JOY DATTA

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RESEARCH INTERESTS

Self-supervised Learning, Biologically Plausible Learning, Generative AI, Computer Vision, Machine Learning

EDUCATION

BRAC University May 2017 - Jan 2022
B.Sc. in Computer Science *CGPA: **3.36**/4.00*

Thesis: Deep Convolutional GAN-based Data Augmentation for Medical Image Classification
Relevant Courseworks: Artificial Intelligence, Neural Networks, Differential & Integral Calculus, Linear Algebra, Statistics & Probability, Modern Probability Theory & Stochastic Processses, Data Structures, Algorithms, Database Systems, Introduction to Robotics.

WORK EXPERIENCE

Research Assistant *(Supervised by Dr. Jia Uddin)* Jan 2023 - Present
Multimedia Signal and Image Processing Research Group, Woosong University *Daejeon, South Korea*

RESEARCH EXPERIENCE

Wildfire Prediction using Convolutional Kolmogorov-Arnold Network *ICECE 2024*
Supervised by Dr. Aniqua Nusrat Zereen

- Developed a Convolutional Kolmogorov-Arnold Network to predict wildfire from satellite images.

Rabbi R*, **Datta J***, Ahmed S, Zereen AN. Paper presented at: 13th International Conference on Electrical and Computer Engineering (ICECE); 2024 Dec 18-20; BUET, Dhaka, Bangladesh. [pre-print]

*Contributed equally.

Peer-Guided Optimization: Incorporating Collaborative Learning into Stochastic Optimization in Machine Learning *ECCE 2025*
Supervised by Dr. Md. Golam Rabiul Alam

- Used two optimizers of different settings where they share gradient information to improve generalization.

Datta J, Rabbi R, Rafin NI., Alam MGR. Paper presented at: 2025 International Conference on Electrical, Computer and Communication Engineering (ECCE); 2025 Feb 13-15; CUET, Chittagong, Bangladesh. [pre-print]

Parameter-Efficient Image Classification with Convolutional Spiking Neural Network via Fast Sigmoid Surrogate Gradient Descent *ECCE 2025*
Supervised by Dr. Md. Golam Rabiul Alam, Dr. Aniqua Nusrat Zereen, and Dr. Jia Uddin

- Trained a tiny convolutional spiking neural network with less than a thousand parameters that compete its conventional convolutional neural network counterpart and state-of-the-art spiking neural networks in classification.

Datta J, Sarwar FA, Rabbi R, Saha P, Zereen AN, Alam MGR, Uddin J. Paper presented at: 2025 International Conference on Electrical, Computer and Communication Engineering (ECCE); 2025 Feb 13-15; CUET, Chittagong, Bangladesh. [pre-print]

Minimizing the Effect of Sleep Deprivation in the Forward-Forward Algorithm *(Under Review at ICML 2025, Submission Number: 12063)*
Supervised by Dr. Swakkhar Shatabda and Dr. Md. Golam Rabiul Alam

- Assessed sleep deprivation effect on the Forward-Forward algorithm and found possible solutions by incorporating short breaks in alternating epochs and using alternative activations..

Datta J, Saha P, Rafin NI, Rabbi R, Shatabda S, Alam MGR; Minimizing the Effect of Sleep Deprivation in the Forward-Forward Algorithm [pre-print]

Deep Representation Learning using Layer-wise VICReg Losses *(Under Review at Scientific Reports, Submission ID: 27a72660-9e30-4039-93c5-1e1c45388bee)*
Supervised by Dr. Aniqua Nusrat Zereen and Dr. Jia Uddin

- Pre-trained a deep model layer-wise with local VICReg losses using unlabeled data and fine-tuned with a very tiny labeled dataset, also demonstrated the learning capability of VICReg approach in a layer-wise training setting.

Datta J, Rabbi R, Saha P, Zereen AN, Abdullah-Al-Wadud M, Uddin J; Deep Representation Learning using Layer-wise VICReg Losses. [pre-print]

Deep Convolutional GAN-based Data Augmentation for Medical Image Classification *(Bachelor's Thesis)*
Supervised by Mr. Moin Mostakim

- A Deep Convolutional GAN was used to generate synthetic MRI images to augment the original dataset to enhance generalizability and reduce class imabalance problems.

Datta J, Durdana B, Rafi S; Deep convolutional GAN-based data augmentation for medical image classification. [pre-print]

Language Modeling without SoftMax using Barlow Twins and VICReg *(Manuscript Under Preparation)*
Supervised by Dr. Jia Uddin

- An approach to train an LLM without Softmax layer, using self-supervised methods like Barlow Twins and VICReg that reduce the computational complexity and explore the possibility of training language models without softmax.

Datta J, Rabbi R, Sarwar FA, Saha P, Uddin J; Language Modeling without SoftMax using Barlow Twins and VICReg.

SELECTED PROJECTS

- Visualizing how the representation spaces evolve in a deep model during training with tSNE [code]
- Restoring blur images using denoising convolutional autoencoder [code]
- Image generation with Variational Autoencoder and its latent space visualization [code]
- Learning to play with Deep Kolmogorov-Arnold Q Network [code]
- Twitter sentiment analysis using deep learning [code]
- Exploratory data analysis and prediction of housing prices [code]
- Netflix movies data analysis and recommender system [code]
- Diabetes prediction using machine learning [code]
- Implementation and analysis of batch, minibatch and stochastic gradient descent from scratch [code]
- Analysis of women harassment in Bangladesh [code]

ACHIEVEMENTS

VC's List, BRACU — Spring 2020

Dean's List, BRACU — Summer 2018

TECHNICAL SKILLS

Programming Languages: Python, Java, SQL
ML Tools: Tensorflow, Keras, Scikit-learn, Pytorch, OpenCV
Developer Tools: JupyterLab, Jupyter Notebook, Spyder, Sublime Text, Git
Data Analysis & Visualization: Numpy, Pandas, Matplotlib, Seaborn, Microsoft Excel
Miscellaneous: DBMS, Bootstrap, HTML, CSS, OOP, Data Structures, Prompt Engineering
Writing & Presentation: Google Docs & Slides, Microsoft Word & Powerpoint, LaTeX

STANDARDIZED TESTS

IELTS Academic — **7.0 / 9.0**
Speaking - ***7*** */ 9,* Listening - ***6.5*** */ 9,* Reading - ***8*** */ 9,* Writing - ***6*** */ 9*

CERTIFICATIONS

- Data Science Math Skills by Duke University (Coursera) [credential]
- Matrix Algebra for Engineers by HKUST (Coursera) [credential]
- Python Data Structures by University of Michigan (Coursera) [credential]
- Introduction to Blockchain Technologies by INSEAD (Coursera) [credential]

EXTRACURRICULAR ACTIVITIES

Robotics Club of BRAC University (ROBU) — **Former Apprentice**