

## NURSadul MAMUN

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## RESEARCH INTEREST

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- Audio, Speech and Language Processing
- Speech Enhancement
- Auditory Nerve Modelling
- Cochlear Implants and Hearing aids
- Speech and Speaker Recognition
- Speech Intelligibility and Quality
- Machine Learning and Algorithm Design

## EDUCATIONAL QUALIFICATIONS:

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PhD in Electrical Engineering May '18 to Present (Pursuing)

Erik Jonsson School of Engineering and Computer Science  
The University of Texas at Dallas, USA.

**Thesis Title: Design Speech Enhancement Algorithms for Cochlear Implant Users.**

Master of Science in Biomedical Engineering Sept.'13 to July '15

University Malaya,  
Kuala Lumpur, Malaysia.

**Result: Distinction**

**Thesis Title: Prediction of Speech Intelligibility Using a Physiologically Based Model of The Auditory System.**

Bachelor of Science in Electrical and Electronic Engineering, March '08 to Dec. '12

Chittagong University of Engineering and Technology  
Chittagong, Bangladesh.

**CGPA: 3.89/4 (90.76%.)**

## MAJOR COURSES:

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Speech and Speaker Recognition, Machine learning, Pattern Recognition and Machine Learning, Probability, Statistics and Random Variable, Digital Signal Processing, Speech Perception.

## RESEARCH EXPERIENCE:

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Research Assistant May '18- Present

**Cochlear Implant Laboratory ECSN 4.418**

**Erik Jonsson School of Engineering and Computer Science  
The University of Texas at Dallas**

### Research Activities:

- **Speech Enhancement Algorithm:** Design a Convolutional Neural Network (CNN) based speech enhancement algorithm for cochlear implant users. The algorithm performs speech enhancement in a cochlear filter-bank feature space, a feature-set specifically designed for CI users based on CI auditory stimuli. The algorithm represents a viable option for implementation on the CCI-MOBILE research platform as a pre-processor for CI users in naturalistic environments.
- **Speaker Identification Algorithm:** Design a speaker identification (SID) algorithm to analyze 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 electrodogram.

**Research Assistant**  
**Auditory Neuroscience Laboratory**  
**Department of Biomedical Engineering,**

Jan. '13- Feb. '16.

**Research Activities:**

- **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.

**TEACHING EXPERIENCE:**

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**Assistant Professor**

Department of Electronics and Telecommunication Engineering  
Chittagong University of Engineering and Technology (CUET)  
Bangladesh.

7<sup>th</sup> Feb. '18 – 7<sup>th</sup> May '18

**Lecturer**

Department of Electronics and Telecommunication Engineering  
Chittagong University of Engineering and Technology (CUET)  
Bangladesh.

24<sup>th</sup> April '16 – 06<sup>th</sup> Feb '18

**HONOURS AND AWARDS:**

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- Received all Academic Technical Scholarships for Semester GPA in the Department of Electrical & Electronic Engineering, Chittagong University of Engineering Technology (CUET), Bangladesh. (2008 – 2012)
- Awarded the best poster presenter in International Conference on Innovations in science, Innovation and Technology in Bangladesh for the research on human auditory system. (October, 2016)
- 2019 International Speech Communication Association INTERSPEECH Travel Grant.
- 2019 Conference on Implantable Auditory Prostheses (CIAP) Travel Grant.
- 176<sup>th</sup> Meeting Acoustical Society of America (ASA) Student Travel Award.

**SKILLS**

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- **Programming Language:** MATLAB, Python, C.
- **Machine Learning:** Classification, Regression, Clustering, LDA, PCA, OLS, WLS, SVD.
- **Machine learning libraries:** Scikit-learn, SciPy, Numpy, Pandas, TensorFlow, Keras.
- **Deep Learning:** DNN, CNN, RNN/LSTM.
- **Circuit Simulation** : P-Spice, DSCH, and MICROWIND.

## **PROJECT WORKS:**

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- Design Convolutional Neural Network (CNN)-based Speech Enhancement Algorithms for Cochlear Implant Users.
- Design Speaker Identification Algorithms using Auditory-inspired features for Cochlear Implant Users.
- Self-supervised Speech Enhancement Algorithm using Convolutional Neural Network (CNN).
- Design Wavelet-transform based Signal Denoising for ECG signal.
- Support Vector Machine (SVM)- based arrhythmia classification for ECG signal.
- Design Objective Speech Intelligibility Metric for Hearing-impaired Subjects.

## **PUBLICATIONS:**

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### **Journal Papers:**

- **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.
- **Nursadul Mamun**, S. A. Zilany. "[A Spectrogram Orthogonal Polynomial Measure \(SOPM\) for the Prediction of Speech Intelligibility and Quality](#)" Submitted to JASA, 2020.
- **Nursadul Mamun**, Nahidul Haque Samrat, Choton Kanti Das, Sagor Ghosh. "[Design and Implementation of a Vehicle Monitoring System for Toll Collection](#)". International Journal of Science & Engineering Research, 2013, V-4, Issue-4.
- Afrin Hossain, Tajrin Jahan Rumky, **Nursadul Mamun**. "[Implementation of smart energy meter with two way communication](#)". International Journal of Science & Engineering Research, 2013, V-4, Issue-7.

### **Conference Papers:**

- **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.
- 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, 2019.

- 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](#)” 10<sup>th</sup> 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.
- Adnan Basir, **Nursadul Mamun**, “[Design of an Effective ECG Filtering Method for Non-linear Noise](#)” International Conference on Advancement in Electrical and Electronic Engineering (ICAEEE 2018), 22-24 November 2018, Dhaka, Bangladesh.
- Antora Dev, **Nursadul Mamun** “[Design of an EEG-based Brain Controlled Wheelchair for Quadriplegic Patients](#)” IEEE 3<sup>rd</sup> International Conference for Convergence in Technology (I2CT), 6-8 April 2018, Pune, India.
- 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](#)” **11-13 February 2017, Bangladesh.**
- Eftekhar Hossain, **Nursadul Mamun** “[Vehicle to Vehicle Communication Using RF and IR Technology](#)” 2nd International Conference on Electrical & Electronic Engineering (ICEEE), 27-29 December 2017, RUET, Rajshahi, Bangladesh.
- B. Patwary, Sabrina Abedin, Tasfia Tasbin and **Nursadul Mamun** “[Conductivity Based Concentration Measurement Technique For Detecting Adulteration](#)” Proceedings of the International Conference on Mechanical Engineering and Renewable Energy 2017 (ICMERE2017) 18 – 20 December, 2017, Chittagong, Bangladesh.
- Taieba Taher, M. A. Haider, **Nursadul Mamun** “[Smart Zone Sensing System with Accident Prevention](#)” 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC) 21 - 23 Dec 2017, Dhaka, Bangladesh. (International)
- **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.**
- **Nursadul Mamun**, Nahidul Haque Samrat, Nur Muhammad Khan, Jahirul Islam. “[Multi-directional Solar Tracker Using Low Cost Photo Sensor Matrix](#)”. International Conference on Informatics, Electronics & Vision (ICIEV), IEEE, 2014.
- Nahidul Hoque Samrat, **Nursadul Mamun**, Shah Mukim Uddin, and Arif Islam. “[Case study: Tidal current energy potential in Bangladesh.](#)” International Conference on Informatics, Electronics & Vision (ICIEV), pp. 1-5. IEEE, 2013.

## **Conference Abstracts or Presentations:**

- **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](#)” 177<sup>th</sup> 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](#)” 176<sup>th</sup> Meeting Acoustical Society of America(ASA), 5-9 November 2018, Victoria, Canada.
- Hussnain Ali, **Nursadul Mamun**, John H. L. Hansen, “The CCI-MOBILE VOCODER” 176<sup>th</sup> 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](#)” 37<sup>th</sup> Mid-Winter Meeting of the Association for Research in Otolaryngology (ARO), 21-25 Feb 2014, USA.
- Evelyn Davies-Venn, **Nursadul Mamun**, S. A. Zilany. “Computational auditory model of intensity effects on amplified speech perception” 39<sup>th</sup> Mid-Winter Meeting of the Association for Research in Otolaryngology (ARO), 20-24 Feb 2016, San Diego, California, USA.

## **Conference Workshops:**

- John H.L. Hansen, **Nursadul Mamun**, Ria Ghosh, Juliana N. Saba “[Hands-On with CCI-MOBILE: A Cochlear Implant and Hearing-Aid Research Platform](#)”, 44<sup>th</sup> Mid-Winter Meeting (virtual) of the Association for Research in Otolaryngology (ARO), Florida, 21-25 February 2021, USA.
- John H.L. Hansen, **Nursadul Mamun**, Ria Ghosh, Juliana N. Saba “[CCi-MOBILE: A Cochlear Implant and Hearing-Aid Research Platform](#)”, 2019 Conference on Implantable Auditory Prostheses (CIAP), Lake Tahoe, California, USA.

## **ACADEMIC REFEREE**

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### **John H.L. Hansen**

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Center for Robust Speech Systems, Coordinator  
IEEE Fellow, ISCA Fellow, IEEE SLTC Past TC Chair, ISCA VP  
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