PRIYESH SHUKLA

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RESEARCH INTERESTS

Edge AI, Emerging devices, circuits, architectures (systems) and algorithms for efficient AI processing, Bayesian Inference, Robotics/IoT-and-AI, Secure Hardware Systems and Quantum Computing

EDUCATION

University of Illinois at Chicago, United States ***August 2018 - Present***
Doctor of Philosophy in Electrical and Computer Engineering
Relevant topics: *Linear Algebra; Probability and Statistics; Low power IC design; Computer Architectures; Deep Learning, Reinforcement Learning and Graphical Models; Quantum effects in Nano-scale Semiconductor structures; Quantum Computing*

Birla Institute of Technology and Science, Pilani, India ***August 2015 - May 2017***
Master of Engineering in Microelectronics

Birla Institute of Technology and Science, Pilani, India ***August 2011 - May 2015***
Bachelor of Engineering (Hons.) in Electrical and Electronics

RESEARCH EXPERIENCE

ARGONNE National Laboratory, Lemont, Illinois ***November 2019 - Present***
Visiting Graduate Researcher (Long term)
Mentor: *Prasanna Balaprakash - MCS division*

- Designing neuromorphic computing systems with co-optimized algorithms and emerging hardware for learning and inference.
- Exploiting leadership class super-computing infrastructure at Argonne for high-dimensional data processing in neuromorphic computing.

AEON Lab, UIC, Chicago, Illinois ***August 2018 - Present***
Mentors: *Amit Ranjan Trivedi, Theja Tulabandhula*

- Design of efficient accelerators for Bayesian Inference to predict uncertainties in decision making targeting critical applications such as autonomous driving, drones and surgical robots.
- Hardware-software cooperation to perform energy efficient and high-speed sampling of probability densities useful in Bayesian learning and inference
- Uncertainty estimation in Reinforcement learning based object detection, and Robotics.
- Characterization and application of emerging memristive devices for ML and AI.
- Energy efficient, intelligent computing systems for Edge devices.

Oyster Lab, BITS-Pilani, India ***August 2013 - May 2017***
Mentors: *Anu Gupta, Subhash Chandra Bose, Navneet Gupta, Abhijit Asati*

- Designed and implemented various analog and digital circuits as well as processor architectures with focus on co-optimizing power, area and throughput.
- Worked on electromagnetic characterization of MEMS switches and interfaces for accelerometers.

PROFESSIONAL EXPERIENCE

QUALCOMM Inc., San Diego, CA, United States ***May 2020 - Aug 2020***
Engineering Intern, RF Analog and Digital SoC IP

- Develop a prototype Machine Learning based tool to predict SoC level SRAM leakage based on device level leakage data across tech nodes and PVTs.
- The tool is to be leveraged for Silicon accurate SoC power estimation.

QUALCOMM Inc., Bengaluru, India ***July 2017 - June 2018***
Engineer, IP Library Division

- Modeled and characterized Standard Cells IP libraries at sub-10nm technology nodes for high density, high power and gated architectures targeting Snapdragon SoCs.
- Explored and tested Machine Learning techniques to predict timing, power and noise characterization of Standard Cells IP libraries.
- Automated in-house flows for Standard Cells IP library production.

CSIR-CEERI, Pilani, India ***July 2014 - December 2014***
Research Intern, Cyber Physical Systems Group

- Implemented reconfigurable interface between wireless sensor network (WSN) nodes and centralized monitoring station for the project Structural Health Monitoring.
- Involved in FPGA based architecture implementation to enhance non-linear images for face detection in complex lighting environment.

PUBLICATIONS AND SELECTED PRESENTATIONS

Priyesh Shukla, Ahish Shylendra, Amit Ranjan Trivedi, Theja Tulabandhula, *MC^{2}RAM: High Performance Markov Chain Monte Carlo Sampling In-SRAM for Fast Bayesian Inference*, 2020 IEEE International Symposium on Circuits and Systems (ISCAS), Seville, Spain, Oct, 2020.

Priyesh Shukla, Amit Ranjan Trivedi, *MC^{2}RAM: Markov Chain Monte Carlo Sampling In-SRAM for Fast Bayesian Inference*, IBM IEEE CAS EDS AI Compute Symposium, NY, Oct. 2019 (poster).

Shamma Nasrin, Justine Drobitch, **Priyesh Shukla**, Theja Tulabandhula, Supriyo Bandyopadhyay, and Amit Ranjan Trivedi, *Bayesian Reasoning Machine on a Magneto-tunneling Junction Network*, Nanotechnology, IoP Science, 2020.

Ahish Shylendra, **Priyesh Shukla**, Saibal Mukhopadhyay, Swarup Bhunia, Amit Ranjan Trivedi, *Low Power Unsupervised Anomaly Detection by Nonparametric Modeling of Sensor Statistics*, IEEE Transactions on Very Large Scale Integration Systems (TVLSI), 2020

Ahish Shylendra, Sina Haji Alizad, **Priyesh Shukla**, Amit Ranjan Trivedi, *Non-parametric Statistical Density Function Synthesizer and Monte Carlo Sampler in CMOS*, International Conference on VLSI Design (VLSID), Bengaluru, India, January 2020.

Ahish Shylendra, **Priyesh Shukla**, Swaroop Bhunia, Amit Ranjan Trivedi, *Fault attack detection in AES by monitoring power side-channel statistics*, International Symposium on Quality Electronic Design (ISQED), Santa Clara, USA, March 2020.

(Publications prior to M.E.)

Priyesh Shukla, Anu Gupta, *Quad-NMOS cross-coupling for linearity enhancement in high frequency continuous-time OTA-C filters with IM3 below -70 dB*, 2017 IEEE International Conference on Frontiers of Sensors Technologies, Shenzhen, China, 2017.

Priyesh Shukla, Anu Gupta, *Current-Mode PMOS capacitance multiplier*, 2017 IEEE International Conference on Inventive Systems and Controls, Coimbatore, India, 2017.

TECHNICAL SKILLS

Programming	Python, C/C++, Verilog/VHDL, Embedded C and Matlab
Tools	Synopsys, Cadence, Xilinx EDK, Nvidia developer's toolkit, SimpleScalar
ML Platforms	Scikit-learn, PyTorch, Keras, TensorFlow

HONORS AND AWARDS

Peter and Deborah Wexler Award worth USD 5000 for being among the top entry level researchers granted by The University of Illinois System, **2018-19**

Graduate Tuition Scholarship, The University of Illinois System, **2018-present**

BITSAA Research Scholarship travel grants by BITS-Pilani, **2016-17**

Award for outstanding merit in 10+2 by Krishna Group of Institutions and Chhattisgarh State Government of India, **2010**

ACTIVITIES AND AFFILIATIONS IN RESEARCH COMMUNITY

Student Member, IEEE, 2019-present

Reviewer, IEEE Internet of Things Journal, IEEE Journal of Selected Areas in Communication, IEEE Transactions on Intelligent Transportation Systems, Journal of Computer Communications, VLSID, ACM Transactions on Internet Technology

REFERENCES

Dr. Amit Ranjan Trivedi
Assistant Professor, Department of Electrical and Computer Engineering
University of Illinois at Chicago, United States
(PhD - Georgia Institute of Technology, USA) (Email: amitrt@uic.edu)

Dr. Theja Tulabandhula
Assistant Professor, Department of Information and Decision Sciences
Liautaud Graduate School of Business, University of Illinois at Chicago, United States
(PhD - Massachusetts Institute of Technology, USA) (Email: theja@uic.edu)

Dr. Prasanna Balaprakash
Computer Scientist, Mathematics and Computer Science Division and Leadershhip Computing Facility
Argonne National Laboratory, Lemont, Illinois, United States
(Email: pbalapra@anl.gov)

Dr. Animesh Datta
Principal Engineer/Manager
Qualcomm Inc., San Diego, CA, United States
(PhD - Purdue University, USA) (Email: anidatta@gmail.com)