Health 1 R21AR075242 01**, 09/01/2019-08/31/2021, \$457,000 (Credit 50%).

- [G15] Principal Investigator and Project Lead, *Self-powered Sensing and Data-logging for Large-scale In-vivo Monitoring of Neural Ensemble Activity*, **National Institute of Health 1R21EY02836201**, 09/01/2017-08/31/2020, \$457,000.
- [G16] Co-Principal Investigator, *Hybrid Chemical Sensing with bio-electronic nose*, **Office of Naval Research N000141612426**, 06/01/2016-05/31/2019, \$750,000 (Credit: 30%).
- [G17] Principal Investigator and Project Lead, *STARSS: Small: Collaborative: Zero-Power Dynamic Signature for Trust Verification of Passive Sensors and Tags*, **National Science Foundation / Semiconductor Research Corporation CNS1525476**, 8/16/2015 - 8/15/2020, \$450,000.
- [G18] Principal Investigator, *Scavenging Thermal-noise Energy and Quantum Fluctuations for Self-powered Time-stamping and Sensing*, **National Science Foundation ECCS1550096**, 8/16/2015 - 8/15/2020, \$344,387.
- [G19] Co-Principal Investigator, *CSR: Medium: Self-organizing Cyber Substrates: Exploring a Modular Computing and Communications Architecture for Structural Health Monitoring*, **National Science Foundation CNS1405273**, 08/01/14-07/30/18, \$1,000,000 (Credit 30%).
- [G20] Co-Principal Investigator, *Ultra-low Power Wireless Sensing System for Multi-metric Self-Powered Monitoring of Bridge Components*, **United States Department of Transportation**, 08/01/13-07/30/17, \$937,135 (Credit 30%).
- [G21] Principal Investigator, *SHF:FAST: A Simulation and Analysis Framework for Designing Large-Scale Biomolecular-Silicon Hybrid Circuits*, **National Science Foundation**, 09/01/11-08/30/17, \$386,602.
- [G22] Principal Investigator, *CAREER: Integrated Research and Education in Self-powered Microsensing for Embedded and Implantable Structural Health Monitoring*, 04/01/10-03/31/16, **National Science Foundation**, CMMI:0954752, \$406,000.
- [G23] Principal Investigator, *Motion Artifact Cancelling MIMO method for Ambulatory Respiratory-rate Monitoring*, **National Institute of Health/General Electrical Global Research**, 08/01/13-07/31/16, \$164,000.
- [G24] Principal Investigator, *Trusted Verification of CMOS Integrated Circuits using Zero-power Timers and Synchronization Circuits*, **Defense Advanced Research Projects Agency (DARPA)**, 9/1/2014 - 8/31/2015, 133,564.
- [G25] Senior Personnel, *Mechanically-Equivalent Response Amplifiers and Frequency Modulators for Energy-harvesting Devices*, **National Science Foundation**, 8/16/2014 - 8/15/2017, \$324,309.00 (Credit 10%)
- [G26] Principal Investigator, *STTR Phase I: Health Monitoring of Orthopedic Implants using Self-powered Piezo-floating-gate Sensing Technology*, **Piezonix LLC/National Science Foundation**, 07/01/14-12/31/14, \$72,253.
- [G27] Principal Investigator, *Self-powered RFID Sensing for Monitoring Complex Product Supply-chain*, **Midland Research Institute for Value Chain Creation**, 05/20/14-05/19/17, \$300,000.
- [G28] Principal Investigator, *Design and Evaluation of Self-powered Time-stamped Event-logger*, **Johns Hopkins Applied Physics Laboratory/US Department of Navy**, 04/01/14-09/30/14, \$68,000.

- [G29] Co-Principal Investigator, *Smart Pavement Monitoring System*, **Federal Highway Administration** (Contract: DTFH61-13-C-00015), 08/15/13-08/14/16, \$444,944 (Credit 25%).
- [G30] Co-Principal Investigator, *Center for Cyber-enabled Cognitive Structures*, **Strategic Partnership Grant, Michigan State University**, 08/01/13-07/31/16, \$481,000 (Credit 35%).
- [G31] Principal Investigator, *Development of Self-powered Age-monitoring Sensor*, **Targeted Support Grant for Technology Development (TSGTD)**, MSU Foundation, 09/01/12-08/01/13, \$60,000.
- [G32] Principal Investigator, *Fabrication and Testing of Gen-II Age-monitoring Sensors*, **Johns Hopkins Applied Physics Laboratory**, 03/01/12-08/30/12, \$47,574.
- [G33] Principal Investigator, *AIR: Development and Evaluation of Self-Powered Piezo-Floating-Gate Sensor Chipsets for Embedded and Implantable Structural Health Monitoring*, **National Science Foundation**, 08/01/11-07/31/14, \$258,000.
- [G34] Principal Investigator, *Self-powered Age Monitoring Sensors*, **Johns Hopkins Applied Physics Laboratory**, 04/15/11-08/30/11, \$65,000.
- [G35] Principal Investigator, *Low-power Speaker Identification System (LPSIS)*, **Johns Hopkins Applied Physics Laboratory** (sub-contract through MSU Foundation), 10/01/09-07/30/11, \$286,046.
- [G36] Co-Principal Investigator, *Smart Pavement Monitoring System*, **Federal Highway Administration**, Contract: DTFH61-08-C-00015, 08/15/08-08/14/11, \$375,000 (Credit 25%).
- [G37] Principal Investigator, *SGER: Cooperative Learning-Unlearning Algorithms for Identifying Noise Robust Auditory Manifolds*, **National Science Foundation**, IIS: 0836278, 08/01/08-07/31/09, \$62,010.
- [G38] Principal Investigator, Investigation into *non-conventional analog decoders for low-density parity check codes*, **National Science Foundation**, CCF: 0728996, 01/01/07-09/30/10, \$250,000.
- [G39] Principal Investigator, *A sub-microwatt self-powered fatigue sensor*, CMMI: 0700632, **National Science Foundation**, 05/01/07-04/30/10 \$295,999.
- [G40] Principal Investigator, *Development of forward error-correcting biosensor based on molecular biowires*, **National Science Foundation**, ECCS: 0622056, 09/01/06-08/30/10 \$270,000.
- [G41] Principal Investigator, *Development of micro-power VLSI devices*, **Johns Hopkins Applied Physics Laboratory** (sub-contract through MBI International), Contract No: 0905899, 04/01/08-03/31/09, \$75,300.
- [G42] Co-Principal Investigator, *Advanced Microsystems for Neural Information Processing*, **National Institute of Health**, 04/01/06-03/31/08 \$375,000 (Credit 25%).
- [G43] Principal Investigator, *Micropower speaker verification systems*, **Johns Hopkins Applied Physics Laboratory** (sub-contract through MBI), Contract No: 0939031, 12/01/2005-11/30/2006, \$75,000.

[G44] Principal Investigator, *Development of ultra-low power acoustic sensors*, **Intramural Research Grant Program**, Michigan State University, 12/01/2005-12/14/2007, \$50,000.

PATENTS

Issued Patents

- [P1] S Chakrabartty, A Gangopadhyay, Large-scale networks of growth transform neurons, US Patent 11,853,878, 2023.
- [P2] S. Chakrabartty, Y. Alazzawi, K-K Liu, S. Singamaneni, M. Yuan, System and Methods for Detecting Embedded Target Elements Using Signal Interference, US Patent 11,464,487, Issued: Oct 11, 2022. S. Chakrabartty, Y. Alazzawi, K. Aono, E. Scheller, *Method and Apparatus for Wireless Power Delivery and Remote Sensing using Self-capacitances*, U.S. Patent No. 11,128,168, Issued: Sep, 21, 2021.
- [P3] S. Chakrabartty, L. Zhou, ``Self-powered sensors for long-term monitoring'', U.S. Patent No. 11,041,764, 06/22/2021
- [P4] S. Chakrabartty, L. Zhou, ``Self-powered timers and methods of use'', US patent: 10,446,234, 10/15/2019.
- [P5] N. Lajnef, S. Chakrabartty, R. Burgueno, W. Borchani ``Self-Powered Sensing System for the Monitoring of Quasi-static Structural Response'', US patent: 9,793,830, 10/17/2017
- [P6] S. Chakrabartty, ``Temperature Compensation Method for High-density Floating-gate Memory'', US patent: 9,437,602, 09/06/2016
- [P7] S. Chakrabartty, ``Self-powered Strain-gauge'', US patent: 9,331,265, Issued: 05/03/2016.
- [P8] S. Chakrabartty, ``Self-powered Timer Apparatus'', US patent: 8,963,647 , Issued Feb. 24, 2015.
- [P9] S. Chakrabartty, ``Margin Decoding Communication System'', US patent: 8,060,810 , Issued Nov. 15, 2011.
- [P10] S. Chakrabartty, N. Lajnef, N. Elvin, A. Gore, ``Self-powered Sensor'', US Patent: 8,056,420, Issued Nov. 15, 2011.
- [P11] S. Chakrabartty, ``Self-powered Strain-rate Sensor'', US Patent: 7,757,565, Issued Jul. 20, 2010.
- [P12] S. Chakrabartty, ``Multiple-input Multiple-output Analog-to-digital Converter'', US Patent no: 7,479,911, Issued Jan. 20, 2009.

PROFESSIONAL ACTIVITIES

- *Fellow*, American Institute of Medical and Biological Engineering (AIMBE)
- *Senior Member*, Institute of Electronic and Electrical Engineers (IEEE)
- *Member*, American Society for Engineering Education (ASEE)
- *Associate Editor*, IEEE Transactions of Biomedical Circuits and Systems (2010-2018)
- *Associate Editor*, Advances in artificial neural systems, Hindawi Publications (2010-2015)
- *Associate Editor*, Frontiers in Neuroscience (2012 -).
- *Chair*, IEEE Circuits and Systems Society, Neural Systems and Applications Technical Committee (2015).
- *Panelist* :
 - National Science Foundation, ECCS, 2006, 2008, 2019, 2020, 2022.
 - National Science Foundation, CISE, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019.

- National Science Foundation, CMMI, 2007, 2010, 2012.
- National Science Foundation, IIP, 2011, 2012, 2013, 2014, 2015.
- *Panelist :*
 - American Society of Engineering Education, SMART Scholarship, 2012.
 - American Society of Engineering Education, NDSEG Scholarship, 2012.
- *International Panel Reviewer :*
 - Natural Sciences and Engineering Research Council of Canada (NSERC), 2008.
 - Dutch Technology Foundation STW, 2009.
- *Keynote Panel:*
 - Pattern Recognition and Machine Intelligence (PReMI09), IIT Delhi, 2009.
- *Organizing Committee :*
 - IEEE Biomedical Circuits and Systems Conference, San Diego, 2011.
 - IEEE Electro-Information Technology Conference, East Lansing, MI, 2006.
- *Technical Committee Member :*
 - IEEE Circuits and Systems: Sensory Systems
 - IEEE Circuits and Systems: Biomedical circuits and systems
 - IEEE Circuits and Systems: Neural systems and applications.
- *Program Committee Member :*
 - 20th Symposium on Integrated Circuits and Systems Design, 2007.
 - 22nd Symposium on Integrated Circuits and Systems Design, 2009
 - IEEE Biomedical Circuits and Systems Conference, 2006-2011.
 - IEEE Statistical Signal Processing Workshop, Ann Arbor, 2012.
- *Session Chair/Co-chair:*
 - Neural Systems and Applications, ISCAS 2012, Seoul, Korea.
 - Analog Circuits and IC Technology, ISCAS 2009, Taipei, Taiwan.
 - Sensor Networks and Algorithms, ISCAS 2009, Taipei, Taiwan.
 - Image Sensors, ISCAS 2009, Taipei, Taiwan
 - Biomedical Instrumentation and Bioanalysis, BIOCAS 2008, Baltimore, MD, USA.
 - Sigma-Delta Modulators, ISCAS 2007, New Orleans, USA.
- *Reviewer*
 - IEEE Journal of Solid-State Circuits.
 - IEEE transactions on Circuits and Systems I and II (TCAS).
 - IEEE transactions on Signal Processing (TSP).
 - IEEE transactions on Very Large Scale Integration (TVLSI).
 - IEEE transactions on Neural Networks (TNN)
 - IEEE sensor journal
 - IEEE transactions on Biomedical Engineering (TBME)
 - IEEE transactions on Biomedical Circuits and Systems (TBioCAS)
 - IEEE transactions on Neural Systems and Rehabilitation Engineering
 - Pattern Recognition Journal
 - IEEE Communication Letters
 - Advances in fuzzy systems, Hindawi.
 - Fuzzy sets and systems, Elsevier.
 - Sensors and Actuators, Elsevier.
 - Analytical Chemistry
 - IEEE Int. Symp. On Circuits and Systems (ISCAS).

INSTITUTIONAL SERVICES

- Vice-Dean for Research and Graduate Education – 2021 – present
- Chair, McKelvey Doctoral Council – 2021 – present
- Chair, McKelvey Masters Council – 2021 - present
- Co-Chair – WashU ESE Faculty Search Committee – 2019 - 2022.
- Member – WashU ESE Department Executive Committee
- Washington University’s Institutional Conflict of Interest Committee (ICOI) – Member 2018-present.
- Wash U ESE Strategic Planning Committee Chair - 2019.
- Wash U ESE Graduate Studies Committee – Member – 2017-2019
- Wash U ESE Ph.D. admissions committee – Chair – 2018
- Wash U MEMS Faculty Search Committee – Member – Spring 2018
- Wash U CSE Faculty Search Committee – Member – Fall 2018
- *Chair*, Graduate Studies Committee (Michigan State Univ.), 2011 – 2013
- *Publicity Chair*, (MSU Electrical and Computer Engineering), 2013 – 2015.
- *Member*, Department Advisory Committee (MSU Electrical and Computer Engineering), 2011-2013, 2014 – 2015.
- *Member*, Strategic Research Task force Committee (MSU Electrical and Computer Engineering), 2011- 2015.
- *Member*, College Graduate Studies Committee (Michigan State Univ.), 2011-2012.
- *Advisor*, Computer Engineering, 2015 - current

GRADUATE ADVISEES

Past Graduate Advisees

- Oindrila Chatterjee, (Ph.D. Spring 2021), Currently, Intel Corp., Chandler, AZ.
- Darshit Mehta, (Ph.D. Spring 2021), Currently, Entrepreneur.
- Sri Harsha Kondapalli, (Ph.D. Fall 2020) Currently, Mathworks, California
- Yarub Alazzawi, (Ph.D. Spring 2020) Currently, Assistant Professor, Baghdad University, Iraq.
- Kenji Aono, (Ph.D. 2018) Currently Post-doctoral Researcher, Electrical and Systems Engineering,
- Mingquan Yuan, (Ph.D. 2018) Currently Research Engineer, Walmart Inc., Dallas, Tx
- Liang Zhou, (Ph.D. 2018) Currently Research Engineer, Analog Devices Inc. CA
- Tao Feng, (Ph.D. Fall 2016) Currently Research Engineer, Skyworks Inc., Ames, IA.
- Hassan Aqeel Khan, (Ph.D. Fall 2015) Currently Assistant Professor, National University of Sciences and Technology, Islamabad.
- Ming Gu, (Ph.D. Spring 2012) Currently Principal Engineer, Fairchild Semiconductors, California.
- Pikul Sarkar, (M.S. Summer 2012). Currently Staff Engineer, Cosmic Circuits., Bangalore, India.
- Amin Fazel, (Ph.D. 2012) Currently Research Staff, *Qualcomm Inc., San Diego, CA.*

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