Mainak Chakraborty

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Full-time PhD Student at IIT Delhi, interested in Signal Processing and Machine Learning

Education

CGPA 9.00/10.0 **PhD in Signal Processing and Machine Learning**, *Indian Institute of Technology, Delhi* (QS Ranking 2024: 150(O)|45(S)) | New Delhi, India — *2021-2025*

9.07/10.0 **MTech in Mechatronics and Robotics Engineering(GATE fellowship)**, *Indian Institute of Engineering Science and Technology, Shibpur* | Shibpur, India — *2019-21*

Teaching Assistantship: Cloud Computing (NPTEL 2025) - Prof. By Prof. Soumya Kanti Ghosh (**Video Link**) | Machine Learning in Bengali (NPTEL-2024)- Prof. Adway Mitra (**Video Link**) | Machine Learning(NPTEL-2024)- Prof. Carl Gustaf Jansson (**Video Link**) | Statistical Inference(NPTEL-2023)-Prof. Niladri Chatterjee (**Video Link**)|
Achievements: IEEE SPS fellowship (2024) | PMRF fellowship (2021) | GATE fellowship (2019)
Courses: Machine Learning | Computational Perception and neuroscience | Embedded systems and application | Robotics |

Journal Publications

- M. Chakraborty, Chandan, S. Anchal, B. Mukhopadhyay and S. Kar. Deep Multi-Class Novelty Detection in Structural Vibrations using Energy-Shifted Contrastive Loss [Accepted in IEEE Transactions on Mobile Computing- August 2025]
- M. Chakraborty, Chandan, S. Anchal, B. Mukhopadhyay and S. Kar. A Structural Vibration-based Dataset for Human Gait Recognition. doi: 0.1038/s41597-025-05517-4 [Accepted in Nature Scientific Data, July 2025]
- M. Chakraborty and S. Kar, "Enhancing Person Identification Through Data Augmentation of Footstep-Based Seismic Signals", *IEEE Signal Processing Letters*, vol. 30, pp. 1642-1646, 2023. doi: 10.1109/LSP.2023.3327650.
- Chandan, M. Chakraborty, S. Anchal, B. Mukhopadhyay and S. Kar, "GajGamini: Mitigating Man–Animal Conflict by Detecting Moving Elephants Using Ground Vibration-Based Seismic Sensor", *IEEE Sensors Letters*, vol. 8, no. 9, pp. 1-4, Sept. 2024, Art no. 6011504. doi: 10.1109/LSENS.2024.3442830.

Conference Publications

- M. Chakraborty, B. Mukhopadhyay and S. Kar. Deepstep: Unified Structural Vibration and Vision based Multi-Modal 4D Gait Recognition [submitted to AAAI, July, 2025]
- M. Chakraborty, Chandan, Mukhopadhyay, B., Kar, S. (2025). Non-intrusive Cognitive Load Estimation using Footstep-induced Structural-Vibration Signals. [Accepted in 15th International Workshop on Structural Health Monitoring (IWSHM), Stanford, USA, 2025].
- M. Chakraborty, Mukhopadhyay, B., Kar, S. (2025). "Poster Abstract: A Structural Vibration-based Gait Abnormality Detection System". [Accepted in ACM-SENSYS, 2025].
- M. Chakraborty, Mukhopadhyay, B., Anchal, S., and Kar, S. (2025, April). VibeGait: Enhancing Structural-Vibration based Gait Recognition using Vision. *ICASSP 2025 - IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 1-5. IEEE.
- M. Chakraborty, M. Das, and S. Aruchamy, "Micro-Seismic Event Detection using statistical feature extraction and machine learning techniques", *2022 IEEE 7th International conference for Convergence in Technology (I2CT)*, Mumbai, India, 2022, pp. 1-5. doi: 10.1109/I2CT54291.2022.9824819.
- M. Chakraborty, S. A, S. Reddy, S. Kumar Mandal, and S. Bhaumik, "Human Action Classification using seismic sensor and machine learning techniques", *2021 5th International Conference on Information Systems and Computer Networks (ISCON)*, Mathura, India, 2021, pp. 1-6. doi: 10.1109/ISCON52037.2021.9702317.

Patents

2025 **System and method for individual classification and novelty detection using structural vibration data-S Kar, M Chakraborty, Chandan, B Mukhopadhyay**, Patent Filed: 202511042769 — *India*

2024 **System and method for elephant detection by a one-dimensional architecture CNN-S Kar, M Chakraborty, Chandan, B Mukhopadhyay, S Anchal**, Patent Filed: 202411060463 — *India*

2023 **Person identification through data augmentation of footstep-based seismic signals-S Kar, M. Chakraborty**, Patent Filed:202311045408 — *India*

2022 **An early micro-seismic event detection. Patent Application Number- M. Chakraborty**, Patent Filed: 202231028771 — *India*

Projects

Wild Elephant monitoring device *March 2024-August 2024*

Personal Project

- We proposed Gaj-Gamini, a seismic sensor-based solution for detecting elephants through ground vibrations aimed at mitigating human-animal conflicts
- **Links: IEEE Xplore**

Illustrated Notes on Selected Lectures of MIT 6.034 Artificial Intelligence, Fall 2010 by Late Prof. Patrick Winston *Jan 2024-April 2024*

Personal Project

- A workshop based on the notes on the AI lectures by Prof. Winston.
- **Links: Lecture Notes**,**Youtube Video**

Cognitive Load Estimation *Dec 2022 - April 2023*

Personal Project

- A detailed review of Cognitive load estimation has been studied across domains for the last three decades.
- Three types of modalities has been investigated: **smart wearables, eye-tracking and EEG**
- An open-source EEG dataset is considered for experimenting. p-value metrics is used for feature selection. 10-fold cross validation is implemented over the dataset 97.47%.
- **Links: Github**,**Medium**,**Research Gate**

Safety Monitoring of Warehouse Staff *Jan 2021- May 2021*

Wobot.ai

- Integrated **YOLOv5** with custom object detection (mask or no-mask) in real-time video feed of a warehouse.
- Collected custom data, built and deployed model over triton server.
- **Links: Github**

Multi-Modal Human Activity Recognition Using vision and vibration sensor *May 2020 - Dec 2020*

IEEE International Conference on Information Systems and Computer Networks[ISCON] (Paper Published)

- In this work, we propose a novel method that can be used for passive human activity classification using camera and geophones, signal processing and ensemble learning techniques.
- **Links: IEEE Xplore**

Experience

Hindu College(Delhi University), *Course Instructor* | New Delhi *Jan 2023 - Jan 2024*

- Course Instructor for Sensor-based Machine Learning Project.
- Guided a student team in developing and deploying a deep learning model on edge devices.

Jawaharlal Nehru University(JNU), *Guest Lecturer* | New Delhi *March 2023 - Aug 2023*

- Taught and evaluated Introduction to Electrical and Electronics Engineering (EN-112), for 120 students.
- facilitating project-based assignments to enhance practical skills and critical thinking **Project Link**.

Etaaide, *Product Architect –Deep learning Engineer* | New Delhi, India *Dec 2021 - Aug 2022*

- Led a 4 member team of IIT Delhi to built vibration sensor-based early warning system for predictive maintenance.
- Winner of TIDE 2.0 grant(12K USD), Incubated at IIT Mandi and IIM Bangaore.

RemoCare, *Research internship* | India *May 2021 – October 2021*

- Led a team of two interns to develop a remote arrhythmia classification(ECG data) module using Bi-LSTM deployed on mobile.
- Detection of 8types of arrhythmia.

CSIR-Central Mechanical Engineering Research Institute, *Research Assistant(AI)* | India *May 2020-May 2021*

- Investigated the possibility of human activity recognition using seismic data classification.
- Developed robust ensemble learning algorithms for various human activity detection using CNN,LSTM.

Skills

Programming	Python, C/C++, C#, embedded C,CUDA, Matlab, Git, Scripting (Bash), LaTeX, HTML
Software	Linux, Tensorflow, Pytorch, Docker, OpenCV, OpenSim,AnyBody Technology,SCONE, Unity Engine
Certifications	Tensorfow Developer Certificate [ID:87883013](2023) | Associate Member of the Institution of Engineers(AMIE) [ID: AM3115693]–(2023)| Deeplearning.ai Tensorflow Developer(2021)|

Volunteering

2020	**IIEST Covid-19 Volunteering team**,	*Kolkata*
2021	**Proxmaq**, Computer Vision Engineer	*Remote*
2023	**Delhi University, Hindu College**, Deep Learning Workshop(AtoZ) for Delhi University Students	*New Delhi*
2024	**Youth Ideathon 2024**, Mentor at India's largest high school-level competition of ideas	*Remote*

Achievements and Events

2015	**ASDC Scholarship**, within top 1% among batch	*India*
2019	**GATE fellowship**, within top 6% among 167376 candidates	*India*
2022	**PMRF Scholarship**, within top 0.5% of candidates among 2,12,568 candidates	*India*
2023	**TensorFlow Developer Certificate**, Credential ID:87883013	*Remote*
2024	**ETH Zurich+Universitätsklinik Balgrist**, Machine Learning Summer School	*Zurich*
2024	**University of Genoa, Italy**, Workshop on Applied Harmonics and Machine Learning	*Genoa*
2024	**IEEE SPS Scholarship**, 2024 IEEE Signal Processing Society Scholarship recipient	*USA*