Patrick M. Sheridan

Curriculum Vitae

Department of Electrical Engineering & Computer Science, University of Michigan
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RESEARCH EMPHASIS

Neuromorphic Computing

Current focus: Low power, nanoscale devices and systems; fault-tolerant crossbar architectures; image processing in memristive hardware; hardware-based sparse coding
Interests: Neuromorphic engineering, novel computing architectures, nanoscale electronics, hardware neural networks, learning systems

EDUCATION

University of Michigan, Ann Arbor, MI
M.S. in Electrical Engineering – *May 2012*
Ph.D. in Electrical Engineering – e*xpected defense: 2015*
Advisor: Dr. Wei Lu
GPA: 3.92

Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA
B.S. Computer Engineering – *December 2009*
B.S. Mathematics – *December 2009*
GPA: 3.96

SKILLS

Programming – Python (inc. Numpy, Cython, IPython, multiprocessing), C++, C, Verilog, FPGA, RISC Assembly, SPICE, Verilog AMS, Matlab, LabVIEW, LaTex, Git

Nanofabrication – E-beam-/photo-lithography, dry/wet etch, metal deposition, chemical vapor deposition, rapid thermal processing.

Metrology/Test & Measurement – Printed circuit board design, test and measurement automation, scanning electron microscope, profilometer, ellipsometer, wafer dicing, wire bonding, soldering.

RESEARCH

Dissertation Research, University of Michigan
Under the direction of Wei Lu, 2010 – 2015 *(expected)*
Focus: Neuromorphic computing; Hardware neural networks; Resistive switching memory (RRAM); Fault tolerant and probabilistic architectures; Sparse coding.
DARPA SyNAPSE and UPSIDE projects.

Undergraduate Research, Virginia Tech
Under the direction of Peter Athanas in the Configurable Computer Lab, 2009 – 2010
Focus: Post-synthesis hardware design modification; hardware-defined adaptable radios; reconfigurable computing.
DARPA IRIS project.

PUBLICATIONS

Peer Reviewed Journal Articles

S. Gaba, **P. Sheridan**, C. Du, and W. Lu, "3-D Vertical Dual-Layer Oxide Memristive Devices," *IEEE Transactions on Electron Devices*, vol. 61, no. 7, pp. 2581 – 2583, May 2014.

S. Gaba, **P. Sheridan**, J. Zhou, S. Choi, and W. Lu, "Stochastic memristive devices for computing and neuromorphic applications," *Nanoscale*, vol. 5, no. 13, pp. 5872–5878, 2013.

Y. Yang, **P. Sheridan**, and W. Lu, "Complementary resistive switching in tantalum oxide-based resistive memory devices," *Applied Physics Letters*, vol. 100, no. 20, pp. 203112, 2012.

P. Sheridan, K.-H. Kim, S. Gaba, T. Chang, L. Chen, and W. Lu, "Device and SPICE modeling of RRAM devices," *Nanoscale*, vol. 3, no. 9, pp. 3833–3840, 2011.

T. Chang, S.-H. Jo, K.-H. Kim**, P. Sheridan**, S. Gaba, and W. Lu, "Synaptic behaviors and modeling of a metal oxide memristive device," *Applied Physics A*, vol. 102, no. 4, pp. 857–863, 2011.

Book Chapter

P. Sheridan and W. Lu, "Memristors and Memristive Devices for Neuromorphic Computing," *Memristor Networks*, pp. 129–149, 2014.

Anticipated Peer-Reviewed Journal Articles

P. Sheridan, C. Du, W. Ma, and W. Lu, "Feature Extraction with Memristive Device Networks," Submitted to *IEEE Transactions on Neural Networks and Learning Systems.*

SH Choi, **P. Sheridan**, W. Lu, "Data Clustering using Memristor Networks," Submitted to *Scientific Reports.*

S. Kim, C. Du, **P. Sheridan,** W. Ma, and W. Lu, "Second-Order Memristor for Bio-Realistic Implementation of Synaptic Plasticity," Submitted to *Nature Nanotechnology.*

Conference Proceedings

P. Sheridan and W. Lu "Defect Consideratons for Robust Sparse Coding Using Memristor Arrays," *IEEE / ACM International Symposium on Nanoscale Architectures, July 8 to 10 2015, Boston, USA, in review.*

T. Chang, S.-H. Jo, **P. Sheridan**, W. Lu, , "Neuromorphic functionalities of nanoscale memristors," in *Frontiers in Electronic Materials: A Collection of Extended Abstracts of the Nature Conference Frontiers in Electronic Materials, June 17 to 20 2012, Aachen, Germany*, *2012,* pp. 197–206.

P. Sheridan, W. Ma, and W. Lu, "Pattern recognition with memristor networks," in *2014 IEEE International Symposium on Circuits and Systems (ISCAS), Melbourne, Australia,* 2014, pp. 1078–1081.

S. Gaba, S. Choi, **P. Sheridan**, T. Chang, Y. Yang, and W. Lu, "Improvement of RRAM device performance through on-chip resistors," in *Materials Research Society Proceedings*, *San Francisco, California,* 2012, vol. 1430, pp. 177-182.

T. Chang, **P. Sheridan**, and W. Lu, "Modeling and implementation of oxide memristors for neuromorphic applications," in *13th International Workshop on Cellular Nanoscale Networks and Their Applications (CNNA)*, *Turin, Italy,* 2012, pp. 1–3.

PROFESSIONAL ACTIVITIES

Nanotechnology and Microsystems Student Association, 2011-2012
Board Member – Industry contact; coordinate networking events; organize faculty speaker series.

Institute of Electrical and Electronics Engineers, 2010 – Present
Graduate Student Member

Journal Article Reviews
Microelectronics Journal, IEEE Transactions on Circuits and Systems I, and IEEE Transactions on Nanotechnology.

Student-Managed Endowment for Educational Development, 2006 – 2009
Technology Sector Area Manager –Coordinated analysts performing equity research; participated in investment selection committee.

Inter-Cooperative Council, 2014
House Council President – Overseeing house officers and addressing student member concerns.

AWARDS & HONORS

National Science Foundation Graduate Research Fellowship Honorable Mention, 2012
Graduate Assistance in Areas of National Need Fellow, 2010
Graduated *summa cum laude* in both Mathematics and Computer Engineering, 2009
Virginia Tech University Honors Program, 2005 – 2009

MENTORSHIP

Graduate Student Peer Mentoring, 2012 – Present
Mentoring three new pre-candidates in machine learning, image processing, and the development of a test and measurement platform for nanoscale devices.

Undergraduate Student Mentoring, 2010 – 2011
Advised two undergraduate students in cleanroom practices, data collection, and scientific writing. Counseled in the preparation of graduate school applications.

NNIN NanoCamp at the University of Michigan, 2011
Electrical Engineering Activities Organizer
Developed and led hands-on activities to encourage middle- and high-school aged students' interest in science and engineering.

INDUSTRY EXPERIENCE

Altria Client Services, Summer 2008
Focus: Mechanical Design, Manufacturing Automation

Philip Morris USA, Fall 2007
Focus: Polarimetric Inspection Development, Short-wave Infrared Imaging