JOY DATTA

Pran Hori Das Rd, Chattogram 4219, Bangladesh

Phone: +8801789602083 **Email:** joy.datta@g.bracu.ac.bd **Website:** https://joy-datta.github.io

RESEARCH INTERESTS

Machine Learning, Computer Vision, Natural Language Processing, Self-supervised Representation 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* [Open Access]
Advisor: Moin Mostakim **Thesis Grade**: **4.0**/4.0
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.

RESEARCH EXPERIENCE

Research Assistant *(Supervised by Prof. Jia Uddin)* Jan 2023 - Present

Multimedia Signal and Image Processing Research Group

Research Areas: Machine Learning, Computer Vision, Spiking Neural Networks

- Exploring various strategies to visual representation learning with limited use of backpropagation and biologically plausible learning, including layer-wise training of deep models via self-supervised techniques.
- Investigating the plausibility of using the forward-forward learning objective in convolutional spiking neural network training and their parameter-efficiency.

PUBLICATIONS

[1] Deep representation learning using layer-wise VICReg losses *Scientific Reports SCIE indexed (**Q1**), Journal Impact Factor - **3.9** (2024)*
Supervised by Prof. Aniqua Nusrat Zereen *and* Prof. Jia Uddin

J. Datta, R. Rabbi, P. Saha, A. N. Zereen, M. Abdullah-Al-Wadud, and J. Uddin, "Deep representation learning using layer-wise VICReg losses," *Scientific Reports*, vol. 15, no. 1, Art. no. 27049, 2025. [Open Access]

Funded by: King Saud University, Riyadh, Saudi Arabia, Ongoing Research Funding program (ORF-2025-951).

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

J. Datta, R. Rabbi, N. I. Rafin, and M. G. R. Alam, "Peer-Guided Optimization: Incorporating Collaborative Learning into Stochastic Optimization in Machine Learning," in *2025 International Conference on Electrical, Computer and Communication Engineering (ECCE)*, Chittagong, Bangladesh, Feb. 13–15, 2025, pp. 1–6. [IEEE Xplore] [Pre-print]

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

J. Datta, F. A. Sarwar, R. Rabbi, P. Saha, M. G. R. Alam, J. Uddin, and A. N. Zereen, "Parameter-Efficient Image Classification with Convolutional Spiking Neural Network via Fast Sigmoid Surrogate Gradient Descent," in *2025 International Conference on Electrical, Computer and Communication Engineering (ECCE)*, CUET, Chittagong, Bangladesh, Feb. 13–15, 2025, pp. 1–6. [IEEE Xplore] [Pre-print]

[4] Wildfire Prediction using Convolutional Kolmogorov-Arnold Network *ICECE 2024*
Supervised by Prof. Aniqua Nusrat Zereen

R. Rabbi*, **J. Datta***, S. Ahmed, and A. N. Zereen, "Wildfire Prediction using Convolutional Kolmogorov-Arnold Network," in *13th International Conference on Electrical and Computer Engineering (ICECE)*, Dhaka, Bangladesh, Dec. 18–20, 2024. [IEEE Xplore] [pre-print]

*Contributed equally.

[5] Meta-Ensemble of FastFlow and PaDiM for Efficient Industrial Anomaly Detection *RAAICON 2025*
Supervised by Prof. Julia Rahman
P. Saha, **J. Datta**, S. Dey, J. Rahman, "Meta-Ensemble of FastFlow and PaDiM for Efficient Industrial Anomaly Detection," presented at IEEE RAAICON 2025, Dhaka, Bangladesh, Nov. 27–28, 2025. [Pre-print]

[6] POM-NeRF: Perception-Oriented Modification of Neural Radiance Fields for Enhanced 3D Volumetric Rendering from Multi-View Images *VISAPP 2026*
Supervised by Prof. Chad Mourning
J. Datta, R. Rabbi, M. S. I. Tonmoy, P. Saha, and C. Mourning "POM-NeRF: Perception-Oriented Modification of Neural Radiance Fields for Enhanced 3D Volumetric Rendering from Multi-View Images," under review for VISAPP 2026.

ONGOING RESEARCH

[1] Training Residual Convolutional Spiking Neural Networks with Forward-Forward Algorithm
Manuscript Under Preparation for Submission at IEEE OJCS (Q1)
Supervised by Prof. Jia Uddin *and* Prof. Chad Mourning
- Incorporating the forward-forward learning objective to train convolutional spiking neural networks.

[2] Minimizing the Effect of Sleep Deprivation in the Forward-Forward Algorithm *Manuscript Under Preparation for Submission at ICPR 2026 (CORE Rank - B)*
Supervised by Prof. Swakkhar Shatabda, Prof. Md. Golam Rabiul Alam, *and* Prof. Chad Mourning
- Assessed the sleep deprivation effect on the Forward-Forward algorithm, incorporated short breaks between epochs, alternative activations, and losses to mitigate the effect on learning.

[3] Multi-level Representation Learning with Hierarchical JEPA Ongoing Research
Supervised by Prof. Richard Lange
- Training and evaluation of H-JEPA models for multi-level visual understanding from videos.

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]
- Implementation and analysis of batch, minibatch and stochastic gradient descent from scratch [code]

TECHNICAL SKILLS

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

ACHIEVEMENTS

VC's List, BRACU Spring 2020
Dean's List, BRACU Summer 2018

EXTRACURRICULAR ACTIVITIES

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