SOUJANYA HAZRA

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EDUCATION

M.Tech, Electrical Engineering *Aug 2024 - Present*
Indian Institute of Technology Kharagpur *CGPA: 8.25/10*
Specialisation: Signal Processing and Machine Learning

B.Tech, Electrical Engineering *Aug 2020 - June 2024*
Kalyani Government Engineering College *CGPA: 8.72/10*

RESEARCH PROJECTS

Explainable EEG Graph Neural Network for MDD Classification *Apr 2025 - Present*
Advisor: Dr Sanjay Ghosh, EE, IIT-KGP

- Built an EEG-based classification framework using a graph neural network and brainwave synchrony patterns to distinguish major depressive disorder from healthy controls with >90% accuracy on 2 datasets.
- Analysed over 10,000 EEG segments to extract and integrate 14 statistical, mathematical, and signal-based features for reliable mental health classification.
- Implemented explainability to quantify and visualise edge, node, and feature importance, enhancing model interpretability and supporting clinically relevant biomarker insights.

Modulo-EEG Signal Recovery with Graph Neural Networks *Aug 2025 - Oct 2025*
Advisor: Dr Sanjay Ghosh, EE, IIT-KGP

- Created a pre-processing pipeline to turn raw EEG data into graph topologies using modulo wrapping, spatial k-nearest neighbour edges, and temporal connections for robust representation.
- Built and trained a custom graph model for EEG folding-status classification and signal reconstruction, obtaining 89.28% accuracy.
- Introduced a novel pre-estimation guided feature injection to the graph model to stabilise training.

AI-Powered Diagnosis of Oral Pre-cancerous Lesions *Jan 2025 - Feb 2025*
Advisor: Dr Subhamoy Mandal, SMST, IIT-KGP

- Developed a deep learning model to classify oral submucous fibrosis with 96.9% accuracy (0.99 AUC-ROC) and leukoplakia with 93.9% accuracy (0.98 AUC-ROC).
- Trained and fine-tuned an encoder architecture on a specialised cytology dataset consisting of 60 subjects, using a patch-based method to analyse high-resolution images.
- Created visual heatmaps to show where the AI diagnoses images for explainability.

COURSEWORK INFORMATION

Machine Learning and AI	Deep Learning Foundations and Applications, Machine Learning for Signal Processing, Embedded Machine Learning, Geometric Methods for Computer Vision
Signal Processing	Statistical Signal Processing, Digital Image Processing, Introduction to Digital Speech Processing, Biomedical Signal Processing and Automation
Mathematical Foundations	Convex Optimisation in Control and Signal Processing, Linear Algebra in Signal and Systems, Probability and Random Processes for Signal and Systems

PUBLICATIONS/PRE-PRINTS

[1] **Hazra, Soujanya**, and Sanjay Ghosh. "Bridging Accuracy and Explainability in EEG-based Graph Attention Network for Depression Detection." arXiv preprint arXiv:2511.05537 (2025).

[2] **Hazra, Soujanya**, and Sanjay Ghosh. "Graph Guided Modulo Recovery of EEG Signals." arXiv preprint arXiv:2510.26756 (2025).

[3] Saha, Aniruddha, **Soujanya Hazra**, and Sanjay Ghosh. "Selection and Stability of Functional Connectivity Features for Classification of Brain Disorders." arXiv preprint arXiv:2511.05531 (2025).

COMMUNITY INVOLVEMENT

- Served as a **reviewer** for IEEE Transactions on Affective Computing.
- Served as a **reviewer** for International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2026).
- Served as a **reviewer** for International Symposium on Biomedical Imaging (ISBI 2026).

TEACHING EXPERIENCE

Teaching Assistant - Signal Processing Systems Design Lab (IIT-KGP) *2025*

- In charge of mentoring undergrad students with their lab experiments and evaluation.

Teaching Assistant - INAE-IIT Kharagpur (Centre for Engineering Education Excellence Program) *2025*

- Assisted in conducting the Signals and Systems program and delivered lectures under the initiative.

COMPETITION AND EVENTS

JTG/IEEE IT Society Summer School *2025*

- Attended the Joint Telematics Group/IEEE Information Theory Society Summer School on Signal Processing, Communications and Networks at IIT Bombay.

Stanford RNA 3D Folding Challenge *2025*

- Utilised deep learning and structural bioinformatics to predict RNA 3D structures from sequencing data, obtaining large-scale biological structure prediction.

SysCon Summer School *2023*

- Attended IIT Bombay's SysCon Summer School 2023, learning signal processing, systems, and control.

SKILLS AND EXPERTISE

Programming Languages	C/C++, Python
ML and Signal Processing	PyTorch, TensorFlow, Scikit-learn, NumPy, SciPy, Pandas, Matplotlib, SHAP, MNE, YASA, MATLAB
Tools and Platforms	Git/GitHub, VS Code, Jupyter, Colab, Linux, LaTeX

POSITION OF RESPONSIBILITY

Convenor of CHITRANK-Art Club *2024*

- Organised 2 workshops, 4 webinars and 10+ competitions for every person who has a genuine passion for art.

Technical Secretary *2024*

- Coordinated members from 3+ clubs to enhance TechFest with cutting-edge technology, elevating its quality.
- Led a talented team of 50+ students to integrate state-of-the-art tech, boosting TechFest's quality and resonance.

Backend Lead of GDSC KGEC *2023*

- Organized 5+ hackathons, conducted 12+ sessions for 100+ college students on Backend Development.
- Collaborated with team members and developed our own website.