Sohini Gupta

Incoming PhD student at NeuBahar Lab, University of Alberta

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Education

Program	Institute	CGPA	Year
PhD Electrical and Computer Engineering	University of Alberta & Amii	-	Starting 2026
Integrated B.Tech + M.Tech Electrical Engineering (Major) Signal Processing & Machine Learning (M.Tech)	IIT Kharagpur	8.82/10	2020-2025

Research Experience

M.Tech Project | IIT Kharagpur **Dr. Sanjay Ghosh**
Undergraduate Researcher *July '24 - May '25*

- Implemented deep learning models for EEG-based diagnosis of depression using Explainable AI.
- Developed EEG-based biomarkers using wavelet coherence and statistical feature extraction to classify Major Depressive Disorder (MDD) patients with high accuracy. Slides

B.Tech Project | IIT Kharagpur **Dr. Sharba Bandyopadhyay**
Undergraduate Researcher *January '24 - July '24*

- Constructed a mathematical model for a network of neurons demonstrating selectivity development for deviant stimulus.
- To mathematically explain the importance of a rare stimulus and why neurons show more selectivity towards it using Information Theoretic approach. Slides

BIG Lab | University of Southern California **Prof. Richard Leahy, Dr. Anand Joshi**
IUSSTF-Viterbi Intern | Certificate *May '23 - July '23*

- Implementing a registration framework using a U-Net architecture. Performed image registration on MNIST dataset and Olivetti datasets, extending the methodology to 3D MRI brain scans.
- Developed deformable templates by applying prototype learning to datasets. Slides

LISA Lab | Indian Institute of Science Bangalore **Dr. Kunal Narayan Chaudhury**
SRFP Intern | Certificate *May '22 - July '22*

- Developed and implemented the mathematical framework for Bayesian Optimization.
- Developed code for implementing Bayesian Optimization algorithm; applied it to a toy problem. Report

Projects

- **Computational Neuroscience, IIT Kharagpur**
  - Simulated the Morris-Lecar and Hodgkin-Huxley equations, performed phase plane analysis, and extracted envelope features from auditory neuron spike time data. Github
- **Neural Style Transfer, IIT Kharagpur**
  - Implementation of the paper Image Style Transfer Using Convolutional Neural Networks by Gatys (2016). Github
- **Image and Video Captioning, IIT Kharagpur**
  - This project explores the task of image and video captioning using Vision Transformers (ViTs). Github

Publications

International Conferences

1. Jain S., **Gupta S.** *, Agarwalla S., Bandyopadhyay S. (2025), "Social experience dependent plasticity in micro-organization and population coding of sequences of mouse vocalizations in the mouse auditory cortex". Association For Research In Otolaryngology 48th Annual MidWinter Meeting, Feb 22-26, 2025, Orlando, Florida. (*Presenter)

Achievements

- Awarded **IUSSTF-Viterbi Research Fellowship 2023.** Among the 15 students selected for the program across India for doing a summer internship at University of Southern California.
- Awarded the **Summer Research Fellowship 2022** by Indian Academy of Sciences.
- Awarded **Honourable Mention** by IIT Kharagpur for contribution in Sports and Games.
- Ranked among the **top 0.5 %** of the candidates in IIT-JEE Advanced 2020 (in a pool of 1.2 million).
- Certificate of merit in AISSE, 2018 for being among the **top 0.1 %** successful candidates in Mathematics.

Relevant Coursework

Neuroscience : Computational Neuroscience, Neuronal Coding of Sensory Information.

AI : Artificial Intelligence Foundation and Application, Deep Learning Foundation and Application, Machine Learning for Signal Processing, Natural Language Processing.

Mathematics : Linear Algebra, Probability & Random Processes, Convex Optimisation, Real Analysis.

Electrical : Information Theory and coding, Digital Signal Processing, Digital Speech Processing, Statistical Signal Processing, Signals and Systems, Control Theory, Embedded Systems, Digital Electronic Circuits.

Summer School in Computational Neuroscience, Neuromatch Academy: Completed a 3-week intensive program, including coursework and a project focused on fMRI analysis. Certificate

Technical Skills

Programming Languages: : Python, MATLAB, C/C++, Assembly.
Software : STM32, Microchip studio, LTspice, Simulink, Android Studio.
Hardware : Arduino, ATMega32.
Tools/Frameworks : Pytorch, Pandas, Scikit-learn, Tensorflow, Keras, OpenCV.

Teaching Experiences

- Teaching Assistant for **Electronic Circuits** Laboratory at IIT Kharagpur
- Teaching Assistant for **Electrical Technology** course at IIT Kharagpur
- Teaching Assistant for **Computational Neuroscience** course at IIT Kharagpur

Initiatives and Extracurricular Activities

- Co-founder of BrAIn - A neuroscience reading group at IIT Kharagpur, to encourage discussions and learning about neuroscience research.
- Authored a comprehensive blog post on Neuron Models-Introduction to Hodgkin Huxley Model.
- Attended the From Molecules to Mind 2024 symposium by the Centre for High Impact Neuroscience and Translational Applications (CHINTA)
- Represented IIT Kharagpur Volleyball Team in INTER IIT sports meet 2023 held in IIT Bombay.
- Represented IIT Kharagpur Volleyball Team in various sports fests like PARAKRAM '25 (Won -Gold), organised by IIT Kanpur and SHAURYA '23 (Won - Gold), organized by IIT Kharagpur.