

Debottam Dutta

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EDUCATION	Ph.D. in Electrical and Computer Engineering University of Illinois at Urbana-Champaign M.Tech in Signal Processing Indian Institute of Science, Bangalore B.Tech in Electronics and Communication Engineering National Institute of Technology, Silchar	Aug, 2022-Present July, 2021 May, 2018
RESEARCH INTERESTS	Deep Learning, Generative Models (VAEs, Energy-based Models, GANs, Denoising Diffusion Models), Representation Learning	
WORK EXPERIENCE	Senior Research Fellow LEAP Lab, Indian Institute of Science <ul style="list-style-type: none">Worked on the project Coswara which aimed at building a remote diagnostic tool for COVID-19 based on cough, breathing and speech signals.Also worked on designing interpretable Convolutional neural network filters that effectively detects COVID-19 from breathing patterns of COVID affected patients.	May, 2021 - June, 2022
SELECTED PROJECTS	Enhancing VAE with a Flexible Prior <ul style="list-style-type: none">VAE, by construction, uses Gaussian prior and posterior which introduce "hole"/low-probability (under the aggregate posterior) regions in the latent space. These holes are the reasons for VAE's bad reputation for producing blurry and inconsistent samples during sampling.Proposed integrating an energy-based flexible prior distribution to VAE that imitates the agg. posterior distribution and in turn achieves SOTA generation by removing the holes from the latent space. Music Generation with Latent Diffusion <ul style="list-style-type: none">The proposed model generates music latent-codes with the help of a diffusion prior that models the harmony and temporal dependence of the musical instruments, while a VAE synthesizes the music audio by upsampling and transforming the latent-codes.Through experiments we show that instead of working with the melody audio directly, handling individual instruments separately yields better performance. This also enables additional instrument generation conditioned on other instruments.The proposed method produces better results and beats existing SOTA baselines in objective and subjective audio quality assessment. Curvature Guided Langevin Monte-carlo <ul style="list-style-type: none">Explored Langevin monte-carlo as a global optimization technique in the context of non-convex parameter estimation problem.Specifically, optimized the algorithm for Chirp signals (often used in modeling human heart beats) exploiting the average curvature of the objective function to reliably find the minimizer. Coswara <ul style="list-style-type: none">We collaborated with hospitals/health-centers to collect and analyze cough, breathing and speech samples from COVID-affected and healthy subjects across the globe.We built a deep learning-based diagnostic tool for early detection of COVID-19 and released for public use.	Oct, 2023 - Present Jan - Sept, 2024 Jan - Sept, 2024 May, 2021 - June, 2022

- The data collected is a rich source of meta-data (COVID-19 related symptoms and other respiratory ailments) and released as [open-source dataset](#).

PREPRINTS

- [1] Debottam Dutta, Chaitanya Amballa, Zhongweiyang Xu, Yu-Lin Wei, Romit Roy Choudhury, **"Learning Energy-based Variational Latent Prior for VAEs"**, submitted to CVPR, 2025
- [2] Sattwik Basu, Debottam Dutta, Yu-lin Wei, Romit Roy Choudhury, **"Estimating Multi-chirp Parameters using Curvature-guided Langevin Monte Carlo"**, submitted to ICASSP, 2025

SELECTED PUBLICATIONS

- [3] Zhongweiyang Xu, Debottam Dutta, Yu-Lin Wei, Romit Roy Choudhury, **"Multi-Source Music Generation with Latent Diffusion"**, NeurIPS 2024 Workshop on Audio Imagination
- [4] Anurenjan Purushothaman, Debottam Dutta, Rohit Kumar and Sriram Ganapathy, **"Speech Dereverberation With Frequency Domain Autoregressive Modeling"**, in IEEE/ACM Transactions on Audio, Speech, and Language Processing, vol. 32, pp. 29-38, 2024, doi: 10.1109/TASLP.2023.3317570
- [5] Debarpan Bhattacharya, Neeraj Sharma, Debottam Dutta. et al. **Coswara: A Respiratory Sounds and Symptoms Dataset for Remote Screening of SARS-CoV-2 Infection**. Sci Data 10, 397 (2023). <https://doi.org/10.1038/s41597-023-02266-0>
- [6] Debottam Dutta, Debarpan Bhattacharya, Sriram Ganapathy, Amir H Poorjam, Deepak Mittal, Maneesh Singh, **"Acoustic Representation Learning on Breathing and Speech Signals for COVID-19 Detection"**, Proc. Interspeech 2022, 2863-2867, doi: 10.21437/Interspeech.2022-10376
- [7] Neeraj Kumar Sharma, Srikanth Raj Chetupalli, Debarpan Bhattacharya, Debottam Dutta, 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
- [8] Debarpan Bhattacharya, Debottam Dutta, Neeraj Kumar Sharma, Srikanth Raj Chetupalli, Pravin Mote, Sriram Ganapathy, Sahiti Nori, Sadhana Gonuguntla, Murali Alagesan **"Analyzing the impact of SARS-CoV-2 variants on respiratory sound signals"**, Proc. Interspeech 2022, 2473-2477, doi: 10.21437/Interspeech.2022-10389
- [9] Debottam Dutta, 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

ACADEMIC HONORS & AWARDS

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

Frameworks: PyTorch, Tensorflow, ESPNET

COURSES

TAKEN

Pattern Recognition and Neural Networks, Speech Processing Fundamentals, Computer Vision, Information Theory, Introduction to Optimization, Random Process, Matrix Theory

EXPERIENCES

Teaching Assistantships

- Real-World Algorithms for IoT and Data Science, UIUC Spring, 2024
- Popular Algorithms For IoT-From Classical To Machine Learning, GET Summer, 2023
- Machine Learning for Signal Processing, IISc Jan-June, 2021

Summer Research Intern-IIT Madras

May-July, 2017

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