Farhanaz Farheen

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Research Interest

Computational Biology — Bioinformatics — Machine Learning — Medical Image Segmentation

Education

Bangladesh University of Engineering and Technology — Dhaka, Bangladesh
Bachelor of Science in Computer Science and Engineering — *Feb 2016 – Feb 2021*

Thesis: Segmentation of Lung Tumor from CT Images using Deep Supervision
Supervisor: Dr. M. Sohel Rahman, Professor, Department of CSE, BUET
CGPA: 3.81 out of 4.00
Major CGPA: 3.95 out of 4.00
Final two-year CGPA: 3.96 out of 4.00

Viqarunnisa Noon School and College — Dhaka, Bangladesh
Higher Secondary Certificate — *2013 – 2015*

Publications

- **An Agent-Based Modeling of COVID-19: Validation, Analysis, and Recommendations [PDF]**
  Published: February 19, 2021
  Published in : Cognitive Computation journal, Impact factor: 5.418, Publisher: Springer
  Authors: Md. Salman Shamil, Farhanaz Farheen, Nabil Ibtehaz, Irtesam Mahmud Khan & M. Sohel Rahman

Under Review

- **Segmentation of Lung Tumor from CT Images using Deep Supervision [Pre-print]**
  First Submitted: August, 2021
  Under Review at : Computers in Biology and Medicine journal, Impact factor: 4.589, Publisher: Elsevier
  Authors: Farhanaz Farheen, Md. Salman Shamil, Nabil Ibtehaz & M. Sohel Rahman

Research Experience

An Agent-Based Modeling of COVID-19: Validation, Analysis, and Recommendations — 2020

- Supervisor: Dr. M. Sohel Rahman, Professor, Department of CSE, BUET
- *Status:* Published in **Cognitive Computation** Journal's Special Issue: Data-Driven Artificial Intelligence approaches to Combat COVID-19; Programming Language: Python; [Source Code], [PDF]
- Programming Language: Python
- **Description**: The study proposes an agent-based model that simulates the spread of COVID-19 in a city. The study can be divided into two key portions: **model validation** (done using data of Ford County, KS, USA) and **experiments run on a scaled-down version** of New York City, USA. We experimented with different interventions and analyzed the conditions that lead to digital herd immunity via **contact tracing**. Our experiments suggest that digital contact tracing with more than 60% of the population owning a smartphone combined with city-wide lockdown results in the effective reproduction number (R_t) to fall below 1 within 3 weeks of intervention. For 75% or more smartphone users, new infections are eliminated, and the spread is contained within 3 months of intervention.

Segmentation of Lung Tumor from CT images using Deep Supervision — 2019 – Present

- Supervisor: Dr. M. Sohel Rahman, Professor, Department of CSE, BUET
- *Status:* Under review at **Computers in Biology and Medicine**
- Programming Language: Python; Framework: Keras; Backend: Tensorflow
- **Description**: The work focuses on the problem of detecting lung tumors from two dimensional CT images. We have used 2D CNNs and applied two-dimensional discrete wavelet transforms (DWT) on the LOTUS dataset while integrating information from neighboring CT slices before feeding them to a Deeply Supervised MultiResUNet model. This has resulted in a dice coefficient of 0.8472.

Exploring the efficacy of APPLES instead of PPLACER in TIPP2 2021 – Present

- Supervisor: Dr. Md. Shamsuzzoha Bayzid, Associate Professor, Department of CSE, BUET
- *Status:* Project in progress
- Programming Language: Python
- **Description**: TIPP2 (Metagenomic Taxonomic Profiling using Phylogenetic Markers) is a marker gene-based abundance profiling method whereas APPLES (Scalable Distance-Based Phylogenetic Placement with or without Alignments) is a Phylogenetic placement method. TIPP2 uses pplacer as one of the subroutines for the phylogenetic placement step. Our work focuses on the evaluation of the algorithm's performance if APPLES is used instead.

An Agent-Based Modeling of COVID-19 for Bangladesh 2020 – Present

- Supervisor: Dr. M. Sohel Rahman, Professor, Department of CSE, BUET
- *Status:* Manuscript in progress
- Programming Language: Python
- **Description**: The study proposes an Agent-Based Model that simulates COVID-19 spread in Bangladesh. A tool called Contact Matrix gives the average interactions between age-groups. To improve scalability, some aspects of compartmental modeling are incorporated.

Notable Projects

CRISPR cas9 on-target Knockout Efficacy Prediction 2020

- Supervisor: Dr. Atif Hasan Rahman, Assistant Professor, Department of CSE, BUET
- Programming Language: Python; Framework: Keras; [Source Code]
- **Dataset**: DeepHF Dataset (Containing 59,000 gRNAs with corresponding 21mers)
- **Project Description**: The experiment was conducted for 3 cas9 variants: WT-SpCas9, eSpCas9 and SpCas9-HF1. We used two basic methods for preparing the input instance: One hot encoding and learning word embeddings using shallow neural networks. For training our dataset, we experimented with many different deep learning models like: Simple CNN model, CRNNCrispr seq branch only, LSTM, GRU, Bi-LSTM, Bi-LSTM with Attention and Hierarchical Attention Networks (HAN). For the test set, we evaluated the Spearman Correlation co-efficients for all three variants and for Bi-LSTM with Word2Vec, the results were: 0.8516, 0.8349 and 0.8303 respectively.

Drug-Target Interaction Prediction using Graph Neural Networks 2021 - present

- Supervisor: Dr. Md. Shamsuzzoha Bayzid, Associate Professor, Department of CSE, BUET
- Programming Language: R; Framework: Keras
- **Dataset**: DrugBank and Yamanashi
- **Project Description**: This project is in progress. We are using an Autoencoder to form a compressed representation of the input since the State-of-the-Art discards a lot of drug-categories leading to loss of information. We are also experimenting with Attention with GNN to train the dataset.

Online Service Provider Website 2019

- Supervisor: Dr. A. B. M. Alim Al Islam, Professor, Department of CSE, BUET
- Programming Language: Python; Framework: Django; [Source Code]
- **Project Description**: This involves four subsystems in total: account subsystem, verification subsystem, order subsystem and feedback subsystem. Services are divided into categories and service providers can upload their commercial content from their accounts. Customers can order any service from (one or more) service providers and add them to their carts. Admins are responsible for customer service and account verification. Customers can provide feedback to service providers for their services. Customers are given the option of chatting with service providers.

Refugee Camp Management System 2017

- Supervisor: Nazmus Saquib, Assistant Professor, Department of CSE, BUET
- Programming Language: Java; [Source Code]
- **Project Description**: This project is focused on creation and management of a large database that allows the storage of personal and medical details of the refugees in a camp. Information of doctor appointments, prescriptions etc. are also stored in the database. The system can store and manage information about camp volunteers as well.

GRE Mock Questions Generator 2016

- Supervisor: Md. Shariful Islam Bhuyan, Assistant Professor, Department of CSE, BUET
- Programming Language: Java; Application Framework: JavaFX [Source Code]

- **Project Description**: The system allows a mock test taker to sit for preparation exams and view their scores. This is a server-client system where the server hosts the GRE question bank and details of the client account. The client gets to choose the difficulty level, and the test ends once the fixed time is up. The score is shown to the client along with the correct answers.

Harry Potter Maze Game 2016

- Supervisor: Mohammed Kaysar Abdullah, Former Lecturer, Department of CSE, BUET
- Programming Language: C (igraphics); [Source Code]
- **Project Description**: This is a simplistic one-player maze game with 7 levels. Obstacles can appear dynamically at any point of movement. The player has to avoid all the obstacles and reach the exit.

Working Experience

Lecturer (Full-time), Department of Computer Science and Engineering Feb 2021 – Present
United International University [Faculty Profile] *Madani Ave, Dhaka*

- **Courses taught by me**: Object Oriented Programming, System Analysis and Design, Database Management Systems, Software Engineering Laboratory

English News Presenter (Part-time), Bangladesh National Radio 2017 – 2021
Bangladesh Betar *Agargaon, Dhaka*

Leadership Experience

Former General Secretary, BUET Debating Club 2019 – 2020
Former President, Viqarunnisa Noon Debating Club 2018 – 2019
Former Vice President (Quiz & Olympiad), Viqarunnisa Noon English Language Club 2016 – 2017

Achievements and Awards

University Merit Scholarship, Bangladesh University of Engineering and Technology 2019
Champion, East West University English Debate Tournament 2018
Dean's List Scholarship, Bangladesh University of Engineering and Technology 2018
Representative of BUET Debating Club, World Universities Debating Championship, Netherlands 2017
Merit Talent Scholarship, Higher Secondary School Certificate, Dhaka Education Board 2015
Finalist, BUET Interschool English Debate Tournament 2014
Finalist, AIUB Interschool English Debate Tournament 2014
Finalist, BRAC Women's Open English Debate Tournament 2014
Octo-finalist, Asia World Schools Debating Championship, Bangkok, Thailand 2013
Champion, BUET Interschool English Debate Tournament 2012
Champion, Interschool English Extempore Speech, VNSC Science Festival 2012
Finalist, Interschool Astro Olympiad, VNSC Science Festival 2011, 2012
Representative of Bangladesh, National Children's Science Congress, Jaipur, India 2011
Finalist, Interschool Sudoku Competition, VNSC Science Festival 2010, 2013
Champion, Science Project Display, VNSC Science Festival 2008, 2010
Champion, Interschool Astro Olympiad, VNSC Science Festival 2009

Technical Skills

Languages: Java, Python, R, C, C++, SQL, HTML, MATLAB, Intel 8086 Assembly Language; **Frameworks**: Keras, Django, OpenGL; **Developer Tools**: Git, VS Code, Codeblocks, Netbeans, Eclipse, Atmel Studio, Latex; **Libraries**: Pandas, NumPy, Matplotlib, SciPy, Scikit-Learn, Tensorflow; **Miscellaneous**: Microsoft Office, Powerpoint, Excel, Word

References

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[URL], [Google Scholar], [Researchgate]