Mainak Chakraborty
Embedded Lab 320, Indian Institute Of Technology Delhi (IIT Delhi), India
Email: mainakchakraborty92@gmail.com , Link(s): Personal Website, Google Scholar

Professional Preparation

Indian Institute Of Technology, Delhi	Cyber Physical Systems	PhD, 2026	9.07/10.00
IIEST, Shibpur	Mechatronics Engineering	Mtech, 2021	9.00/10.00

Research Interests

Signal Processing	Cross-Modal Learning	Human Gait Recognition
Novelty and Anomaly Detection	Edge AI / TinyML	Cognitive Load Estimation
Human-Computer Interaction	Wearable and Embedded Systems	Behavioral Sensing

Skills

1. **Programming & Development:** Python, C/C++, C#, MATLAB, Git, Docker, AWS, CUDA, Linux, HPC
2. **Hardware & Embedded Systems:** NVIDIA Jetson (Orin, Nano), Raspberry Pi, ESP-32, Sony Spresence
3. **Model Optimization & Deployment:** Model pruning, quantization, edge AI, and TinyML applications
4. **Simulation & Modeling Tools:** OpenSim, AnyBody, SCONE, Unity Engine, OpenCV
5. **Certifications:** TensorFlow Developer Certificate (2023) | (AMIE, 2023)

Research Experience

02/2022–Present **Graduate Research Assistant**, Electrical Engineering, Indian Institute of Technology Delhi (India): Explored Cross-modal gait identification and behavioral sensing using structural vibration and vision-based deep learning frameworks towards a Doctoral degree.

12/2021–08/2022 **Product Architect** – Deep Learning Engineer, Etaaide (New Delhi, India) Led design of a vibration-sensor–based predictive maintenance system.secured TIDE 2.0 innovation grant and national incubation support.

05/2021–10/2021 **Research Intern**, RemoCare (Remote, India): Implemented Bi-LSTM networks for real-time arrhythmia classification on mobile ECG datasets.

06/2021–10/2021 **Research Intern**, Proxmaq (India) : Built a pruned TensorFlow Lite model for on-device object detection in assistive smart glasses for visually impaired users.

05/2020–05/2021 **Research Assistant**, CSIR–Central Mechanical Engineering Research Institute (Durgapur, India): Developed CNN and LSTM models for human activity recognition using seismic signal data towards a master's degree.

Teaching Experience

01/2023–Present **Graduate Teaching Assistant**, National Programme on Technology Enhanced Learning (NPTEL, India)
Assisted in course delivery, video lectures, and student evaluation for:
– Cloud Computing (2025)(500+ students) - Link, Machine Learning in Bengali (2024)(300+ students) - Link, Machine Learning (2024) (500+ students) - Link, Statistical Inference (2023)(50+ students) - Link

01/2023 – 01/2024 **Course Instructor**, Hindu College (University of Delhi, India)
Guided undergraduate student teams through the complete project lifecycle — development, training, and deployment of machine learning models on edge devices. (100+ students)

03/2023 – 08/2023 **Guest Lecturer,** School of Engineering, Jawaharlal Nehru University (Delhi, India)
Taught and evaluated EN-112: Introduction to Electrical and Electronics Engineering (120+ students); developed lab exercises and supervised semester projects. Link

Journal Articles

[1] **M. Chakraborty**, Chandan, B. Mukhopadhyay, and S. Kar, "Deep Multi-Class Novelty Detection in Structural Vibrations with Modified Contrastive Loss," *IEEE Transactions on Mobile Computing*, 2025. Link

[2] **M. Chakraborty**, Chandan, S. Anchal, et al., "A Structural Vibration-based Dataset for Human Gait Recognition," *Scientific Data*, 12, Art. no. 1617, (2025). Link

[3] **M. Chakraborty** and S. Kar, "Enhancing Person Identification Through Data Augmentation of Footstep-Based Seismic Signals," *IEEE Signal Processing Letters*, 30, pp. 1642-1646, (2023). Link

[4] 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*, 8(9), Art. no. 6011504, (2024). Link

[5] **M. Chakraborty**, Chandan, S. Anchal, B. Mukhopadhyay, and S. Kar, "Deepstep: A Deep Learning-based Indoor Person Identification Framework using Footstep-Induced Structural Vibration Signals," *IEEE Transactions on Instrumentation and Measurement.* **(Accepted November 2025)**

Peer-reviewed Conference

1] **M. Chakraborty**, B. Mukhopadhyay, and S. Kar, "Poster Abstract: A Structural Vibration-based Gait Abnormality Detection System," *Proceedings of the 23rd ACM Conference on Embedded Networked Sensor Systems (SenSys '25)*, New York, NY, USA, pp. 672–673, (2025). Link

[2] **M. Chakraborty**, B. Mukhopadhyay, S. Anchal, and S. Kar, "VibeGait: Enhancing Structural-Vibration-based Gait Recognition using Vision," *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pp. 1–5, (2025). Link

[3] **M. Chakraborty,** Chandan, M., B. Mukhopadhyay, and S. Kar, "Non-Intrusive Cognitive Load Estimation Using Footstep-Induced Structural Vibration Signals," *Structural Health Monitoring*, (2025). Link

[4] **M. Chakraborty**, M. Das, and S. Aruchamy, "Micro-Seismic Event Detection using Statistical Feature Extraction and Machine Learning Techniques," *Proceedings of the 7th IEEE International Conference for*

Convergence in Technology (I2CT), Mumbai, India, pp. 1–5, (2022). Link

[5] **M. Chakraborty,** S. A., S. Reddy, S. Kumar Mandal, and S. Bhaumik, "Human Action Classification using Seismic Sensor and Machine Learning Techniques," *Proceedings of the 5th International Conference on Information Systems and Computer Networks (ISCON)*, Mathura, India, pp. 1–6, (2021). Link

Patents

[1] S. Kar, **M. Chakraborty,** Chandan, and B. Mukhopadhyay, "System and Method for Individual Classification and Novelty Detection Using Structural Vibration Data," *Patent Filed:* 202511042769, (2025).

[2] S. Kar, **M. Chakraborty,** Chandan, B. Mukhopadhyay, and S. Anchal, "System and Method for Elephant Detection by a One-Dimensional Architecture CNN," *Patent Filed:* 202411060463, (2024).

[3] S. Kar and **M. Chakraborty**, "Person Identification Through Data Augmentation of Footstep-Based Seismic Signals," *Patent Published:* 202311045408, (2023).

Recognitions

1. **IEEE Signal Processing Society Scholarship** — *IEEE SPS, USA* (2025, 2024)
   Recognized twice consecutively for academic excellence and research contributions in signal processing.
2. **Prime Minister's Research Fellowship (PMRF)** — *Government of India* (2022–2025)
   Awarded to the top 0.5% of 212,568 candidates nationwide for doctoral research excellence.
3. **IIT Delhi Research Grant** — *Indian Institute of Technology Delhi, India* (2025)
   Supported international paper presentation at the *International Workshop on Structural Health Monitoring (IWSHM), USA*.
4. **ICASSP Student Travel Grant** — *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), USA* (2025)
   Awarded competitive travel funding to present research at IEEE's flagship signal processing conference.
5. **University of Genoa Travel Grant** — *University of Genoa, Italy* (2024)
   Funded participation in the *Workshop on Applied Harmonics and Machine Learning.*
6. **Machine Learning Summer School Participant** — *ETH Zurich & Universitätsklinik Balgrist, Switzerland* (2024)
   Selected participant among global applicants for advanced training in medical machine learning.
7. **GATE Fellowship** — *Government of India* (2019–2021)
   Secured national fellowship by ranking in the top 6% among 167,376 candidates in the Graduate Aptitude Test in Engineering.
8. **ASDC Undergraduate Scholarship** — *Automotive Skill Development Council, India* (2015)
   Awarded to the top 1% of undergraduate students for outstanding academic performance.

Professional Service & Leadership

- **Reviewer**, *IEEE Transactions on Instrumentation and Measurement (TIM)*, 2025
- **Organizing Committee Member**, *ICASSP*, 2025
- **Head**, *IEEE Delhi Signal Processing Society (SPS) Student Chapter*, 2025
- **Student Representative**, *Departmental Postgraduate Committee (DTPC)*,Senate Rep- IIEST Shibpur, 2020
- **Graduate Member**, *IEEE* and *Association for Computing Machinery (ACM)*
- **Volunteer**, *Progress Workshop*, ICASSP 2025
- **Hobbies,** *Running, swimming, writing, staring at the wall and reflecting, embracing boredom*

References : Prof. Subrat Kar (IIT Delhi), Dr. Bodhibrata Mukhopadhyay (IIT Roorkee) *[More on Request]*