MD FOKHRUL ISLAM

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RESEARCH INTEREST

My research interests include multi-modal learning in low-data regimes and explainable machine learning, with a focus on geometries in nature. I am also interested in building automatic systems for healthcare, robotics, and social good, emphasizing graph representation learning, reinforcement learning, and machine perception.

EDUCATION

University of Dhaka *Dhaka, Bangladesh*
Master of Science in Robotics and Mechatronics Engineering *Feb, 2022 – July, 2023*
CGPA: 3.79 out of 4.0, Rank **3rd place**

Bachelor of Science in Robotics and Mechatronics Engineering *Feb, 2017 – Dec, 2021*
CGPA: 3.45 out of 4.0 | Last 3 semester: 3.74/4.0

PUBLICATIONS & MANUSCRIPTS

1. 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 (TSNRE), 2022*. [paper], [code]. Also appeared in CVPR 2022, *WiCV Workshop* [poster]
2. **Md Fokhrul Islam**, Shafin Rahman, Sejuti Rahman. Relation and Knowledge Aware Zero Shot Learning in 3D Object Recognition. In preparation to submit at *Computer Vision and Image Understanding(CVIU)*. [paper abstract], [code]
3. 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]
4. 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 (TSNRE), 2022* [paper], [code]

RESEARCH EXPERIENCE

Research Assistant
Supervisor: Dr. Sejuti Rahman *Oct, 2019 – Present*

- **Relation and Knowledge Aware Zero Shot Learning in 3D Object Recognition (Master's thesis)** *May, 2022 – July, 2023*
  Resources: [masters thesis book], [paper abstract], [code]
  - Developed a novel framework for class embedding learning that integrates knowledge base text and 2D visual information using GCN and co-attention mechanisms. Introduced an innovative Generalized Zero-Shot Learning (GZSL) framework incorporating embedding and feature generation models, enhanced by a contrastive module for instance-level supervision.
  - Significantly improved performance, achieving an average 19.22% increase in the average harmonic mean and a 21.4% enhancement in unseen accuracy on ModelNet10 and ScanobjectNN datasets.

- **IHABOT: Intelligent Hospital Assistance Robot to Fight Contagion by Reducing Doctor-Patient Interaction** *June, 2022 – Oct , 2022*
  Funding: *Centennial Research Grant, University of Dhaka*
  Resources: [report], [demo]
  - Designed and engineered an autonomous hospital assistance robot with advanced autonomous navigation, mapping capabilities, and proficiency in real-world navigation.

  - Integrated a diverse array of sensors to acquire and analyze patients' physiological data, as well as evaluate their physical exercises.

- **Artificial Intelligence in Business Decision Making: A Study on Code-Mixed and Transliterated Bangla Customer Reviews** *Feb, 2022 – May, 2022*
  Funding: *Centre for Advanced Research in Strategic Human Resource Management, University of Dhaka*
  Resources: [paper], [report], [code]
  - Proposed a novel data augmentation technique for enhancing cross-lingual contextual understanding, obviating the need for a parallel corpus.
  - Collected and annotated a gold standard dataset, achieving substantial performance improvements over established word embedding methods on the same dataset.

- **An Intelligent Agent for Evaluating and Guiding the Post-Stroke Rehabilitation Exercises (Undergraduate thesis)** *March, 2020 – Dec, 2021*
  Funding: *ICT Division, Ministry of Posts, Telecommunications, and Information Technology of the Government of Bangladesh*
  Resources: [undergrad thesis book], [paper], [review paper], [code], [poster], [demo]
  - Presented a novel spatio-temporal graph convolution framework designed for rehab. exercises.
  - Introduced a guidance system featuring self-attention mechanisms to efficiently direct patients' attention toward the most informative joints during rehabilitation exercises.

- **Learning to Trade with Deep Q Learning.** *Oct, 2019 – Jan, 2020*
  Funding: *Centre for Advanced Research in Strategic Human Resource Management, University of Dhaka*
  Resources: [report], [code]
  - Developed a Reinforcement Learning model for stock trading using Deep DQN algorithm.
  - Improved model performance by integrating trend analysis and sentiment information with NLP.

SCHOLARSHIPS & AWARDS

- National Science & Technology (NST) Fellowship for **Excellent Master's Thesis** *2022-2023*
- IFIC Bank Trust Fund **Research Grants (Highest & Consecutive 3 times)** *2021, 2022, 2023*
- **Winner in the Research Project Category**, Seminar on "Robotics in Bangladesh: Academia and Industry Initiatives" *2022*
- 1^{st} **Runner-up Poster Presentation** in Dhaka University Research and Publication Fair *2022*
- Bank Asia Higher Education Scholarship *2017-2021*
- Islamic Bank (IBBL) Scholarship for Undergrad Studies *2017-2021*

PROFESSIONAL DEVELOPMENT

- Attended OxML Summer School 2022 - Health Track [syllabus] [certificate] *Jul 2022 - Aug 2022*
  Organizer: AI for Global Goals, CIFAR & University of Oxford's Deep Medicine Program
  Topics covered: statistical / probabilistic ML, representation learning, graph neural networks and geometrical deep learning, computer vision, knowledge-aware ML as well as topics related to ML in healthcare.
- Other online Certificates: (1) AI for Medical Diagnosis (2) Deep Learning *2020*
- BanglaDesh Robot Olympiad(BDRO) Volunteer and mentor | certificate *Sept 2019*

TECHNICAL SKILLS

Languages: Python, C/C++, SQL, HTML/CSS, Matlab
Frameworks: PyTorch, Tensorflow, Keras, Scikit-learn, HuggingFace, etc.
Others: Solidworks, Robot Operating System, Arduino, Raspberry pi, Git, LaTeX, Ubuntu

REFERENCE

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