Dr. Shovan Barma
ASSOCIATE PROFESSOR & HoD
PhD (NCKU, Taiwan)

Department of Electronics & Communication Engineering

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Joined the Institute in August 2016

About

Dr. Shovan Barma is currently working as an Associate Professor in the Department of Electronics and Communication Engineering at Indian Institute of Information Technology Guwahati (IIITG). Before, he was appointed as Assistant Professor in Dept. of ECE, IITG in August 2016. He did his PhD at National Cheng Kung University (NCKU), Taiwan in 2015 followed by Post Doctoral Fellow at University of Macau till July 2016. He received B.E. and M.E. degrees in ECE from Jadavpur University, Kolkata and Indian Institute of Science (IISc), Bangalore, Karnataka, India, in 2007 and 2009, respectively. Dr. Barma's research activities involve Biomedical Signal and Image Processing, Machine Learning and AI-Based Product Development. He is the Founder of Precise Medication Research Pvt. Ltd., a startup working in the area of Healthcare Technology. For more about research/publications Google Scholar / ORCID

Research Interests

- Biomedical Signal & Image Processing
- Machine Learning and Deep Learning
- Microscopic Image Processing
- Human Emotion Analysis
- AI-Based Product Development

Teaching

- Biomedical Signal Processing
- Digital Design
- Signal & System
- Digital Signal Processing
- Intellectual Property Rights for Information Technology

PhD Supervision

1. **Mr. Franklin Barbaghaba** (Ongoing)
   Research Area: Image Processing and Deep Learning
2. **Ms. Chandita Barman** (Ongoing)
   Research Area: Medical Image Processing and Deep Learning
3. **Mr. Ankur Bhattacharjee** (Ongoing)
   Research Area: Hardware Architecture for ECG Signal Processing
4. **Mr. Anand Shankar** (Thesis Submitted)
   Thesis Title: A Comprehensive Analysis of Epileptic Seizure Using Electroencephalogram and MRI in Deep Learning Framework
5. **Dr. Sumona Biswas** (Completed)
   Thesis Title: Deep Learning For Optical Microscopy: Focus on Virtual Staining in Plant & Cancer Tissue and Product Development
6. **Dr. Parthana Sarma** (Completed)
   Thesis Title: Electroencephalogram (EEG) Based Emotion Recognition by Distinguishing EEG-Segments Having High Affective Content From Relevant Channels at Scalp Level

Professional Association and Activities

- Associate Editor: IEEE Transactions on Instrumentation & Measurement
- Associate Editor: IEEE Access
- IEEE Member
- Indian Academy of Neuroscience (Life Member)
- Indian Network for Memory Studies (INMS) Member

Sponsored Research Project

1. **As PI:** Microscopic Image Based Vegetable/Fruit Quality Assessment, Faculty Entrepreneurship Programme under Technology Development Program. Funded by: ITI DRISHTI CPS Foundation, (1 Year) 2024-25. Amount Rs. 15 L (Ongoing)
2. **As PI:** Microscopic Image Based Vegetable/Fruit Quality Assessment, Lab to Market-Commercializing Technology Development Program. Funded by: ITI DRISHTI CPS Foundation, (1 Year) 2023-24. Amount Rs. 28L (Ongoing)
3. **As PI:** Theoretical Evaluation of Different Strategies (Choice of Kernel, Striding and Pooling) During Implementing Deep Convolution Neural Network (DCNN)Pipeline, by SERB (MATRIX), DST, Govt. of India. (3 Years) 2023-2025. Amount Rs. 6L (Ongoing)
4. **As PI from India:** Detection and Forecasting of Extreme Weather Events in Egypt and India Using Deep Learning Funded by: DST, India & ASRT, Egypt. (2 Years), 2021 - 2022. Amount Rs. 9L (Tenure Completed)
5. **As PI:** A Low Cost, Portable and High Quality Device (Prototype) For Food Quality Assessment Based On Microscopic Image and Deep Learning. Funded by: DST/MHRD (NMHRD-I), Govt. of India. (3 Years), 2019 - 2021. Amount Rs. 11L (Tenure Completed)
6. **As PI:** Classification of EEG Data Using Deep Learning (LSTM+CNN) Technique and Hilbert Vibration Decomposition (HVD) Method and Its Application in Epilepsy Funded by: NBCBH-PTG/DBT, Govt. of India. (2 Years), 2019 - 2021. Amount Rs. 17L (Completed)

Open Positions

- **For Postdoctoral Fellow or PhD Scholar:** Looking for enthusiastic and motivated individuals having an interest in any of the above research areas can contact (shovan@iiitg.ac.in). Although I am very keen to provide financial support to all scholars, due to the lack of availability of funds, always it is not possible. Hence, interested Post-doctoral and PhD scholars are highly encouraged to apply for independent funding from different Govt. / Non-Govt. agencies.
- **For Postgraduate students:** Interested postgraduate (M-Tech) students can join for their final year project from any of the above research areas.
- **For Undergraduates students:** Interested students (B-Tech) are welcome to gain some working experience in any of the above research areas as a semester project. Contact (shovan@iiitg.ac.in) mentioning your research interest.
- **For Internship:** Interested students may join as interns.

Publication

Journal

- Sumona Biswas and Shovan Barma, "Feature Fusion GAN Based Virtual Staining on Plant Microscopy Images", IEEE/ACM Transactions on Computational Biology and Bioinformatics, (2024), IEEE (Accepted)
- Mohamed Rashdy, Roy, Samchitha, Sayed A Mohamed, Marwa S. Moustafa, Barma, Shovan, "Cyclone Detection with End-to-End Super Resolution and Faster R-CNN", Earth Science Informatics , (2024), Springer (Accepted)
- Sumona Biswas, Shovan Barma, "MicroMobiNet: A Deep Lightweight Network With Hierarchical Feature Fusion Scheme for Microscopy Image Analysis in Mobile-Edge Computing", IEEE Internet of Things Journal,vol. 11 (9), (2024), pages. 8288-8298, IEEE
- Basab Bijay Purkayastha and Shovan Barma, "Discrimination of Cardiac Abnormalities Based on Multifractal Analysis in Reservoir Computing Framework", IEEE Open Journal of Instrumentation and Measurement,2, (2023), pages. 2500811, IEEE
- Jia Wen Li, Rong Jun Chen, Shovan Barma, Fei Chen, Sio Hang Pun, Peng Un Mak, Lei Jun Wang, Xian Xian Zeng, Jin Chang Ren, Hai Min Zhao, "An Approach to Emotion Recognition Using Brain Rhythm Sequencing and Asymmetric Features", Cognitive Computation, (2022), (Springer),DOI: 10.1007/s12559-022-10053-2
- Anand Shankar, Samarendra Dandapat, and Shovan Barma, "Discrimination of Types of Seizure Using Brain Connectivity Features Based on Multivariate Synchronization Modeling", IEEE Open Journal of Instrumentation and Measurement, (2022), DOI: 10.1109/OJIM.2022.3202103
- Anand Shankar, Samarendra Dandapat, and Shovan Barma, "Seizure Type Classification by Generating Input Images With In-Depth Features from Decomposed EEG Signals For Deep Learning Pipeline", IEEE Journal of Biomedical and Health Informatics, (2022), DOI: 10.1109/JBHI.2022.3159511
- Parthana Sarma, Shovan Barma, "Emotion Recognition by Discriminating EEG Segments With High Affective Content From Automatically Selected Relevant Channels", IEEE Transactions on Instrumentation & Measurement, (2022), DOI: 10.1109/TIM.2022.3147876
- Jia Wen Li, Shovan Barma, Peng Un Mak, Wang I Vai, and Sio Hang Pun, "Emotion Recognition Based on EEG Brain Rhythm Sequencing Technique", IEEE Transactions on Cognitive and Developmental Systems, (2022), DOI: 10.1109/TCDS.2022.3149953
- Jia Wen Li, Shovan Barma, Peng Un Mak, Fei Chen, Cheng Li, Ming Tao Li, Wang I Vai, and Sio Hang Pun, "Single-channel Selection for EEG-based Emotion Recognition Using Brain Rhythm Sequencing", IEEE Journal of Biomedical and Health Informatics, (2022), DOI: 10.1109/JBHI.2022.3148109
- Parthana Sarma, Shovan Barma, "Emotion Recognition by Distinguishing Appropriate EEG Segments Based on Random Matrix Theory", Biomedical Signal Processing and Control,vol. 70, (2021), pages. 102991, Elsevier
- Sumona Biswas, Shovan Barma, "A Large-Scale Fully Annotated Low-Cost Microscopy Dataset for Deep Learning Framework", IEEE Transactions on Nanobioscience,vol. 20, no. 6, (2021), pages. 507 -515,
- Parthana Sarma, Shovan Barma, "Usefulness of Blinking Duration Variability (BDV) in Discriminating Emotional States", Biomedical Signal Processing and Control,vol. 69, (2021), pages. 102883, Elsevier
- Anand Shankar, Hnin Kay Khaing, Samarendra Dandapat, and Shovan Barma, "Analysis of Epileptic Seizures Based on EEG Using Recurrence Plot Images and Deep Learning", Biomedical Signal Processing and Control,vol. 69, (2021), pages. 102854, Elsevier
- "A Large-scale Optical Microscopy Image Dataset of Potato Tuber for Deep Learning Based Plant Cell Assessment", Scientific Data (Nature),vol. 7, Article-number 371, (2020),
- Parthana Sarma, Shovan Barma, "Review on Stimuli Presentation for Affect Analysis Based on EEG", IEEE Access,vol. 8, (2020), pages. 51991 - 52009.
- Jia Wen Li Shovan Barma, Peng Un Mak, Sio Hang Pun, Mang I Vai, "Brain Rhythm Sequencing Using EEG Signals: A Case Study on Seizure Detection", IEEE Access,vol. 7, (2019), pages. 160117 - 160124,
- Xi Mei Chen, Shovan Barma, Sio Hang Pun, Mang I Vai, and Peng Un Mak, "Direct Measurement of Elbow-joint-Angle Using Galvanic Couple System", IEEE Transactions on Instrumentation and Measurement,vol. 68, no. 4, (2019), pages. 757-766,
- Shovan Barma, Bo-Wei Chen, Wen Ji, Seungmin Rho, Chih-Hung Chou, and Jiong-Fa Wang, "Detection of the Third Heart Sound Based on Nonlinear Signal Decomposition and Time-Frequency Localization", IEEE Transactions on Biomedical Engineering,vol. 63, no. 8, (2016), pages. 7172I-1727,
- Chih-Hung Chou, Ta-Wen Kuan, Shovan Barma, Bo-Wei Chen, Wen Ji, Chih-Hsiang Peng, and Jiong-Fa Wang, "A New Binary-Valued Clustering Method and VLSI Processor for ASOR System", IEEE Transactions on Very Large Scale Integration (VLSI) Systems,vol. 24, no. 5, (2016), pages. 1871-1886,
- Kashif Iqbala, Michael Odetayoa, Anne Jamesa, Rahat Iqbala, Neeraj Kumara, and Shovan Barma, "An efficient image retrieval scheme for colour enhancement of embedded and distributed surveillance images", Neurocomputing,vol. 174 Part A, (2016), pages. 413-430, Elsevier
- Feng Jiang, K. Bharat Bhaian, Shovan Barma, Haibiao Weng , and Debin Zhao, "Game Theory based Noreference Perceptual Quality Assessment for Stereoscopic Images", The Journal of Supercomputing (Springer),vol. 71, no. 9, (2016), pages. 3337-3352, Elsevier
- Feng Jiang, K. Bharat Bhaian, Shovan Barma, Haibiao Weng , and Debin Zhao, "Game Theory based Noreference Perceptual Quality Assessment for Stereoscopic Images", The Journal of Supercomputing (Springer),vol. 71, no. 9, (2016), pages. 3337-3352, Elsevier
- Shovan Barma, Bo-Wei Chen, Wen Ji, Feng Jiang, and Jiong-Fa Wang, "Measurement of Duration, Energy of Indentaneous Frequencies, and Spitts of Subcomponents of the Second Heart Sound", IEEE Transactions on Instrumentation and Measurement,vol. 64, no. 7, (2015), pages. 1958-1967,
- Chih-Hsiang Peng, Yu-Chuan Lin, Shovan Barma, Jiong-Fa Wang, Hung-Yuan Peng, Samarendra Bharathiraja, and Chih-Hung Chou, "A power embedded system on-chip design for sequential motion optimization learning core with tri-layer two and butterfly-path accelerator", IET Computers & Digital Techniques,vol. 9, no. 2, (2015), pages. 90-100,
- Shovan Barma, Bo-Wei Chen, Ka Lok Man, and Jiong-Fa Wang, "Quantitative Measurement of Split of the Second Heart Sound (S2)", IEEE/ACM Transactions on Computational Biology and Bioinformatics,vol. 12, no. 6, (2015), pages. 851-860, IEEE
- Shovan Barma, Bo-Wei Chen, Ka Lok Man, and Jiong-Fa Wang, "Quantitative Measurement of Split of the Second Heart Sound (S2)", IEEE/ACM Transactions on Computational Biology and Bioinformatics,vol. 12, no. 6, (2015), pages. 851-860, IEEE
- C. Ray/Chaudhuri, and S. Barma, "A High Performance 10Hz Voltage Controlled Oscillator Using Neural System Architecture", Analog Integrated Circuits and Signal Processing,vol. 6, no. 3, (2011), pages. 459-465,
- N. P. Fulzele, P. Bhattacharyya, S. Barma , C. Roy Chaudhuri and H. Saha, "Nanocrystalline ZnO Based MEMS Gas Sensors with CMOS ASIC for Mining Applications", International Journal on Smart Sensing and Intelligent Systems,vol. 1, no. 2, (2008), pages. 430-442,

Patent

- Shovan Barma and Sumona Biswas , "System and Device for Quality Assessment of Vegetables", Patent No: 513965, (2024), Indian Patent (Granted)

Conference

- A Shankar, D Chakrabarty, S Dandapat, S Barma, "Long Short-Term Memory Framework for Classification of Seizure Types Using A Different Format of EEG Signal", 2023 IEEE Signal Processing in Medicine and Biology Symposium (SPMB), (2023), IEEE
- Anand Shankar, Debaleena Chakrabarty, Manob Jyoti Saikia, Samarendra Dandapat, Shovan Barma, "Seizure Type Detection Using EEG Signals Based on Phase Synchronization and Deep Learning", 2023 IEEE 19th International Conference on Body Sensor Networks (BSN), (2023), IEEE
- Manish Santhosh, Shovan Barma, Debaprasad Das, "An Overview of Artificial Neuromorphic Circuits", 2022 IEEE International Conference of Electron Devices Society Kolkata Chapter (EDKCON), (2022), pages. 455-458, IEEE
- Aditya Gadhade, Samchitha Roy, Marwa S Moustafa, Sayed A Mohamed, Reda El-Geody, Shovan Barma, "Extreme Weather Event (Cyclone) Detection in India Using Advanced Deep Learning Techniques", in 9th IEEE International Conference on Orange Technology (ICOT) in Taiwan, Taiwan, (2021),
- Anand Shankar, Samarendra Dandapat, Shovan Barma, "Classification of Seizure Types Based on Statistical Variants and Machine Learning", IEEE INDICON21,December 19-21, (2021),
- Anand Shankar, Samarendra Dandapat, Shovan Barma, "Seizure Type Classification Using EEG Based on Hilbert Vibration Decomposition and Deep Learning", 2021 IEEE Conference on Engineering in Medicine and Biology Conference (EMBC 2021), Virtual, Nov. 1-5, (2021),
- Anand Shankar, Samarendra Dandapat, Shovan Barma, "Classification of Epileptic Seizure From EEG Signal Based on Hilbert Vibration Decomposition and Deep Learning", 43rd IEEE Conference on Engineering in Medicine and Biology Conference (EMBC 2021), Virtual, Nov. 1-5, (2021),
- Jia Wen Li, Shovan Barma, Sio Hang Pun, Fei Chen, Cheng Li, Ming Tao Li, Pei Ke Wang, Mang I Vai, and Peng Un Mak, "EEG-based Emotion Recognition Using Similarity Measure of Brain Rhythm Sequencing", 3rd IEEE Conference on Engineering in Medicine and Biology Conference (EMBC 2021), Virtual, Nov. 1-5, (2021),
- Jia Wen Li, Shovan Barma, Sio Hang Pun, Mang I Vai, Peng Wei, Wei Sun Liu and Peng Un Mak, "Brain Rhythm Sequencing and Its Application for EEG-based Emotion Recognition", 2021 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA) , Virtual, June 16-21, (2021),
- Anand Shankar, Hnin Kay Khaing, Samarendra Dandapat, Shovan Barma, "Epileptic Seizure Detection Based on Gramian Angular Field Transformation and Deep Learning", 2nd IEEE Conference on Applied Signal Processing 2020 (APSCON 2020), Kolkata India, Oct. 7-9, (2020),
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- Jia Wen Li, Shovan Barma, Sio Hang Pun, Mang I Vai, Pei Ke Wang, Xin Liu, Yuan Yu Ye, Jia Jiang Wang, Shuang Zhang, Peng Un Mak, "Initial Study of Emotion Recognition Using Brain Rhythm Sequencing Method", 11th Asian Pacific Conference on Medical and Biological Engineering, Okayama, Japan, May 25-27, (2020),
- Sumona Biswas, Shovan Barma, "Usability of Foldscope in Food Quality Assessment Device", International Conference on Pattern Recognition and Machine Intelligence (PReMI 2019), Tezpur, India, Dec. 17-20, (2019), pages. 490-498,
- Sumona Biswas, Shovan Barma, "Foldscope Image Enhancement in HSV Space by PSO Optimization Technique", IEEE 12th Biomedical Engineering International Conference (BMEICON 2019), Ubon Ratchathani, Thailand, Thailand Nov. 24-22, (2019),
- Parthana Sarma, Shovan Barma, "Emotion Analysis Based on LASSO", IEEE Region 10 Symposium (TENSYM), Kolkata, India, 7-9 June, (2019),
- Yi Zhao, Wang I Vai, Shovan Barma, Sio Hang Pun, Jia Wen Li and Peng Un Mak, "A Computation Resource Friendly Convolutional Neural Network Engine For EEG-based Emotion Recognition", IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA 2019) , Tianjin, China, Jun 14-16, (2019),
- Jia Wen Li, Xu Tong Cai, Shovan Barma, Sio Hang Pun, Pedro Antonio Mau, Hei Juan Huang, U Kin Che, Mang I Vai, Peng Un Mak, "Scalp Level Connectivity for Representative Channels in Emotional Status", World Congress on Medical Physics and Biomedical Engineering 2018 in Prague, Czech Republic, Jun 3-8, (2018),
- Suraj , Ish Kaur , Dharmendra Kumar , Shovan Barma, "Virtual Machine Intelligence for Home Automation", IEEE International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU) , in Bhimtal, India, 23-24 Feb, (2018),
- Suraj, Parthana Sarma, Amit Kumar Yadav, Amit Kumar Yadav, Shovan Barma, "Keystroke Rhythm Analysis Based on Dynamics of Fingertips", International Conference on Machine Intelligence and Signal Processing (MISP) in IIT Indore, India, 22-24 Dec, (2017),
- Jia Wen Li, Peng Un Mak, Shovan Barma, Sio Hang Pun, Xu Tang Cai, U. Kin Che, Mang I. Vai, "Studies of scalp level connectivity and representative channels in epilepsy", IEEE Biomedical Engineering International Conference (BMEICON), in Hokkaido, Japan, 31 Aug.-2 Sept, (2017),
- Meftiftian Nishat, Madhurjya Bora, Gitartha Kashyap, Dubong Cai, Sio-Hang Pun, and Shovan Barma, "Analysis of Neural Electrical Activities During Elicitation of Human Emotion Based on EEG", IEEE International Conference on Signal Processing and Communication (ICSC), in Noida, India, 26-28 Dec, (2016),
- Shovan Barma , Bo-Wei Chen, Hung-Ming Wang, Hung-Jui Wang, and Jiong-Fa Wang, "Second Heart Sound (S2) Decomposition by Hilbert Vibration Decomposition (HVD) for Affective Signal Modeling and Learning", in International Conference on Webbased Learning (ICWL), in Kenting, Taiwan, 20-23 Sep, (2014),
- Shovan Barma, Ta-Wen Kuan, Chih-Hung Chou, and Jiong-Fa Wang, "A Novel Feature Generation Method Based on Nonlinear Signal Decomposition for Automatic Heart Sound Monitoring", in IEEE International Conference on Orange Technology (ICOT), in Xi'an, China, 20-23 Sep, (2014),
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- Shovan Barma, Ta-Wen Kuan, Jaw-So-yang Wu, Shih-Pang Tseng, Jiong-Fa Wang, "A review on heart sound modeling: Fluid dynamics and signal processing perspective", in IEEE International Conference on Orange Technology (ICOT) , in Taiwan, Taiwan, 12-16 Mar, (2013),

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