

## TECHNICAL EXPERTISE

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

## EMPLOYMENT

**Indiana University, Bloomington, IN**, *Research Assistant, [ASPIRE research lab](#)*

Fall 2016 - Present

- Developed an attention-based monaural [speech enhancement](#) model that aims to maximize human perceptual rating of the enhanced speech by incorporating embedding vectors from a human Mean-Opinion Score (MOS) prediction model and jointly training the models on real-world noisy speech data. ([INTERSPEECH-2021](#))
- Proposed and implemented a quantized speech prediction model that classifies speech spectra into a corresponding quantized class and applies a language-style model to ensure more realistic speech spectra. Acceptable quantization level is determined by a listener study ran in [Amazon MTurk](#) designed in [Qualtrics](#). ([ICASSP-2021](#), [poster](#), [slides](#), [video](#))
- Designed a recurrent layer named Intra-Spectral Recurrent (ISR) layer that captures spectral dependencies within the magnitude and phase responses of the noisy speech using Markovian recurrent connections, and successfully deployed in 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 modeling the Markovian assumption along the frequency axis in both uni-directional and bi-directional ways, and tested in a magnitude [speech enhancement](#) model. ([MLSP-2019](#), [poster](#))
- Engineered a deep architecture named Recurrent Stacked Generative Adversarial Network (RSGAN) which generates video clips based on a pre-condition like a sentence description, action classes, or fMRI signals. ([IU-VISION-2017](#), [poster](#))
- Designed [prediction models](#) for nulliparous pregnant women to diagnose gestational diseases like diabetics, pre-eclampsia, and hypertension as part of the NSF Proactive Health Informatics (PHI) project. Also, developed a smart system that tracks the daily physical activity of women collected by wearable devices and helps to diagnose gestational complications.
- Investigated [speech emotion detection](#) deep architectures like RNN and CNN in the scale of arousal and valence.
- Developed an automatic [classification of rhetorical questions](#) with stress detection on our own collected dataset using Recurrent Neural Network (RNN) and Convolutional Recurrent Neural Network (CRNN) models. ([code](#) [📄](#))
- Implemented an [end-to-end speech recognition](#) system for the English language using bi-directional recurrent neural network architecture without any frame wise labeling. ([code](#) [📄](#))

**BOSE Corporation, Boston, MA**, *Machine Learning/Neural Signal Processing Intern*

Summer 2020

- Researched [enhancing speech](#) in remote microphone applications by self-speech removal to provide better quality sound with low latency to the hearing aids and voice-assistive wearable devices. LSTM-based architecture with speaker dependent d-vector is used for real-time operation.

**United International University (UIU), Dhaka**, *Lecturer, Department of CSE*

August 2016

- Taught courses of Computer Science curriculum, like C++ Programming language, Algorithms, Digital Logic Design and Pattern Recognition courses in classes of more than 90 undergrads.

**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 via [Megaco 1.0 protocol](#). Also designed front-end panel by [JSP framework](#) for VoIP administrators and customers for easy use.

## EDUCATION

**Ph.D. in Computer Science**,  
Indiana University, Bloomington, IN

Fall 2022 (Anticipated)  
Advisor: [Prof. Donald S. Williamson](#)

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

December 2019

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

July 2014