343 Congress St., Troy, NY
518-687-4223
hussam4@rpi.edu
shamim-hussain.github.io
github.com/shamim-hussain

Md Shamim Hussain

Fourth-year Ph.D. student (since Fall 2019) in Computer Science at Rensselaer Polytechnic Institute.

Research Interests

Machine Learning, Deep Neural Networks, Probabilistic Models, Artificial Intelligence.

Education

2019–Present **Doctor of Philosophy (Computer Science)**
Rensselaer Polytechnic Institute, Troy, NY

2019–2021 **Master of Science (Computer Science)**
Rensselaer Polytechnic Institute, Troy, NY
CGPA: 4.00/4.00

2017–2019 **Master of Science in Electrical and Electronic Engineering**
Bangladesh University of Engineering and Technology, Dhaka
CGPA: 3.69/4.00

2012–2017 **Bachelor of Science in Electrical and Electronic Engineering**
Bangladesh University of Engineering and Technology, Dhaka
CGPA: 3.93/4.00 (placed 9'th among 196)

Experience

Aug 2020–Present **Research Scholar**, *Rensselaer-IBM AI Research Collaboration*
IBM AI Horizons
Research Topic: Attention and Graphs

May 2022–Aug 2022 **IBM Resident Scholar**, *Research Externship*
IBM Thomas J Watson Research Center, Yorktown Heights, NY
Research Topic: Efficient Subsampled Self-Attention for Transformers

Jan 2020–Jul 2020 **Research Assistant**, *Under Supervison of Dr. Mohammed J. Zaki*
Rensselaer Polytechnic Institute, Troy, NY
Research Topic: Novel Graph Neural Network Architecture

Aug 2019–Dec 2019 **Teaching Assistant**
Rensselaer Polytechnic Institute, Troy, NY
Course: Computer Organization
– Worked as the Head TA under supervision of Dr. Konstantin Kuzmin

Aug 2017–July 2019 **Research Assistant**, *DSP Research Lab*
Bangladesh University of Engineering and Technology, Dhaka
Research Topic: Breast Lesion Classification from Ultrasound Images using CNN
– Developed a CNN based breast lesion classification system using transfer and multi-task learning

Programming Skills

Languages	Proficient in Python, C, C++ and Matlab; Working knowledge of Java, C# and Haskell
ML Libraries	PyTorch, Tensorflow, Keras, OpenCV, Scikit-learn, Pandas, Numba
Other Skills	CUDA, MPI, Slurm, Programming on the AiMOS supercomputer

Relevant Coursework

Computer Science	Machine Learning and Optimization, Data Mining, Computational Vision, Information and Coding Theory, Projects in AI/ML, Parallel Programming, Machine Learning (by Andrew Ng), Probabilistic Graphical Models (by Daphne Koller), Reinforcement Learning (by David Silver)
Mathematics	Computational Optimization, Probability and Statistics, Linear Algebra, Complex Analysis, Numerical Analysis
Digital Signal Processing	Advanced Digital Signal Processing, Digital Image Processing, Digital Speech Processing

Publications

- **"The Information Pathways Hypothesis: Transformers are Dynamic Self-Ensembles"** (Accepted in KDD'23) [Arxiv:2306.01705]
- **"Global self-attention as a replacement for graph convolution"** in Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (pp. 655-665). DOI: 10.1145/3534678.3539296 [Arxiv:2108.03348]
- **"SwishNet: A Fast Convolutional Neural Network for Speech, Music and Noise Classification and Segmentation"** (Preprint) [Arxiv:1812.00149]
- **"A fast double-talk detection algorithm based on signal envelopes for implementation of acoustic echo cancellation in embedded systems"** in The 4th International Conference on Advances in Electrical Engineering (ICAEE), 2017 (pp. 199-204). IEEE.(2017, September) DOI: 10.1109/ICAEE.2017.8255353
- **"Identification of Autoregressive Systems in the Presence of Additive Noise Using the Matrix Pencil Method"** in 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT). IEEE, 2019. DOI: 10.1109/ICASERT.2019.8934608
- **"Breast Lesion Classification from Bi-Modal Ultrasound Images by Deep CNN Using Transfer and Multi-Task Learning"** (Preprint). DOI: 10.13140/RG.2.2.18288.61444

Relevant Projects

- Edge Augmented Graph Transformer [Github Link]
- Analysis of Audio Classification Performances of 1D and 2D CNN and RNN on the MUSAN Corpus [Github Link]
- Investigation on 4x Super-resolution by Deep Convolutional Neural Networks [Github Link]
- Experiments on Generative Models : Conditional Wasserstein GANs, Fisher GAN, PixelCNN, Autoregressive RNN, Adversarial and Variational Autoencoders [Github Link]
- A Parallel Implementation of The Apriori Algorithm on AiMOS Supercomputer Using CUDA and MPI [Github Link]
- An Implementation of Restricted Boltzmann Machine with Pytorch [Github Link]
- Implementation of a Single Channel Speech Dereverberation Technique using Block Adaptive Inverse Filtering and Spectral Subtraction [Github Link]
- Finding Model Parameters of ARMA and AR Systems in Noise by Stochastic Gradient Descent in the Frequency Domain [Github Link]
- Design of a Recursive Algorithm for Finding All Real Roots of Higher Order Polynomial Equations [Github Link]

Academic Achievements

2021	Master of Science in Computer Science with a perfect CGPA (4.00/4.00)

2013 University Merit

2012-13 Dean's List

2006-17 Bangladesh Educational Board Scholarships (In Junior, Secondary and Higher Secondary levels)

Other Achievements

2022 Summer Residency at IBM T.J. Watson Research Center

2020 Selected for the IBM AI Horizons Scholar program

2016 1st Runner-up in Cadence Tensilica Xtensa Embedded DSP Design Contest

2008-10 Bangladesh National Math Olympiad – Champion (once) and 1st Runner-up (once)

2007-10 Divisional Math Olympiad – Champion (3 times) and 2nd Runner-up (once)

2009-11 Perfect (100%) Attendance in College

Volunteer Works

2022 Studend volunteer in SIGKDD'23

2022 Helped organize RPI Bangladeshi Students' Association (BDSA) new-year festival

2018 Helped organize the seminar on "Beat Breast Cancer by Early Detection, Diagnosis and Treatment" at BUET

2013 Managed a group on "Programming problems - solutions and discussions"