Tanjeem Azwad Zaman

📱 +14126084701 | 🌐 tanjeemzaman.github.io | ✉ zaman.tanjeemazwad@gmail.com | ⭘ Tanjeem29

RESEARCH INTEREST

Computational Biology, Machine Learning, Algorithms

EDUCATION

PhD in Computational Biology   2025 - Present
CMU-Pitt Joint Program in Computational Biology (CPCB)
Carnegie Mellon University, School of Computer Science

BSc in Computer Science and Engineering (CSE)   2019 - 2024
Bangladesh University of Engineering and Technology (BUET)
CGPA: 4.00/4.00, Position: 1/113

PUBLICATIONS

Published

T. A. Zaman*, R. J. I. Momin*, and M. S. Bayzid, "On the robustness to gene tree rooting (or lack thereof) of triplet-based species tree estimation methods," *RECOMB-CG*, 2025. DOI: 10.1101/2024.11.22.624944

A. Rafi, A. M. S. Rumi, S. A. Hakim, Sohaib, M. T. Tahmid, R. J. I. Momin, **T. A. Zaman**, R. Reaz, and M. S. Bayzid. "wQFM-TREE: highly accurate and scalable quartet-based species tree inference from gene trees," *Bioinformatics Advances*, 2024. DOI: 10.1101/2024.07.30.605630

H. S. Shahgir*, **T. A. Zaman***, K. S. Sayeed, M. A. Haider, S. S. R. Jony, and M. S. Rahman, "Leveraging Complementary Attention Maps in Vision Transformers for OCT Image Analysis," *ICIP*, 2025. DOI: 10.48550/arXiv.2310.14005

Preprints

M. T. Tahmid*, **T. A. Zaman***, and M. S. Rahman, "GraFusionNet: Integrating Node, Edge, and Semantic Features for Enhanced Graph Representations," *bioRxiv*, 2024. DOI: 10.1101/2024.11.22.624875

RESEARCH EXPERIENCE

Robustness to Gene Tree Rooting of Triplet-based Species Tree Estimation Methods
Supervised by Dr. Md Shamsuzzoha Bayzid   August 2023 - March 2025
(Computational Biology, Phylogenetics)

– Conducted rigorous empirical testing with different phylogenetic rooting techniques on input gene trees to evaluate its effect on the species trees estimated by triplet-based estimation methods like STELAR.

– Evaluated key parameters like RF Distance, Triplet and Quartet Scores for simulated datasets with varying ILS, gene counts, and base pairs. Considered correctness of inter-clade relationships for biological datasets.

– Identified and explained conditions where STELAR with algorithmic rootings yielded better performances than with Outgroup rooting, even outperforming the state-of-the-art species tree estimation method ASTRAL.

– Suggested an avenue for the underrated triplet-based methods to excel even when the true root is unknown.

Highly Accurate and Scalable Quartet-Based Species Tree Inference from Gene Trees
Supervised by Dr. Md Shamsuzzoha Bayzid   August 2023 - July 2024
(Computational Biology, Phylogenetics, Algorithms)

– Addressed the scalability issues of the quartet-based species tree estimation method wQFM.

– Introduced wQFM-TREE, which uses graph theory, combinatorics, and data structures efficiently to avoid explicitly enumerating all possible quartets, as done in wQFM.

– Benchmarked against other state-of-the-art (SOTA) methods on simulated datasets (up to 2000 taxa), and empirical datasets (the One Thousand Plant Transcriptomes Initiative dataset).

– Showed that wQFM-TREE consistently outperformed or matched the accuracy of SOTA methods, ASTRAL and TREE-QMC - especially in cases with higher taxa; showcasing its competitiveness in large-scale phylogenetic analyses.

Ophthalmic Biomarker Detection using Ensembled Vision Transformers
Supervised by Dr. M. Sohel Rahman   October 2023 - March 2025
(Medical Imaging, Machine Learning)

– Used extensive data augmentations and meticulous ensembling of vision transformers to detect ophthalmic biomarkers from OCT scans, placing 1st at the IEEE SPS VIP Cup 2023.
– Consulted an ophthalmologist to learn about local and global features. Ensembled MaxViT (utilizing its strided attention to focus on the former) and EVA-02 (that excels at detecting global features) for the winning idea.
– Used data augmentation strategies including random greyscale transformation, color jitter, random resized cropping, horizontal flipping, and random perspective shifts to enhance model robustness during training.
– Post-competition, utilized unlabelled data by adopting pseudolabeling and knowledge distillation to train a single MaxViT that matched our winning solution, while significantly reducing inference time and computational cost.

GraFusionNet: Dual Graph Autoencoders for Enhanced Graph Representations
Supervised by Dr. Mohammad Saifur Rahman   November 2023 - May 2025
(Cheminformatics, Machine Learning, Graph Neural Networks)

– Developed a Dual-Graph Autoencoder framework that effectively utilizes both node features and the traditionally overlooked edge features in graph-structured data.
– Made graphs using node and edge features from RDkit. Final features were composed of latent layers of separate Autoencoders trained on the graphs and their line-graphs, and the Embeddings extracted by ChemBERT from SMILES.
– Benchmarked on the Tox-21 dataset (a multi-label binary classification task) and the HIV dataset from MoleculeNet. Our approach was more accurate than other GNN-based methods using edge features (like Graph Transformers)
– Conducted ablation studies with different feature combinations, gaining insights into the efficiency of structural vs. semantic features in each classification task.

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Work Experience

Lecturer - Department of CSE, BRAC University   January 2025 - July 2025
Courses:
– [CSE331] Automata and Computability (Theory)
– [CSE423] Computer Graphics (Theory + Lab)

Adjunct Lecturer - Department of CSE, BUET   August 2024 - December 2024
Courses:
– [CSE211] Theory of Computation (Theory)
– [CSE326] Information Systems Development and Management (Lab)
– [CSE322] Computer Networks (Lab)
– [CSE210] Computer Architecture (Lab)
– [CSE200] Technical Writing and Presentation (Lab)

Machine Learning Intern - North-West Power Generation Company Limited, BD   April 2023 - June 2023
– Part of an internship program organized by the Department of CSE, BUET
– Collected data from several sensors installed around the NWPGCL plant, and used ML models to predict the operational state of machinery

Software Development and Data Analytics Intern - Infolytx   May 2023 - June 2023
– I was part of a team in charge of developing an app with real-time data analysis and visualization for a foreign client.
– Built a full-stack module from scratch: Data-Analysis (pandas), Backend (FastAPI), and Frontend development. (Javascript)

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Projects

Implementing Paging and Copy-on-Write Techniques in xv6 - Operating System Sessional [Link]
Building a Subset C - Compiler - Compiler Sessional [Link]
Implementing Ray-Tracing - Computer Graphics Sessional [Link]
Brainlytic: an Interactive Problem Solving App in Bengali - Head of Content Team - under Dr. Anindya Iqbal [Link]
DoctorAid: organized EHRs for Doctors - using NodeJS, React, PostgreSQL - Software Development Sessional [Link]

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Grants, Awards & Honors

IEEE Upsilon Pi Epsilon Award 2023 **-** **Winner** - by IEEE Computer Society [Link]   2023
IEEE SPS Video and Image Processing Cup 2023 **-** **Champion** - by IEEE SPS [Link]   2023
University Gold Medal **-** *awarded to the highest CGPA holder in a graduating batch* - by BUET   2024
Prime Minister's Gold Medal **-** *awarded to highest CGPA holder in each faculty of grad. batch*   2024
University Merit Scholarship and *Dean's List Award* - by BUET Authority   2020 to 2023
Robi Datathon 3.0 **-** **Runner-up** - by Robi, Axiata   2024
International Physics Brawl **-** 36th**, Category O** - by Charles University, Prague, Czechia   2022
AI for Bangla 2.0 **-** **Honorable Mention** - by the Govt. of Bangladesh (BD)   2023
Inter University AI Contest **-** 1st **Place** - by BUET CSE Dept.   2022
Bangladesh Mathematical Olympiad (BdMO) **-** **National Champion and Camper**   2011 to 2018
Bangladesh Physics Olympiad (BdPhO) **-** **National Winner and Camper**   2014 to 2018
Bangladesh Biology Olympiad (BdBO) **-** **National Champion and Camper**   2017
Bangladesh Olympiad in Informatics (BdOI) **-** **3rd Place, Nationals**   2016
Creative Talent Hunt **-** **National Winner, Math and ICT, Class 9-10** - by Govt. of BD   2015
Board Talentpool Scholarship (HSC and SSC) - by the Education Ministry of Bangladesh   2018, 2017
International Assessment for Schools **-** **Gold in Math, Science and English** - by UNSW   2016, 2015, 2008

Affiliations and Volunteering

IEEE Computer Society Student Branch Chapter, BUET
Technical Committee, Chair   2022-2023
Treasurer   2021-2022
Technical Committee, Executive   2020-2021

Class Representative for 7 semesters - CSE, BUET   2019-2024

Content Team Head at Brainlytic [Link]   2020-2024
In charge of organizing and setting problems for an interactive math and logic-based problem-solving app.
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Test Scores

GRE   **TOEFL (iBT)**
Verbal: 165 (95%) | Quant: 170 (92%) | AWA: 4.5 (83%)   Score: 120/120
November 7, 2024   *August 24, 2024*
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Selected Programming Language Literacy

Python (PyTorch, Pandas, NumPy, Scikit-learn, Seaborn, Matplotlib), **C/C++, Bash, Java, JavaScript**
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Hobbies

Playing the violin, competitive football (soccer)
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References

Dr. Md. Shamsuzzoha Bayzid
Professor, Department of CSE
Bangladesh University of Engineering and Technology
Contact: +8801841234464
email: shams_bayzid@cse.buet.ac.bd

Dr. M. Sohel Rahman
Professor, Department of CSE
Bangladesh University of Engineering and Technology
Contact: +8801552389480
email: msrahman@cse.buet.ac.bd