Md Rafsan Jani

Department of Electrical and Computer Engineering (ECE), Drexel University, Philadelphia, PA, USA

🛛 +1 (408) 580-1705 🔰 🛛 rafsanjani.muhammod@gmail.com 🔰 🌴 rafsanjani.pythonanywhere.com 🔰 📮 mrzResearchArena

Research Areas & Interests

- Machine Learning: Physics-informed Neural Networks (PINNs), Deep Learning: Optimization, and Data-driven Modeling
- Artificial Intelligence: Probabilistic Graphical Models, AI-driven Optimization, Explainable AI
- · Algorithms Design & Analysis: Partial Differential Equations (PDEs) and Numerical Analysis, Computational Complexity

Publications

JOURNAL PUBLICATIONS

- **Rafsanjani Muhammod***, Sajid Ahmed* et al., "PyFeat: A Python-based Effective Features Generation Tool from DNA, RNA, and Protein Sequences," [Published in **Bioinformatics**, Impact Factor: **6.937**, **Github Repository**] (* for the co-first author)
- Md Rafsan Jani et al., "iRecSpot-EF: Effective Sequence Based Features for Recombination Hotspot Prediction," [Published in Computers in Biology and Medicine, Impact Factor: 4.589, Webserver]
- Sajid Ahmed*, **Rafsanjani Muhammod*** et al., "ACP-MHCNN: An Accurate Multi-Headed Deep-Convolutional Neural Network to Predict Anticancer Peptides," [Published in **Scientific Reports**, Impact Factor: **5.133**, **Github Repository**] (* for the co-first author)
- H.M. Haque*, **Rafsanjani Muhammod*** et al., "SubFeat: Feature subspacing ensemble classifier for function prediction of DNA, RNA and protein sequences," [Published in **Computers in Biology and Chemistry**, Impact Factor: **2.877**] (* for the co-first author)
- M.S. Rahman, U. Aktar, **Md Rafsan Jani** et al., "iPromoter-FSEn: Identification of Bacterial sigma70 Promoter Sequences Using Feature Subspace Based Ensemble Classifier," [Published in **Genomics**, Impact Factor: **5.736**, **Webserver**]
- M.S. Rahman, U. Aktar, Md Rafsan Jani et al., "iPro70-FMWin: Identifying Sigma70 Promoters Using Multiple Windowing and Minimal Features," [Published in Molecular Genetics and Genomics, Impact Factor: 3.291, Webserver]

CONFERENCE PUBLICATIONS

- C. Rahman, M. Rahman, M. Rafsan, S. Zakir, **Rafsanjani Muhammod**, and M. Ali, "CNN for Modeling Sanskrit Originated Bengali and Hindi Language," [Published in AACL IJCNLP-2022]
- S. Ahmed, A. Mahbub, F. Rayhan, Md Rafsan Jani et al., "Hybrid Methods for Class Imbalance Learning Employing Bagging with Sampling Techniques," [Published in CSITSS-2017]
- S. Ahmed, F. Rayhan, A. Mahbub, Md Rafsan Jani et al., "LIUBoost: Locality Informed Underboosting for Imbalanced Data Classification," [Published in IEMIS-2018]

For details of the publication list, please visit: Google Scholar and ResearchGate.

Note: I use both Md Rafsan Jani (Official) and Rafsanjani Muhammod (Nickname) as my publication name.

Education _

Drexel University

Ph. D. IN ELECTRICAL AND COMPUTER ENGINEERING (ECE) Thesis: Metagenomics Analysis employing Deep Learning

United International University (UIU)

 B. SC. IN COMPUTER SCIENCE AND ENGINEERING (CSE) [OVERALL CGPA: 3.32/4.00, THESIS GPA: 4.00/4.00]
 February 2014 – May 2018

 Major Courses:
 Machine Learning & AI, Pattern Recognition, Bioinformatics, Simulation & Modeling, Statistics & Probability

 Thesis:
 Classifying Multi-Class High-Dimensional Imbalanced Datasets employing Active Learning and Data Balancing Methods

 Supervised and co-supervised by Dr.
 Swakkhar Shatabda and Dr. Dewan Farid respectively.

Research Projects

Multi-Headed Convolutional Neural Network to Predict Anticancer Peptides

RESEARCH OUTCOMES (JOURNALS): SCIENTIFIC REPORTS

We developed a multi-headed (multi-input) shallow convolutional network architecture for anti-cancer peptides identification. The original idea came from *multiple-input and multiple-output networks*. In contrast, we did not mix input from multiple categories; instead, we divided the datasets into separate heads based on the category. In comparison to the existing state-of-the-art, the preliminary results seem promising [Github Repository].

Supervised by: Dr. Iman Dehzangi (Assistant Professor, Computer Science, Rutgers University - Camden, USA)

Philadelphia, PA, USA April 2023 – Today

United City, Dhaka, Bangladesh

Rutgers University — Camden September 2017 – August 2018

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Genome Sequences Analysis employing Machine Learning

RESEARCH OUTCOMES (JOURNALS): BIOINFOMATICS, CBM, CBC, GENOMICS, MGG

United International University (UIU)

January 2018 – March 2019

We developed *PyFeat* and *SubFeat*, which are extensive Python-based tools for generating multiple numerical feature presentation schemes from DNA, RNA, and protein sequences. Prior to that, we presented *iRecSpot-EF*, which uses a novel set of features extraction approaches (i.e., position-specific k-mers and gapped k-mers) from genome sequences to predict recombination of hot and cold spots. We attained state-of-the-art performance by combining Support Vector Machine and Logistic Regression with novel feature sets. In addition, we had presented *iPromoter-FSEn* and *iPro70-FMWin* which are two novel predictors for identifying sigma70 promoter sequences, and we used an ensemble approach for both of the sigma70 predictors.

Supervised by: Dr. Swakkhar Shatabda (Professor, Computer Science, United International University, Bangladesh)

Professional Experience _

Drexel University

- Research Assistant (RA) at Drexel University
- Project: Metagenomics Analysis employing Deep Learning

Rutgers University – Camden

RESEARCH ASSISTANT (RA) AT MACHINE LEARNING, BIOINFORMATICS & COMPUTATIONAL BIOLOGY LAB

• Project: Protein Structures Understanding employing Deep Learning (Mentor: Dr. Dehzangi)

United International University (UIU)

RESEARCH ASSISTANT (RA) AT BIOINFORMATICS RESEARCH LAB

• Project: Genome Sequence Analysis employing Machine Learning (Mentor: Dr. Shatabda)

International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b)

INTERN RESEARCHER AT GENOMICS AND BIOINFORMATICS LAB

• Project: Developing a parallel processing identifier tool for detecting resistance genes [GitHub Repository]

Odin Outsourcing

INSTRUCTOR (BIG DATA WITH PYTHON) & SOFTWARE ENGINEER

• Course: Big Data with Python [Course Website]

United International University (UIU)

TEACHING ASSISTANT (TA) IN DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

• Courses: Pattern Recognition & Machine Learning [Course Website] (Mentor: Dr. Farid)

Trainer / Workshop ____

Noakhali Science and Technology University (NSTU)

TRAINER (BIOINFORMATICS AND MACHINE LEARNING)

• Slides: [Bioinformatics], [Machine Learning-1, Machine Learning-2]

Technical Skills _

- Programming Languages: Well-versed in Python, among others (C/C++, Java, Shell-Script)
- Machine Learning Research Tools: Well-versed in PyTorch, among others (TensorFlow, scikit-learn, NumPy, matplotlib)
- PINNs Tools: DeepXDE, NVIDIA's Modulus, Raissi's PINNs-Torch
- Writing Tools: LaTeX, Mendeley (reference/citation manager)
- Web Technologies: Flask Web Framework (based on Python), MySQL, Redis Queue, Web Scraping
- Operating Systems: Linux-based OS (Ubuntu, Debian) with the firm command-line controls and Linux-server configuration
- Miscellaneous: Git/GitHub (version control), vim/vi, Markdown

Accomplishments _

2022	Research Fellowship, Drexel University	Philadelphia, USA
2017	Champion, National Robotech Festival (Category: Artificial Intelligence)	Dhaka, Bangladesh
2017	$\mathbf{2^{nd}}$ Runner-Up, National Robotech Festival (Category: Machine Learning)	Dhaka, Bangladesh
2020	Improving Deep Neural Networks, taught by Dr. Andrew Ng	Coursera Online
2018	Algorithms for DNA Sequencing, taught by Dr. Ben Langmead	Coursera Online

Philadelphia, PA, USA April 2023 – Today (40h+20h/week)

Camden, NJ, USA (Remotely) November 2020 – June 2022 (20h/week)

United City, Dhaka, Bangladesh June 2018 – December 2018 (40h/week)

Mohakhali, Dhaka, Bangladesh February 2019 – April 2019 (20h/week)

Gulshan, Dhaka, Bangladesh January 2019 – June 2020 (40h/week)

United City, Dhaka, Bangladesh June 2017 – February 2018 (20h/week)

Noakhali, Bangladesh 2 Days Workshop (March 21-22, 2019)

Voluntary Works / Community Services _____

2022	Peer-Reviewer, PLoS One	Remotely
2020-22	Assistant Peer-Reviewer, (CBM; BioSystems; CBC; several Machine Learning conferences)	Remotely
2020	Volunteer, International Conference on Learning Representations (ICLR)	Remotely
2020	Volunteer & Fellowship, International Conference on Machine Learning (ICML)	Remotely