Nursadul Mamun

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Permanent Residence in USA (Green Card)
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OBJECTIVE: "Seeking full time opportunity to contribute to a dynamic team in the field of signal processing, audio/speech/hearing, machine learning."

RESEARCH INTEREST:

- Speech Enhancement in Hearing Aid and Cochlear Implants
- Speech & Speaker Recognition/verification
- Emotion recognition

- Machine Learning (DNN, CNN, RNN, GAN)
- Speech Intelligibility and Quality Measure
- Bandwidth Expansion

WORK EXPERIENCE:

Research Intern

1. **Audio Research Scientist Intern, Meta Inc., Redmond, Washington** (May 2022 – Oct 2022)

2. **Acoustic System Engineering Intern, Apple Inc., Cupertino, California** (Jan 2021 – Aug 2021)

Research Assistant

1. **Center for Robust Speech Processing (CRSS), The University of Texas at Dallas, USA** (Current, from May 2018)

2. **Auditory Neuroscience Laboratory, University of Malaya, Malaysia** (Jan 2013 – Dec 2015)

Professional Experience: (April 2016 – May 2018)
**Assistant Professor, Dept. of Electronics and Telecommunication Engineering,
Chittagong University of Engineering and Technology (CUET), Bangladesh**

Research Activities:

Speech Enhancement Algorithm: We present a novel approach for speech enhancement in cochlear implant (CI) users by designing a deep complex convolution transformer with a frequency transformation network. Our network combines the power of complex-valued representations and CNN-based processing to enhance speech signals in a cochlear filter-bank feature space, tailored for CI auditory stimuli. This algorithm proves to be a promising pre-processor for CI users in real-world settings, making it a viable choice for implementation on the CCi-MOBILE research platform.

Speaker Identification Algorithm: Design speaker identification (SID) algorithm to analyses and quantify the ability of CI-users to perform speaker identification based on direct electric auditory stimuli. The input speech signal is processed using a CI Advanced Combined Encoder (ACE) signal processing strategy to construct the CI auditory electrodogram and perform SID using electrodograms. The proposed SID systems for NH and hearing aid user either used cochleagram or neurogram features from the human auditory nerve model and classified speaker voice to recognize individual's ID.

Bandwidth Extension: Design ML-based bandwidth expansion system that reconstruct high frequency component of a speech signal from low frequency components of the signal and subsequently remove noise from the signal. The network applies attention mechanism in the U-net architecture and conformer in the bottleneck layer to extract both local and global features.

Speech Intelligibility Metric: Design speech intelligibility metric using a physiological based model of the auditory system. The metric can predict human speech intelligibility for listeners with and without hearing loss both in quiet and noisy conditions. A well-known orthogonal polynomial measure was used as a feature's extractor from the auditory neurogram.

Robust Gender Classifier: Design a robust gender classification based on neural responses. This study proposes a gender classification technique using the neural responses of a physiologically-based computational model of the auditory periphery and the performance of the proposed method was evaluated for eight different types of noise.

EDUCATION

Ph.D. in Electrical and Electronic Engineering
<u>University of Texas at Dallas</u>, Richardson, Texas, USA.
Focus: *Speech Enhancement for Cochlear Implant users.*
Advisor: Professor John H. L. Hansen (email: john.hansen@utdallas.edu)

May 2018 to Present (Expected Graduation:
September 2023)

Master in Electrical and Electronic Engineering (2nd)
<u>University of Texas at Dallas</u>, Richardson, Texas, USA.
Advisor: Professor John H. L. Hansen (email: john.hansen@utdallas.edu)

Graduated: December 2021
(3.75 with 'HONORS' out of 4)

Master of Science in Biomedical Engineering (1st)
University of Malaya, Kuala Lumpur, Malaysia.
Focus: *Speech intelligibility prediction measure.*
Advisor: Dr. Md Shamsul Arefeen Zilany (email: msazilany@gmail.com)

Graduated: July 2015
'DISTINCTION' (Fully Research mode).

Bachelor of Science in Electrical and Electronic Engineering
Chittagong University of Engineering and Technology, Bangladesh.

Graduated: December 2012
(3.89 with 'HONORS' out of 4; 90.76 %)

Selected Courses
- Digital Signal Processing
- Machine Learning
- Pattern Recognition and Machine Learning
- Speech and Speaker Identification
- Speech Perception
- Probability, Statistics, and Random variable

SKILLS AND ABILITIES
- **Programming:** MATLAB, Python, C.
- **Environment:** Windows, Linux.

Extra Curricular:

➢ Serve as Judge a judge of Special Award program for Acoustical Society of America (ASA) at the International Science and Engineering Fair (ISEF) 2023, Dallas, Texas.
➢ Serve as Judge a judge of Award program for Presidency School and College at the International Science Fair 2023, Chittagong, Bangladesh.

SELECTED PUBLICATIONS:

Journal Papers:

- **Nursadul Mamun**, John H.L. Hansen. "Speech enhancement for cochlear implant recipients using deep complex convolution transformer with frequency transformation"). Submitted to IEEE Transaction on Audio, Speech, and Language Processing.
- **Nursadul Mamun**, Anjali Menon. "A multi-model complex-valued frequency transformation network for speech enhancement using contact microphone". Submitted to IEEE Signal Processing Letter.
- **Sabbir Ahmed, Nursadul Mamun** "Cochleagram based noise adapted speaker identification for distorted speech". Submitted to Journal of Digital Signal Processing.
- **Nursadul Mamun**, and John H.L. Hansen. "Familiar and unfamiliar speaker recognition assessment and system emulation for Cochlear Implant users". The Journal of the Acoustical Society of America, 2023, Vol. 155.2, pp. 1293-1306.
- **Nursadul Mamun**, S. A. Zilany, John H.L. Hansen. "An Intrusive Method for Estimating Speech Intelligibility from Noisy and Distorted Signals". The Journal of the Acoustical Society of America, 2021, Vol. 150, pp. 1762-1778.
- **Nursadul Mamun**, W. A. Jassim, S. A. Zilany. "Prediction of Speech Intelligibility Using a Neurogram Orthogonal Polynomial Measure (NOPM)"). IEEE Transaction on Audio, Speech, and Language Processing, 2015 (ISI/SCOPUS *Cited Publication*), vol. 23(4), pp. 760-773.

Selected Conference Papers:

- **Nursadul Mamun**, John H.L. Hansen "CFTNet: Complex-valued frequency transformation network for speech enhancement, Accepted in INTERSPEECH, Dublin, Ireland, 2023**.
- **Nursadul Mamun,** Soheil Khorram, John H.L. Hansen "Convolutional Neural Network-based Speech Enhancement for Cochlear Implant Recipients, INTERSPEECH 2019, 15-19 September 2019, Graz, Austria**.
- **Nursadul Mamun,** Ria Ghosh, John H.L. Hansen "Quantifying Cochlear Implant Users' Ability for Speaker Identification using CI Auditory Stimuli, INTERSPEECH 2019, 15-19 September 2019, Graz, Austria**.
- T Taher**, Nursadul Mamun**, MA Hossain "A Joint Bandwidth Expansion and Speech Enhancement Approach Using Deep Neural Network, 2023 International Conference of ECCE, Chittagong, Bangladesh, 2023**.

- K Akter, **Nursadul Mamun**, MA Hossain "A TF Masking based Monaural Speech Enhancement using U-Net Architecture, 2023 International Conference of ECCE, Chittagong, Bangladesh, 2023**.**

- S Sarker, K Akter, **Nursadul Mamun**, "A Text Independent Speech Emotion Recognition Based on Convolutional Neural Network, 2023 International Conference of ECCE, Chittagong, Bangladesh, 2023**.**

- **Nursadul Mamun**, Khadija Akter "A Self-supervised Convolutional Neural Network for Speech Enhancement" ICEEICT 2021, **18**-20 Nov 2021, Bangladesh.

- Sabbir Ahmed, **Nursadul Mamun** "Cochleagram Based Speaker Identification Using Noise Adapted CNN" ICEEICT 2021, **18**-20 Nov 2021, Bangladesh).

- Khadija Akter, **Nursadul Mamun**, "Predicting Speech Intelligibility with the Regeneration of Envelope from TFS Cues for Hearing Impaired Listeners" EECE, 7-11 February 2019, Bangladesh.

- Md. Ibrahim Khalil, **Nursadul Mamun**, Khadija Akter "Robust Text Dependent Speaker Identification Using Neural Responses from the Model of the Auditory System" EECE, **7-11** February 2019, Bangladesh.

- John H.L. Hansen, Hussnain Ali, Juliana N. Saba, Ram Charan M. C., **Nursadul Mamun**, Ria Ghosh, Avamarie Brueggeman "CCi-MOBILE: Design and Evaluation of a Cochlear Implant and Hearing Aid Research Platform for Speech Scientists and Engineers" IEEE-EMBS International Conference on Biomedical and Health Information, University of Illinois at Chicago, Chicago, IL, USA**.** (accepted)

- **Nursadul Mamun**, W. A. Jassim, S. A. Zilany. "Robust Gender Classification using Neural responses from the Model of the Auditory System" IFESS, 17-19 September 2014, Malaysia.

- **Nursadul Mamun**, W. A. Jassim, S. A. Zilany. "Speech-based Gender Classification Using Neurogram Orthogonal Polynomial measure" RCEE, 04-05 Mar 2014, Malaysia.

- Shoumya Chowdhury, **Nursadul Mamun**, A. A. Shahjamal Khan, Fahim Ahmed. "Text Dependent and Independent Speaker Recognition Using Neural Responses from the Model of the Auditory System" EECE-2016, 11-13 February 2017, Bangladesh.

- Khadija Akter, **Nursadul Mamun** "*Prediction of Speech Perception with Recovered Envelope Cues from TFS stimulus For Normal Hearing Listener*" ICEEICT 2018, 13-15 September 2018, MIST, Dhaka, Bangladesh**.**

- Taieba Athay, **Nursadul Mamun**, "Predicting Speech Intelligibility Based on Neural Cross-Correlation for Normal Hearing People" 10th International Conference on Electrical and Computer Engineering, 20-22 December 2018, Dhaka, Bangladesh**.**

- Md. Saiful Islam, **Nursadul Mamun** and Muhammad S. Ullah "Speech Based Deception Detection Using Bispectral Analysis", ICGSP, 2018, Australia**.**

Conference Abstracts or Presentations:

- **Nursadul Mamun**, John H.L. Hansen "Transformer-based Monaural Speech Enhancement for Cochlear Implant (CI) Users via Complex Spectral Mapping, 2023 Conference on Implantable Auditory Prostheses (CIAP), Lake Tahoe, California, USA**.**

- **Nursadul Mamun**, John H.L. Hansen "TSUNet: Transformer-based Single Channel Speech Enhancement using SkipConv U-Net for Cochlear Implant Users, 183rd Meeting Acoustical Society of America (ASA), 5-9 December 2022, Nashvile, Tennesse**.**

- **Nursadul Mamun**, John H.L. Hansen "CCi-MOBILE: Auto-LSP based speech enhancement with cochlear implant listeners using convolutional neural network constraint mapping, 2021 Conference on Implantable Auditory Prostheses (CIAP), Lake Tahoe, California, USA**.**

- **Nursadul Mamun**, Soheil Khorram, John H.L. Hansen "CCi-MOBILE: Environment-specific speech enhancement with cochlear implant listeners using convolutional neural network, 2019 Conference on Implantable Auditory Prostheses (CIAP), Lake Tahoe, California, USA**.**

- Ria Ghosh, Juliana N. Saba, **Nursadul Mamun**, Hussnain Ali, John H.L. Hansen "CCi-Mobile: moving towards exploring advanced research paradigms for cochlear implant and hearing aid users, 2019 Conference on Implantable Auditory Prostheses (CIAP), Lake Tahoe, California, USA**.**

- Evelyn E. Davies-Venn, **Nursadul Mamun**, Md Hossain , Timothy Kwan, Melanie Putman , MSA Zilany "Comparison of the predictive accuracy of different computational models of auditory perception" 177th Meeting Acoustical Society of America(ASA), 13-17 May 2019, Louisville, Kentucky, **USA.**

- **Nursadul Mamun**, Khadija Akter, Hussnain Ali, John H. L. Hansen "*Measuring Speech Perception with Recovered Envelope Cues using the Peripheral Auditory Model*" 176th Meeting Acoustical Society of America (ASA), 5-9 November 2018, Victoria, Canada**.**

- Hussnain Ali, **Nursadul Mamun**, John H. L. Hansen, "The CCi-MOBILE VOCODER" 176th ASA, 5-9 November 2018, Victoria, Canada**.**

- S. A. Zilany, **Nursadul Mamun**, W. A. Jassim. "Prediction of Behavioral Speech Intelligibility and Quality using a Computational Model of the Auditory System" 37th Mid Winter Meeting of the Association for Research in Otolaryngology (ARO), 21-25 Feb 2014,

- Evelyn Davies-Venn, **Nursadul Mamun**, S. A. Zilany. "Computational auditory model of intensity effects on amplified speech perception" 39th Mid-Winter Meeting of the Association for Research in Otolaryngology (ARO), 20-24 Feb 2016, San Diego, California, USA.

REFERENCES:

John H.L. Hansen, Ph. D.
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Professor, Dept. of Electrical Engineering, Erik Jonsson School
Center for Robust Speech Systems, Coordinator
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