Mostofa Rafid Uddin

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Summary

- PhD candidate at Carnegie Mellon University School of Computer Science.
- Fellow of Center for Machine Learning in Health Research 2023.
- Experienced Researcher in Machine Learning (ML) and Computer Vision (CV) with 1st authored paper at CVPR.
- Highly proficient in Deep Learning with Pytorch and data structure and algorithms.
- Experienced Tutor/TA of Machine Learning with excellent communication and presentation skills.

Research Interests & Expertise

Research Topics of Interest: *High Expertise:* Unsupervised, Self-supervised Representation Learning, Contrastive Learning, 3D Computer Vision, Object detection and Segmentation, Structural Bioinformatics.
Moderate Expertise: Deep Generative Models, Probabilistic Graphical Models, Domain adaptation, Domain Generalization, Vision Foundation Models, Geometric Learning.
Datasets of expertise: Scene-centric images, 3D tomographic images, Microscopy images, 3D data with various representations, Biological Sequence Data.

Education

2021- Present	**Doctor of Philosophy (Ph.D), School of Computer Science**, Carnegie Mellon University, Pittsburgh, PA 15213, USA **Advisor: Min Xu** **Distinctions**: CMLH Fellowship for Digital Health 2023, Outstanding Research Accomplishment Award 2024.
2021- 2024	**Master of Science (M.Sc.), Computational Biology- Advanced Study, School of Computer Science**, Carnegie Mellon University, Pittsburgh, PA 15213, USA **Relevant Coursework**: Machine Learning (Ph.D.) level, Computer Vision, Probabilistic Graphical Models.
2014 -2018	**Bachelor of Science in Computer Science and Engineering**, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh. **Academic distinctions**: Deans list awards, University merit scholarships. **Relevant Coursework**: Computer Graphics, Object-oriented Programming, Structured Programming, Pattern Recognition, Digital Image Processing.

Selected Research Publications

A few representative publications are mentioned here. For a full and up-to-date list, please visit my google scholar link.

- **Mostofa Rafid Uddin**, Gregory Howe, and Min Xu. Harmony: A Generic Unsupervised Approach for Disentangling Semantic Content from Parameterized Transformations.*Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022, pp. 20646-20655. (H5-index: 356). [paper link] [news link]. Skills: Unsupervised Learning, Representation Learning, Deep Generative Models, Bio-image Analyses.
  - In many real-life image analyses, particularly biomedical research domains, objects in the images undergo several parameterized transformations.
  - I developed an unsupervised method to disentangle the transformations from image contents and demonstrate that it significantly facilitates many downstream tasks.
- **Mostofa Rafid Uddin**, Sazan Mahbub, M Saifur Rahman, and Md Shamsuzzoha Bayzid. SAINT: Self-Attention Augmented Inception-Inside-Inception Network Improves Protein Secondary Structure Prediction. *Bioinformatics*, 2020 Nov 1; 36(17):4599-608. (H5-index: 136, Impact Factor: 6.937) [paper link]. Skills: Neural Machine

Translation, Structural Bioinformatics, Dense Prediction.

- Predicting 8-state (Q8) secondary structure from amino acid sequences of protein is an important but challenging problem.
- Developed a self-attention augmented inception-inside-inception network that improves state-of-the-art protein secondary structure prediction and recovers insights of protein folding through interpretable attention features.

Technical Skills

Languages: Python, Java, C, C++. **HPC Computing:** AMD Cluster, TMUX, Oracle Cloud, AWS.
Frameworks: Pytorch, Detectron, Tensorflow, OpenCV, Numpy, Scipy, Scikit-learn.

Work Experience

2021 - Present	**Graduate Research Assistant**, Computational Biology Department, School of Computer Science, Carnegie Mellon University, PA, USA
2022	**Graduate Teaching Assistant**, Computational Biology Department, Spring 2022 CMU 02-620: Machine Learning for Scientists Fall 2022 CMU 02-740: Bioimage Informatics
2019- 2020	**Lecturer**, Department of Computer Science and Engineering, East West University, Dhaka, Bangladesh.

Grants, Awards, & Services

- **Center for Machine Learning and Health (CMLH) fellowship in Digital Health, 2023** CMLH fellowships, around 100,000 USD worth, are awarded each year to several (around 10) outstanding digital health-related research proposals by CMU PhD students. I received the award in 2023. [link] Skills: Grant Writing, Independent Research.
- **Outstanding Research Accomplishment Award** This award is given each year to one CMU PhD student from the Computational Biology Department who has contributed significant research during his time in the PhD program. Skills: Independent Research.
- Regularly serve as a reviewer in top AI and vision conferences such as CVPR, ICCV, ECCV, NeurIPS, AAAI, WACV, etc.
- Worked as a mentor in CMU AI Mentoring Program, where I mentor CMU undergraduate students coming from underrepresented communities interested in AI research
- Gave research talk on IEEE Applied Imagery Pattern Recognition (AIPR) Workshop (virtual), October 2021, Washington, DC, US. [*link*]
- Won best poster award at 3rd International Conference on Networking, Systems and Security (NSysS 2017). Poster Title: *Archiving Medical Records in DNA Sequence*[*pdf*] Skills: Precision Health, Electronic Health Records

Mini-Research Projects

♢ **Pytorch Implemented Local Energy Minimizer** Implemented the local energy minimizer module of OpenMM software by modifying pytorch autograd mechanics. [*github*]

♢ **Edge prediction: Predicting Edge in Academic Citation Networks** Predicted how likely an academic article is to cite another particular article using an intelligent and novel feature engineering pipeline that could generate highly accurate predictions with relatively simpler models. [*github*]

♢ **Predicting age from lung single cell data** Applied multiple feature extraction models and classifiers to predict biological age from scRNA-seq data of multiple control patients. [*github*]

♢ **Onubadok: Bangla to English Machine Translation Using Seq2Seq Model with Attention Mechanism.** In this project on Neural Machine Translation(NMT), I observed that using Bahdanau's attention with a vanilla encoder-decoder model improves BLEU score for Bangla to English translation. [*github*]