Dr. Mrinmoy Bhattacharjee

LEAP Lab, Room C-308, Electrical Engineering, Indian Institute of Science Bangalore, Karnataka 560012
Mobile : +91-7896239301 — Email : mrin.mb@gmail.com

Summary

I am a passionate researcher with extensive experience in studying audio signals. I am very comfortable with advanced machine/deep learning algorithms. I am proficient in C, Python, and other scripting languages. My works have been published in top-tier journals and conferences. I enjoy working independently or with a team and have excellent communication skills.

Education

Degree/Certificate	Institute/Board	CPI/%	Year
Ph.D., *Signal Processing & Machine Learning*	IIT Guwahati, Assam	8.00 CPI	2023
M.Tech., *Computer Technology*	NIT Raipur, Chattissgarh	8.44 CPI	2014
B.Tech., *Information Technology*	Assam University Silchar	79.55%	2011
Higher Secondary, 10 + 2	Assam Board	77.40%	2007
Secondary, 10	CBSE	93.40%	2005

Research Experience

- **Speaker and language diarization for conversational speech** **May'24 - present**
  - **PI**: *Dr. Sriram Ganapathy (Electrical Engineering, IISc)*
  - **Role**: Postdoctoral Researcher
  - **Responsibilities**:

- **Developing Automatic Speech Recognition Systems for air-traffic communications** **May'23 - May'24**
  - **PI**: *Dr. Petr Motlicek (Idiap Research Institute, Switzerland)*
  - **Funding Agencies**: The European Organisation for the Safety of Air Navigation (EUROCONTROL), Brétigny, France; Institute of Flight Guidance, German Aerospace Center (DLR), Braunschweig, Germany; Armasuisse, Federal Office for Defence Procurement, Switzerland
  - **Role**: Postdoctoral Researcher
  - **Responsibilities**: Developing methods to tackle out-of-vocabulary and rare words in ASR systems for air-traffic communications, exploring semi-supervised learning techniques to develop ASR systems with un-labeled data.
  - Proposed two approaches based on Finite State Transducers to bias a trained ASR system so that the detection rate of a list of special entities is improved

- **Development of scalable speaker recognition systems for Indian languages** **Apr'22 - Apr'23**
  - **PI**: *Prof. S. R. M. Prasanna (IIT Dharwad, Karnataka, India)*
  - **Funding Agency**: Ministry of Electronics and Information Technology (MeitY), Govt. of India
  - **Role**: Senior Project Engineer
  - **Responsibilities**: Developing open-source Python-based speaker recognition toolkit, baseline systems for various Indian scenarios, project website, system demo prototypes, and web-based hands-on experience portals.
  - Member of organizing team of the O-COCOSDA and VLSP 2022 Challenge on Multilingual Speaker Verification.

- **Analysis of Speech and Music Content for Movie Genre Classification** **Ph. D., Jan'16 - Jan'23**
  - **Supervisors**: *Prof. S. R. M. Prasanna (EE Dept., IIT Dharwad), Dr. Prithwijit Guha (EEE Dept., IIT Guwahati)*
  - Proposed magnitude spectrum-based features for speech and music classification
  - Explored phase information for speech and music classification
  - Proposed harmonic-percussive source separation features with classifiers based on multi-task learning framework for speech overlapped with music detection
  - Proposed a movie-trailer genre classification system using speech and music information as features

- **Online handwriting recognition for Assamese language** **Aug'14 - Dec'15**
  - **PI**: *Prof. S. R. M. Prasanna (IIT Guwahati, Assam, India)*
  - **Funding Agency** DST, Govt. of India
  - **Role**: Assistant Project Engineer
  - Responsibilities included recognizing online handwriting for the Assamese language, feature designing and system development.
  - Used GMM, SVM, and HMM for the recognition systems and programmed in Matlab/C.

- **Redundancy Reduction in Wireless Sensor Networks** **M. Tech., Jun'13 - May'14**
  - **Supervisor** : *Prof. Subrata Gupta (Dept. of Electrical Engineering, NIT Raipur, Chhattisgarh, India)*
  - Proposed an algorithm for determining overlap between adjacent sensor sensing area
  - Proposed method to shut down redundant nodes in a Wireless Sensor Network for energy saving

Research Interests

- **Speech Technology**: Speech Recognition, Speaker Verification, Language/Dialect Identification, Speech/Music Analysis, Speech Paralinguistics, Audio classification
- **Machine/Deep Learning**: Multi-Task Learning, Semi-Supervised Learning, Zero/Few Shot Learning, Transfer Learning

Teaching Interests

- Data Structures and Algorithms
- C Programming
- Digital Signal Processing
- Fundamentals of Speech Processing
- Machine Learning
- Deep Learning

Publications

- **Mrinmoy Bhattacharjee**, S. R. Mahadeva Prasanna, and Prithwijit Guha. 2024. Exploration of Speech and Music Information for Movie Genre Classification. ACM Transactions on Multimedia Computing Communications and Applications. Just Accepted (May 2024). https://doi.org/10.1145/3664197
- **Mrinmoy Bhattacharjee**, Iuliia Nigmatulina, Amrutha Prasad, Pradeep Rangappa, Srikanth Madikeri, Petr Motlicek, Hartmut Helmke, Matthias Kleinert, "Contextual Biasing Methods for Improving Rare Word Detection in Automatic Speech Recognition," in **Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)**, 2024, Seoul, South Korea. (accepted)
- **Mrinmoy Bhattacharjee**, Petr Motlicek, Iuliia Nigmatulina, Hartmut Helmke, Oliver Ohneiser, Matthias Kleinert, Heiko Ehr, "Customization of Automatic Speech Recognition Engines for Rare Word Detection Without Costly Model Re-Training", in **Proc. 13th SESAR Innovation Days**, 2023, Seville, Spain.
- **Mrinmoy Bhattacharjee**, Shikha Baghel and S. R. M. Prasanna, "Driver Speech Detection in Real Driving Scenario," in **Proc. 25th International Conference on Speech and Computer (SPECOM)**, Dharwad, India, 2023, pp. 1-11. Springer, Cham.
- Jagabandhu Mishra, **Mrinmoy Bhattacharjee** and S. R. M. Prasanna, "I-MSV 2022: Indic-Multilingual and Multi-Sensor Speaker Verification Challenge," in **Proc. 25th International Conference on Speech and Computer (SPECOM)**, Dharwad, India, 2023, pp. 1-9. Springer, Cham.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Clean vs. Overlapped Speech-Music Detection Using Harmonic-Percussive Features and Multi-Task Learning," in **IEEE/ACM Transactions on Audio, Speech, and Language Processing**, vol. 31, pp. 1-10, 2023.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Speech/music classification using phase-based and magnitude-based features", in **Elsevier Speech Communication**, vol. 142, pp. 34-48, 2022.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Speech/Music Classification Using Features From Spectral Peaks," in **IEEE/ACM Transactions on Audio, Speech, and Language Processing**, vol. 28, pp. 1549-1559, 2020.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Foreground-Background Audio Separation using Spectral Peaks based Time-Frequency Masks," in **Proc. International Conference on Signal Processing and Communications (SPCOM)**, 2022, pp. 1-5.
- Moakala Tzudir, **Mrinmoy Bhattacharjee**, Priankoo Sarmah, S. R. M. Prasanna, "Low-Resource Dialect Identification in Ao Using Noise Robust Mean Hilbert Envelope Coefficients," in **Proc. National Conference on Communications (NCC)**, 2022, pp. 1-5.2023
- Shikha Baghel, **Mrinmoy Bhattacharjee**, S. R. M. Prasanna, and Prithwijit Guha, "Automatic Detection of Shouted Speech Segments in Indian News Debates." in **Proc. Interspeech** 2021, pp. 4179-4183.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Detection of Speech Overlapped with Low-Energy Music using Pyknograms," in **Proc. National Conference on Communications (NCC)**, 2021, pp. 1-6.
- **Mrinmoy Bhattacharjee**, S. R. M. Prasanna and Prithwijit Guha, "Classification of Speech vs. Speech with Background Music," in **Proc. International Conference on Signal Processing and Communications (SPCOM)**, Bangalore, India, 2020, pp. 1-5.
- Shikha Baghel, **Mrinmoy Bhattacharjee**, S. R. M. Prasanna, and Prithwijit Guha, "Shouted and Normal Speech Classification Using 1D CNN," in **Proc. International Conference on Pattern Recognition and Machine Intelligence (PReMI)**, 2019, pp. 472-480.
- **Mrinmoy Bhattacharjee** and Subhrata Gupta, "Determining redundant nodes in a location unaware Wireless Sensor Network," in **Proc. IEEE International Conference on Advanced Communications Control and Computing Technology (ICACCCT)**, 2014, pp. 858-862.

Talks delivered

- Conducted practical sessions in a ***SERB sponsored High End Workshop on Fundamentals of Deep Learning*** jointly organized by Indian Institute of Technology Guwahati and Research for Resurgance Foundation Nagpur, held from 12th to 18th Sep 2022.
- Delivered a session in a workshop on ***Introduction to Machine Learning using Python*** organized by the Research Scholar Forum, Dept. of EEE, IIT Guwahati.
- Conducted hands-on courses in a one-week Faculty Development Programme on ***Artificial Intelligence and Machine Learning***, jointly organized by Electronics and ICT Academics, held from 17^{th} to 21^{st} Dec 2018 through National Knowledge Network of MeitY, Govt. of India.

Teaching Experience

- **Teaching Assistant, IIT Guwahati** **Jan 2016-Dec 2020**
  - *Courses*: Pattern Recognition and Machine Learning, Digital Signal Processing, Signals and Systems, Machine Learning Lab, Basic Electronics Lab,
- **Teaching Assistant, NIT Raipur** **Aug 2012-May 2014**
  - *Courses*: C programming laboratory

Other Experience

- **RnDOPS: ERP solution for the R&D Section of IIT Guwahati** **Jun'15 - May'17**
  - **PI**: *Dean R&D (IIT Guwahati, Assam, India)*
  - Worked as lead programmer for developing a complete automation solution (RnDOPS) for the Research and Development Section, IIT Guwahati.
  - RnDOPS was developed using JSP/Java in the backend and HTML/CSS/Javascript in the frontend
  - The RnDOPS system is still fully operational at IIT Guwahati.

Honors and Awards

- **Ph. D. fellowship** (Jan, 2016 - Dec, 2020): *Visvesvaraya Ph.D. Scheme, MeitY, GoI.*
- **M. Technology fellowship** (Jun 2012 - May 2014): *MHRD, GoI*
- **Certificate of appreciation** for securing 1^{st} position in Higher Secondary examination in the district: *Deputy Commissioner, Tinsukia District, Assam*
- **Certificate of proficiency** and a cash award for securing star marks in Higher Secondary examination: *Assam Higher Secondary Education Council*
- **Merit Scholarship** for excellent performance at matriculation examination: *Oil India Ltd., Duliajan, Assam*

Professional Activities

- Member of **IEEE** and **IEEE Signal Processing Society**.
- Reviewer for **IEEE Access** journal, **Elsevier Digital Signal Processing** journal, **INTERSPEECH**'24, **INTERSPEECH**'23, **SPECOM**'22, **NERC**'22, **EUSIPCO**'22, **NCC**'22, **IEEE INDICON**'21.
- Served as **lead developer** for building RNdOPs, and ERP solution for IIT Guwahati R&D section.
- As a part of industrial training during B.Technology, developed an ERP solution for the health section of Hindustan Paper Corporation Limited at Pachgram, Assam.
- As part of a summer project during B.Technology, developed an interactive quiz master program in C.
- Worked as a volunteer in organizing the 10^{th} ***Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP)***, during 18^{th} to 22^{nd} Dec 2016 at IIT Guwahati.
- Participated in the ***Winter School of Speech and Audio Processing (WiSSAP)*** organized by the Center for Linguistic Science and Technology, IIT Guwahati during 19^{th} to 22^{nd} Jan 2018.
- Participated in the 4^{th} ***Research Evaluation Workshop*** organized by Visvesvaraya PhD Scheme for Electronics & IT/ITES, MeitY, Govt. of India, held at MNIT Jaipur during 13^{th} to 15^{th} Sep 2018.
- Participated in a workshop on ***Application of Machine Learning for Healthcare*** organized by Northeast Center for Biological Sciences and Healthcare Engineering, IIT Guwahati during 8^{th} to 9^{th} Feb 2021.

Technical Skills

- **Scripting**: C/C++, Python, Java, SQL, HTML/CSS, JavaScript/Ajax, JSP/PHP, Latex, Bash
- **Machine Learning**: Keras/Tensorflow, PyTorch, libSVM, HTK, Kaldi, K2/Icefall, Matlab/Octave
- **Tools**:Spyder/Jupyter, MySQL, .NET, Netbeans/Eclipse, Network Simulator-2/TCL, MS-Office/LibreOffice, GIMP
- **Operating Systems**: Ubuntu, Windows

Additional information

- **Languages**: Native Bengali, Full Professional English, Bilingual Hindi & Assamese, Elementary French
- **Hobbies**: Current affairs, Sports, Cooking