NUSRAT JAHAN MOZUMDER

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EDUCATION

Ph.D., Computer Science August 2020-Present
University of Virginia (UVa)
B.Sc., Computer Science and Engineering February 2013-September 2017
Bangladesh University of Engineering and Technology (BUET) 3.53 GPA

EXPERIENCE

Graduate Research Assistant, LessLab, University of Virginia August 2020-Present

- Advisor: Professor Matthew B. Dwyer
- Research Area: DNN Testing and Validation, Image processing, Large Language Models in AI system Validation, Requirement Driving Testing.

Graduate Teaching Assistant, Department of CS, University of Virginia August 2022-Present

- Course Assisted: Compilers (CS4620), Artificial Intelligence (CS4710), Machine Learning (CS4774), The Origin of Neural Networks (CS1501)
- Responsibilities: Helping students with their materials and grading their assignments.

Lecturer, Department of CSE, Notre Dame University Bangladesh January 2018-December 2020

- Course Instructed: Computer Security, Pattern Recognition, Database, Object-oriented Programming, Data Communication, Operating System, Computer Network, Data Structure
- Academic Mentor: provided academic guidance to students and supervised their research projects related to machine learning and software development

Lecturer, Department of CSE, Southeast University, Bangladesh October 2017-January 2018

- Course Instructed: Object-oriented Programming, Operating System, Computer Network, Data Structure

Undergraduate Research Assistant, Department of CS, BUET July 2016-Sepetember 2017

- Advisor: Professor Tanzima Hashem
- Research Area: Genomic Data Privacy

PUBLICATIONS (GOOGLE SCHOLAR)

1. **Training for Verification: Increasing Neuron Stability to Scale DNN Verification**
   Dong Xu, Nusrat Jahan Mozumder, Hai Duong, Matthew B. Dwyer

   30^{th} International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS24)

2. **Towards Privacy-preserving Authenticated Disease Risk Queries**
   Nusrat Jahan Mozumder, Maitraye Das, Tanzima Hashem, Sharmin Afrose, Khandakar Ashrafi Akbar

   Journal of Information Processing 27. pages:624-642, January 2019

3. **A Novel Secret Sharing Approach for Privacy-Preserving Authenticated Disease Risk Queries in Genomic Databases**
   Maitraye Das, Nusrat Jahan Mozumder, Sharmin Afrose, Khandakar Ashrafi Akbar, Tanzima Hashem

   IEEE 42nd Annual Computer Software and Applications Conference (COMPSAC). Volume:1. pages:645-654. 2018. Tokyo, Japan

RESEARCH PROJECTS

1. **Text to Image Mapping Using Pretrained Generative Models for efficient Test Suit Generation**
   Although generative models efficiently generate images with feature diversity, it is difficult to control the diversion. This project addresses the issue and aims to facilitate a model that uses natural language to predict the input vector of a generative model with desired feature diversity, thus providing a more suitable way to generate a test suit of certain criteria.
2. **Increasing Neuron Stability to Scale DNN Verification**
   This project addresses the complexities of DNN verification that arises because of neuron instability. We developed two novel techniques named as Bias Shaping (targets a neuron's bias) and Stable Pruning (prunes the unwanted unstable neuron) to increase a network's neuron stability. Experiments showed that these techniques enhance DNN verification and also are adaptable with other techniques.
3. **Identification of Relevant Latent Subspace for Efficient Neural Network Validation**
   The latent space of a generative model captures essential features from the input domain in a compact manner. Hence, using latent representation of a complex input data distribution as a replacement reduces the computational complexity as well as the risk of out-of-distribution data. This project identifies the subsets within the latent space that are relevant to a specific problem, offering more reduction in data and computation complexity.
4. **Towards Privacy-preserving Authenticated Disease Risk Queries in Genomic Databases**
   A disease risk query returns the probability of a patient to develop a particular disease based on her genomic and clinical data that needs to be carefully handled in a privacy-preserved environment. We proposed a novel secret sharing architecture that provides a fully privacy-preserved environment and authenticates the correctness of the generated result. Our architecture uses distributed database and ensures that no party apart from the patient can access any sensitive information while contributing in the query assessment.

PROJECTS SUPERVISED

- **Crime Pattern Identification and Prediction using Data Mining Tools**
  This project proposed a model that predicts the crime rate of an area with the probable steps to reduce the rate.
- **Coinex: Financial Tracker**
  A financial tracker software which helps a person to keep track of his own income and expense records. The desktop version of this software was developed using C#, WPF and MS SQL server while HTML, CSS, JavaScript, PHP and Firebase were used for its web app version as well as HTML, CSS, Bootstrap and Javascript were used to make its advertisement site.

SERVICES

Chair, Computer Science Graduate Student Group (CSGSG), UVa January 2023 - December 2023

- Organised the CSGSG and coordinated among it's officers
- Represented students and their issues in front of the faculties
- Arranged multiple events, including research symposium, outdoor activities, and social hour.

Mentoring Chair, Computer Science Graduate Student Group (CSGSG), UVa January 2021 - December 2021

- Provided support to new students and connected them to older students for further help

Media Chair, Association of Bangladeshi Students (ABS), UVa August 2022 - July 2023

- Managed the ABS social accounts, updated them with recent news, facilitated proper arrangement for pictures and videos in every event

Reviewer, 4^{th} International Conference on Networking, Systems and Security (NSysS 2017),

- Reviewed papers that were submited to the conference

Event Director, Bangladesh Women of Computer Science and Engineering (BWCSE), BUET

- Organised several events for BWCSE

AWARDS AND SCHOLARSHIPS

- Best Poster Award at UVa Research Symposium 2024

- End-of-Year Computer Science Department Outstanding Service Award, UVa (2021-2022)
- PhD Fellowship, Department of CS, UVa, 2020
- Best Paper Award in 2018 IEEE 42nd Annual Computer Software and Applications Conference (COMPSAC), Tokyo, Japan, 2018
- 1^{st} Runner Up, Intra-University Idea Contest, Organized by Department of CSE, BUET, 2015
- Board Merit Scholarship for outstanding result in Higher Secondary School Certificate Exam, 2012

TECHNICAL SKILLS

- **Programming:** C, C++, Java, Python
- **Machine Learning Tools:** Pytorch, Tensorflow, Keras, scikit-learn, WEKA
- **Database:** Oracle, MySQL
- **Version Control:** git
- **Hardware:** ATmega32 - Atmel Corporation, Arduino
- **Others:** MatLab, Prolog, Shell Script, Latex