

# Debottam Dutta

📍 Dhakuakhana, Assam, 787055

☎ +919678501032 ✉ [debottamd@iisc.ac.in](mailto:debottamd@iisc.ac.in) 📞 [Debottam Dutta](#) 🌐 [debottam-dutta7](#)

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AREA OF INTEREST	My area of interest lies in machine learning and deep learning approach to audio and speech related problems which include speech/audio representation learning, speech recognition, acoustic scene classification, speech enhancement, explainable AI, acoustics for healthcare etc.
CURRENT POSITION	Working as a <b>Senior Research Fellow</b> at <b>LEAP Lab</b> , Indian Institute of Science, Bangalore. Currently I am involved in <b>Project Coswara</b> where I focus on designing a COVID-19 detection tool from acoustics. I am also engaged in developing speech enhancement and ASR systems using End-to-end models.
EDUCATION	<b>M.Tech in Signal Processing</b> (8.6/10) Indian Institute of Science, Bangalore July, 2021 <b>B.Tech in Electronics and Communication Engineering</b> (8.94/10) National Institute of Technology, Silchar May, 2018
PUBLICATIONS	[1] <b>Debottam Dutta</b> , Purvi Agrawal, and Sriram Ganapathy, “A multi-head relevance weighting framework for learning raw waveform audio representations,” in 2021 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA), 2021, pp. 191–195 [2] Neeraj Kumar Sharma, Srikanth Raj Chetupalli, Debarpan Bhattacharya, <b>Debottam Dutta</b> , Pravin Mote, Sriram Ganapathy, “The second dicova challenge: Dataset, task and baseline system for covid-19 diagnosis using acoustics,” IEEE Intl. Conference on Acoustics Speech Signal Processing (ICASSP), 2022
PROJECTS	<b>ASR in the wild for Hindi Language</b> Oct, 2021-Present <ul style="list-style-type: none"><li>• Ongoing project with Sony Research India.</li><li>• ASR in the wild is challenging due to the presence of variety of multi-media content, multiple speakers, channels and unrestricted background.</li><li>• Initial experiments with end-to-end systems show promising results.</li></ul> <b>Svadhyaaya System For The Second Diagnosing COVID-19 Using Acoustics Challenge (DiCOVA2) 2021</b> Sep-Oct, 2021 <ul style="list-style-type: none"><li>• Developed a deep learning based model for detecting COVID-19 from cough, breathing and speech samples.</li><li>• The developed model is an ensemble of BLSTM classifier with a relevance weighting based learnable front-end and a TDNN system.</li><li>• Our submitted systems achieved <b>3rd position</b> in both breathing and speech tracks in the leaderboard.</li></ul> <b>Time Frequency Representation Learning for Audio Signals</b> M.Tech Thesis, June, 2021 <ul style="list-style-type: none"><li>• Objective was to learn raw waveform audio representations from a learnable filter-bank which addresses the biases and limitations introduced by mel filter-bank.</li><li>• The proposed multi-head relevance weighting based front-end produced representations which elicited significant accuracy improvements over log-mel spectrograms in multiple downstream tasks.</li><li>• Experiments of parametric filter-bank learning in a self-supervised setting also showed different filter-bank profile than mel.</li></ul>

**Interpretable Representations for Acoustic Scene Classification** Jan-July, 2020

- Project for the course *Speech Information Processing* in which using a CNN-DNN framework, an interpretable gaussian filter-bank was learned from the CNN kernels for the task of three class acoustic scene classification.
- Showed that the learned filter-bank also resembles the human auditory frequency response and offers better accuracy than the usually used mel filter-bank.

**Speech Enhancement using Emperical Risk Minimization** Jan-June, 2020

- For the course *Time-Frequency Analysis*, implemented speech denoising in perceptual risk optimization framework, a Computationally efficient technique that does not rely on clean signal prior and requires no training.
- Estimators obtained by optimizing some perceptually relevant distortion measures provide better speech denoising performance in low SNR conditions than many popular bench mark techniques.

**MEMS IMU Error Analysis for Sensor Fault Detection** B.Tech Thesis, 2018

- Designed and implemented a Auto regressive and SVM based time-series data analysis and prediction model for analysis of IMU(Inertial Measurement Unit) sensor data.
- Used the developed model to predict and detect any potential fault in the sensor which is extensively used in most of the navigation devices.

ACADEMIC  
HONORS &  
AWARDS

**AICTE-PG Scholarship**

- Recieved monthly stipend from All Indian Council for Technical Education for post-graduate studies.

**Ishan-Uday Scholarship**

- Awarded with scholarship from Ministry of Human Resource Development(MHRD) and University Grants Commission (UGC), India during the course of undergraduate study.

**Ishān Bikās Scholarship**

- Scholarship from govt. of India for summer research in premier institutes of India.

**Ananda Ram Borooah Award:**

- Award from Govt. of Assam for excellent performance in HSLC examination.

SKILLS

**Programming Languages and Packages:** C, C++, Python, MATLAB, L<sup>A</sup>T<sub>E</sub>X, SHELL Scripting, git

**Frameworks:** PyTorch, Tensorflow, Kaldi, ESPNET

**Operating Systems:** Linux, Windows

COURSES  
TAKEN

Pattern Recognition and Neural Networks, Speech Information Processing, Time-Frequency Analysis, Mathematical Methods and Techniques for Signal Processing, Digital Image Processing, Advanced Deep Learning, Deep Learning for Natural Language Processing, Detection and Estimation Theory, Linear and Non-linear Optimization, Random Process, Matrix Theory

EXPERIENCES

**Teaching Assistantship - Machine Learning for Signal Processing, IISc** Jan-June, 2021

- Responsibilities include maintaining course logistics, doubt solving and checking assignments.

**Summer Research Intern-IIT Madras**

May-July, 2017

- Worked on error analysis and mathematical modelling of Inertial Measurment Unit (IMU) sensor data, using Auto-regressive models.

**Summer Research Intern-IIT Guwahati**

May-July, 2016

- Worked on the project of mathematical modeling and design of the radiation pattern of an LED Street Lamp to beat the performance of traditionally used High Power Sodium (HPS) Lamps.