Curriculum Vitae

Personal Information
Name: Mainak Biswas
University: Indian Institute of Science, Bangalore
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Date of Birth: 12th January, 1999.
Course: PhD
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Academic Details

Course	Duration	Institute	Grade
PhD (Engg.) in BAI	2021 -	Indian Institute of Science, Bangalore	9.90
B.E. in IT	2017 - 21	Jadavpur University, Kolkata	9.51
ISC (XII)	2015 - 17	Don Bosco School, Liluah	97.25%
ICSE (X)	2004 - 15	Don Bosco School, Liluah	96.00%

Publication details

 1. Biswas M., Umapathi B.M., Sunder S., Sridharan D., *Does Posner cueing engage attention or expectation? Answers from an embedding-filtered deep convolutional network, Conference on Cognitive Computational Neuroscience, 2023* (accepted)
 2. Biswas M., Sahu M., Agrebi M., Singh P.K and Badr Y, *Speech Emotion Recognition using Deep CNNs trained on Log-Frequency Spectrograms*, Data Analytics and Computational Intelligence: Novel Models, Algorithms and Applications, 2023 (accepted)
 3. Biswas, M., Rahaman, Mondal, M., Chaudhuri, S.G. *Multiple Uniform Circle Formation by Fat Robots Under Limited Visibility, ICDCN (2023) conference* [link]
 4. Biswas, M., Rahaman, S., Ahmadian, A. et al. *Automatic spoken language identification using MFCC based time series features. Multimed Tools Appl (2022)* [link]
 5. Biswas, M., Rahaman, S., Jha, A.K., Singh, K.K., Chaudhuri, S.G. *(2022). Uniform Distribution of Fat Robots on a Circle Under Limited Visibility. In: Mandal, J.K., Buyya, R., De, D. (eds) Proceedings of International Conference on Advanced Computing Applications. Advances in Intelligent Systems and Computing, vol 1406. Springer, Singapore.* [link]
6. Biswas, M., Rahaman, S., Kundu, S., Singh, P.K., Sarkar, R. *(2021). Spoken Language Identification of Indian Languages Using MFCC Features. In: Kumar, P., Singh, A.K. (eds) Machine Learning for Intelligent Multimedia Analytics. Studies in Big Data, vol 82. Springer, Singapore* [link]

Research Projects
1. Generating Brain Connectivity Matrices using diffusion models (active): Trying to generate brain connectivity matrices using diffusion model conditioned on age/ dmri raw data using diffusion models.
2. Decoding Behaviour scores from Brain Connectivity Matrices: Determine whether brain connectivity matrices correlate/predict behavioural (and MRS) scores of psychophysical experiments.
3. Decoding Attention from EEG-data using deep learning (main project 2022): (i) This study aims to find neural signatures for attention (from EEG data from 2-AFC task) using deep embedding aided CNNs. It shows that embeddings help the model to capture variability in neural data amongst subjects. *(ii)* Addresses whether Posner task is an attention/expectation cue using Transfer Learning. *(iii)* Saliency maps to understand signatures of attention and expectation. *(iv)* Find regions in the brain (EEG electrodes) that are essential for att./exp.
4. Spoken Language Identification: (i) Classification of Indian languages using MFCC features and SVM classifier. (published) (ii) Further analysis was done using multidimensional time series features (from MFCC). The relevant features were selected, and the model outperformed any state-of-the-art model. It obtained accuracies of over 99% in IITM and IIIT-H audio datasets and 98.5% on the Vox-Forge dataset. (published) (iii) Detection of emotion from speech data using Spectrograms.
5. Text Normalization and Composite Word Separation using WFST: Developed a text normalization model (for several domains) using weighted finite state transducers.

Academic Achievements
- Received PMRF fellowship: 2021
- GATE 2021: AIR: 111, Score: 846/1000
- B.E. IT, Jadavpur University: Department rank: 2.
- Region topper in ISC 2017 (class 12).
- JEE Mains 2017: AIR-7698 (205/360); WBJEE 2017: Rank-643.
- Cleared NTSE round 1 (2014-15, District Rank: 1, State: WB).
- Top 10% in NSEJS 2013; State rank in top 20 in NSTSE (thrice).

Industry Experience
1. Student Trainee at *Samsung Research Institute, Bangalore (SRIB):* Summer internship from 18th May, 2020 to 13th July, 2020. Project: Text Normalization using WFSTs.

Technical Skills (Relevant)
1. *Mathematics:* matrix theory, random process, multivariable calculus; numerical methods, group theory; convex optimization, proximal, projected GD, mirror descent, SVRG; information theory
2. *AI related*: (i) ML-DL: ANNs, graph NNs, transformers (ii) *Generative Models*: VAEs, GANs, ARs, flow-based, Diffusion and Energy-Based models. (iii) Domain Adaptation, self, semi-supervised, few-shot learning: DANN, ADDA, CPC, DeepInfoMax, MoCo, MAML (iv) *NLP:* Text Normalization, SLID, language models, NLI, etc. (v) *RL:* Bandits to Q-learning, actor critic algos, safe-RL via curriculum learning. (vi) *Technologies:* TensorFlow, pytorch, open AI-GYM.
3. *Neuroscience & Detection theory:* SDT, drift diffusion model, etc., basic neural mechanisms for vision and attention.
4. DSP, DIP: signal, systems; transforms, convolutions etc., image segmentation, filtering, edge detection.
5. *CS Fundamentals:* DSA, OOPs, RDBMS, shell scripts, basics of OS, distributed algorithms, Automata, Grammars, WFSTs, etc.
6. *Programming Languages:* Python, C, C++, Java, JavaScript, Web-Dev technologies, Assembly, SQL, MATLAB, R.

Academic Projects

1. *Generative Models, Domain Adaptation, and Few Shot learning:* Implemented Diffusion models, VQ-VAEs, DC-GANs, on celebA and bitemoji datasets; DANN, MAML.

2. *Safe RL using curriculum Learning:* Implemented safe RL using curriculum learning on a dangerous grid world setting.

3. *NLI:* Worked on the SNLI dataset using sequential models.

4. *Mirror Descent and SVRG:* Implemented mirror descent, SVRG.

5. *Algorithms for fat swarm robots to form geometric shapes:* (i) Developed an algorithm to move independent, decentralized swarm robots to the circumference of a circle. (published) (ii) Extended it to multiple circles and arbitrary shapes. (accepted)

6. *Social Networking Site for Sports Lovers:* Java-based web application that allows users to follow their favourite teams/players and predict results of future matches, and chat.

Teaching Experience

- *PMRF TAship:* (i) NPTEL course (online), cs-97, Introduction to Machine Learning (Autumn 22). (ii) NLP course at Dept. of IT, Jadavpur University (Spring 22).

DECLARATION: I hereby declare that the information stated above is correct and up to the best of my knowledge.

Date: 06/06/2023