

## TECHNICAL EXPERTISE

• Speech Enhancement, Translation & Recognition • Machine Learning • Deep Learning • Natural Language Processing (NLP) • Sequence to sequence modeling • Knowledge Distillation • Classification & Regression • Machine Learning Models (Bayesian Network, HMM, GMM, Clustering, Decision Tree, Ensemble Methods) • Deep Neural Network (DNN) • Recurrent Neural Network (RNN) • Long-Short Term Memory (LSTM) • Convolutional Neural Network (CNN) • Transformers • Deep Learning Libraries (PyTorch, TensorFlow, Keras, Fairseq) • NLP Libraries (NLTK, Scikit-Learn) • Human Survey Platform (Qualtrics, Amazon MTurk) • Computer Vision & Graphics Libraries (CImg, OpenCV, OpenGL) • Python • Matlab • C/C++ • Java • HTML, CSS & Javascript • SQL • R • Shell Script

## EMPLOYMENT

**Amazon Services LLC, Cambridge, MA, *Applied Scientist Intern, Alexa AI*** Fall 2022

- Researched the development of a real-time, end-to-end compressed multi-lingual speech translation system. Investigated the use of large transformer-based models and applied knowledge distillation approach to transfer their performance to smaller models with 50% and 75% fewer parameters. (In review, at [ACL 2023](#))

**Microsoft Corporation, Redmond, WA, *Audio & Acoustics Research Intern*** Summer 2022

- Focused on analyzing and improving the performance of speech enhancement algorithms to generate high-fidelity (Hi-Fi) speech by removing distortions and extending speech bandwidth. Applied causal LSTM models with various augmentation to recover codec and clipping distortions, and performed deep noise suppression. (Will submit, at [INTERSPEECH 2023](#))

**BOSE Corporation, Framingham, MA, *Machine Learning/Neural Signal Processing Intern*** Summer 2020

- Researched on enhancing speech in remote microphone applications by removing self-speech in order to provide better quality sound with low latency to hearing aids and voice-assistive wearable devices. Utilized an LSTM-based architecture with speaker-dependent d-vector for speaker identification, to ensure real-time operation.

**Indiana University, Bloomington, IN, *Research Assistant, ASPIRE research lab*** Fall 2016 - Present

- Developed an attention-based monaural speech enhancement model with the objective of maximizing human perceptual rating of enhanced speech. This was accomplished by incorporating embedding vectors from a human Mean-Opinion Score (MOS) prediction model and jointly training the model utilizing real-world noisy speech data. ([INTERSPEECH-2021](#))
- Proposed & implemented a quantized speech prediction model that classifies speech spectra into a corresponding quantized class, and applies a language-style model to generate more realistic speech. Acceptable quantization level was determined by listener study conducted on [Amazon MTurk](#), designed using [Qualtrics](#). ([ICASSP-2021](#), [poster](#), [slides](#), [video](#))
- Designed a recurrent layer, named Intra-Spectral Recurrent (ISR) layer to capture spectral dependencies within the magnitude and phase responses of noisy speech using Markovian recurrent connections. This was successfully integrated into a LSTM-based single-channel speech enhancement model. ([ICASSP-2020](#), [slides](#), [video](#))
- Formulated a new type of recurrent output layer that enforces spectral-level dependencies within each spectral time frame, by modeling the Markovian assumption along the frequency axis in both uni-directional and bi-directional ways. This was tested in a magnitude speech enhancement model. ([MLSP-2019](#), [poster](#))
- Engineered a deep architecture, named Recurrent Stacked Generative Adversarial Network (RSGAN) to generate video clips based on a precondition, such as a sentence description, action classes, or fMRI signals. ([IU-VISION-2017](#), [poster](#))

**REVE Systems, Dhaka, Jr. *Software Engineer, Team Media Gateway*** January 2015

- Programmed media gateway controller to facilitate both calls and faxes between the telephone network and VoIP network or another telephone network using the [Megaco 1.0 protocol](#). Additionally, designed a front-end panel using the [JSP framework](#) for easy use by VoIP administrators and customers.

## EDUCATION

**Ph.D. in Computer Science,** April 2023 (Anticipated)  
Indiana University, Bloomington, IN  
Advisor: [Prof. Donald S. Williamson](#)

**M.Sc. in Computer Science,** December 2019  
Indiana University, Bloomington, IN

**B.Sc. in Computer Science & Engineering (CSE),** July 2014  
[Bangladesh University of Engineering & Technology \(BUET\)](#), Dhaka, Bangladesh