Sayeed Shafayet Chowdhury

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Education

PURDUE UNIVERSITY

PhD in Machine Learning, Advisor- Prof. Kaushik Roy

2019-2024 IN, USA

- CGPA 4.0/4.0

BUET

B.Sc. in Electrical and Electronics Engineering

2016 Dhaka, Bangladesh

- CGPA 3.98/4.0, Rank 2/205

Links

GitHub **Sayeed-github**

Linkedin **Sayeed-in**

Research Interest

Machine Learning • Computer Vision • Data Science • Software Engineering

Coursework

Machine Learning I and II, Deep Learning, Reinforcement Learning, Optimization, Probability and Random Signals, Digital Image Processing, Digital Video Processing, Linear Algebra, Algorithms and Data Structures, CMOS VLSI design, IC/MEMS Fabrication

Skills

PROGRAMMING

Python • C/C++ • Java • Verilog • Assembly • HTML/CSS • PHP

MACHINE LEARNING (ML)

Pytorch • TensorFlow • Keras • OpenCV • AWS • Azure • Numpy • Scipy

MISCELLANEOUS

Shell • LaTeX• Microsoft Office • Git • Adobe Illustrator • Photoshop • AutoCad • Cadence

Awards

TRACER RESEARCH GRANT

Purdue & Georgia Tech (2024)

TRAVEL GRANT FROM META

ECCV (2022)

IEEE SIGNAL PROCESSING CUP

1st prize (2016) and 2nd prize (2015)

BEST PAPER AWARD

IEEE R-10 HTC (2017) • ICECE (2016)

DEAN'S LIST AWARD

BUET

Awarded at all terms of bachelors

Experience

GRADUATE RESEARCH ASSISTANT, NRL, PURDUE

Aug 2019 – Now IN, USA

- Developing brain-inspired Spiking Neural Networks for visual perception at low-power.
- Analyzing and improving the scene understanding capabilities of computer vision algorithms.

ADVANCED ML ALGORITHM INTERN, ANALOG DEVICES INC.

September 2023 – December 2023 MA, USA

- Developed an algorithm for speech enhancement using bone conduction microphone (BCM) data.
- Proposed and implemented a speech enhancement approach using fusion of air conduction (AC) and BCM signals.

Research Projects

Ultra low latency Spiking Neural Networks (SNN)

- Proposed temporal pruning for low-power image recognition, Reinforcement learning (Atari) and event-based optical flow.
- Achieved 5X lower latency (just 1 timestep) and up to 100X higher energy-efficiency compared to previous state-of-the-art.

DCT-based encoding for energy-efficient SNNs

- Proposed DCT-based frequency domain encoding method for spiking neural networks to process sequential inputs.
- Achieved up to 10X lower latency and up to 2X higher energy-efficiency compared to prior state-of-the-art.

Understanding Visual Syntax with Vision Transformers

- Reported a novel problem with Vision Transformers (ViTs) where they fail to capture image syntax.
- Proposed a masked auto-encoder based training with ViTs to capture syntactic anomalies in an explainable manner.

Understanding the Effect of Leak in SNNs

- Performed a frequency-domain analysis to understand the effect of the leak parameter in SNNs.
- Obtained SNNs with $\sim$5% higher noise robustness and $\sim$2X lower energy consumption by optimizing leak and threshold.

Scene understanding from videos

- Proposed a novel optimal transport based formulation for unsupervised procedure learning from videos.
- Developed an algorithm for temporal localization of key steps in surgical videos in collaboration with IU health.

Publications

- S. S. Chowdhury, S. Chandra, and K. Roy, "Towards Syntactical Understanding of Images", Submitted to AAAI (2024).
- Y. Long, S. S. Chowdhury, K. Roy, "Segmented Recurrent Transformer: An Efficient Sequence-to-Sequence Model", EMNLP (2023).
- S. S. Chowdhury, N, Rathi, and K. Roy, "Towards Ultra Low Latency Spiking Neural Networks for Vision and Sequential Tasks Using Temporal Pruning", ECCV (2022).
- S. S. Chowdhury*, I. Garg*, and K. Roy, "DCT-SNN: Using DCT to Distribute Spatial Information over Time for Learning Low-Latency Spiking Neural Networks", ICCV (2021). (*equal contribution).
- S. S. Chowdhury*, C. Lee*, and K. Roy, "Towards Understanding the Effect of Leak in Spiking Neural Networks", Neurocomputing (2021).
- S. S. Chowdhury, I. Garg, and K. Roy, "Spatio-Temporal Pruning and Quantization for Low-latency Spiking Neural Networks", IJCNN (2021).