SWAKSHAR DEB

(+880) 1797574820 | swakshar.sd@gmail.com | personal website | google scholar | github

RESEARCH INTEREST

My research interests include graph signal processing, graph neural networks, and computer vision for the purpose of developing highly efficient robotic vision systems.

EDUCATION

Masters of Science *May, 2022 – October, 2023*
University of Dhaka *Dhaka, Bangladesh*
Major: Robotics and Mechatronics Engineering
Research Area: Graph Wavelet Neural Networks
Advisor: Dr. Sejuti Rahman, Associate Professor & Chairperson, Department of RME, DU
CGPA: 3.82 out of 4.0, Ranked 2^{nd} **place**

Bachelor of Science *Jan, 2017 – April, 2022*
University of Dhaka *Dhaka, Bangladesh*
Major: Robotics and Mechatronics Engineering
Dissertation: Rehabilitation Exercises Assessment with Graph Neural Networks
Advisor: Dr. Sejuti Rahman, Associate Professor & Chairperson, Department of RME, DU
CGPA: 3.72 out of 4.0, Ranked 5^{th} **place**

PUBLICATIONS

1 **Swakshar Deb**, Shafin Rahman, Sejuti Rahman. SEA-GWNN: Simple and Effective Adaptive Graph Wavelet Neural Network. Accepted in *Association for the Advancement of Artificial Intelligence (AAAI), 2024*. [Paper], [Supplementary], [Code].

2 **Swakshar Deb**, Shafin Rahman, Sejuti Rahman. GA-GWNN: Generalized Adaptive Graph Wavelet Neural Network. Accepted in *Pattern Recognition Letters (PRL), 2023*. [Paper], [Supplementary], [Code].

3 **Swakshar Deb**, Md Fokhrul Islam, Shafin Rahman, Sejuti Rahman. Graph Convolutional Networks for Assessment of Physical Rehabilitation Exercises. Accepted in *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE), 2022*. [Paper], [Code], [Video]. Also appeared in the Proceedings of WICV Workshop of *IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2022*, New Orleans, LA, USA. [Poster].

4 Tahsin Tariq Banna, **Swakshar Deb**, Sejuti Rahman and Shafin Rahman. GEMM: A Graph Embedded Model for Memorability Prediction. Accepted in *International Joint Conference on Neural Networks (IJCNN), 2023,* Queensland, Australia. [Paper], [Code], [Video]

5 Mohammad Tareq, Md Fokhrul Islam, **Swakshar Deb**, Sejuti Rahman, Abdullah Al Mahmud. Data-augmentation for Bangla-English Code-Mixed Sentiment Analysis: Enhancing Cross Linguistic Contextual Understanding. Accepted in *IEEE Access, 2023*. [Paper], [Code]

6 Sejuti Rahman, Sujan Sarker, A. K. M. Nadimul Haque, Monisha Mushtary Uttsha, Md Fokhrul Islam, **Swakshar Deb**. AI-Driven Stroke Rehabilitation Systems and Assessment: A Systematic Review. Accepted in *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE), 2022* [Paper].

RESEARCH EXPERIENCE

Research Assistant *Jan, 2020 – Present*
Graph Machine Learning
Advisor: Dr. Sejuti Rahman, Associate Professor & Chairperson, Department of RME, DU

ONGOING RESEARCH PROJECTS

- **Ma (Mother) Mental Health: Artificial intelligence-Enabled Detection of Perinatal Depression** *Jun, 2023 – Present*
  Keywords: Maternal Depression, Machine Learning, Visual Saliency
  Funding: *AI-SAROSH*, *IDRC Canada*
  Position: Research Assistant (RA).
- **Image Memorability Prediction** *Jan, 2023 – Present*
  Keywords: Graph Neural Network, Image Segmentation, Visual Saliency
  Funding: *Ministry of Science and Technology, Government of Bangladesh*
  Position: Research Assistant (RA).

OTHER RESEARCH PROJECTS

- **Empowering Graph Wavelet Convolution for Node Classification: A Novel Approach with Local Lifting Scheme** *May, 2022 – July, 2023*
  Resources: [M.Sc. thesis], [Paper], [Code].
  - Proposed a highly scaleable, efficient, and novel algorithm to produce desirable class of wavelet filters for the adaptive graph wavelet neural network.
  - Our algorithm evaluated on both homophilic and heterophilic datasets exhibit $\sim 15\%$ improvement over the baseline graph wavelet-based approach - opening up a new frontier for future research.
- **Intelligent Hospital Assistance Robot to Fight Contagion by Reducing Doctor-Patient Interaction** *Feb, 2022 – Jun, 2022*
  Funding: *Centennial Research Grant, University of Dhaka*
  Resources: [Report], [Code], [Video]
  - Developed an autonomous hospital assistance robot, equipped with real-world navigation abilities.
  - Integrated diverse sensors to gather and analyze physiological data from patients.
- **Artificial Intelligence in Business Decision Making: A Study on Code-Mixed and Translitерated Bangla Customer Reviews** *Jan, 2022 – May, 2022*
  Funding: *Centre for Advanced Research in Strategic Human Resource Management, University of Dhaka*
  Resources: [Paper], [Code]
  - Proposed a novel class of data augmentation technique to enhance cross-lingual understanding.
  - Collected and annotated a gold standard dataset for Bangla-English code-mixed sentiment analysis.

UNDERGRADE RESEARCH PROJECTS

- **An Intelligent Agent for Evaluating and Guiding the Post-Stroke Rehabilitation Exercises** *Jan, 2021 – Dec, 2021*
  Funding: *Information and Communication Technology Division, Ministry of Posts, Telecommunications, and Information Technology of the Government of Bangladesh*
  Resources: [B.Sc. dissertation], [Paper], [Survey paper], [Code], [Poster], [Video]
  - Proposed a novel spatio-temporal graph convolution based framework for rehabilitation exercises.
  - Introduced a guidance system that focuses on the most informative joints.
- **Investment Decision Marking with Reinforcement Learning** *Oct, 2019 – Jan, 2020*
  Funding: *Centre for Advanced Research in Strategic Human Resource Management, University of Dhaka*
  Resources: [Report], [Code]
  - Used past ten consecutive stock price differences, trend prediction with LSTM, newspaper sentiment, and diverse accounting features as states and buy, sell, or hold as the action space.
  - Trained the agent with state-of-the-art deep Q learning algorithms such as Double Deep Q Learning, Q Learning with Prioritized Experience Replay.

SCHOLARSHIPS & AWARDS

- **2023 Dhaka University Student Scholarship** (Awarded for the academic performance)
- **2023 IFIC Bank Scholarship** (Awarded for excellent research potential in the M.Sc. thesis)
- **2022** 1^{st} **runner up** for poster presentation in **Dhaka University Science Fair**
- **2022** 1^{st} **place** for poster presentation in **Robotics in Bangladesh: Academia and Industry Initiative**
- **2021 IFIC Bank Scholarship** (Awarded for the excellent undergraduate project dissertation)
- **Board Merit Scholarship: Government of Bangladesh** (Year: 2007, 2013)

TECHNICAL SKILLS

Languages: Python, C/C++, Latex, Matlab, Markdown, Shell
Frameworks: Pytorch, Tensorflow, Keras, Arduino
Libraries: OpenCV, NLTK, Pandas, NumPy, Matplotlib, Scikit-Learn, Seaborn
Operating System: Windows, Linux

REFERENCE

Dr. Sejuti Rahman
Associate professor & Chairperson, Department of RME, DU
Mobile: (+880)1836800864
Email: sejuti.rahman@du.ac.bd
Google Scholar: Dr. Sejuti Rahman