Farhat Lamia Barsha

Cookeville, Tennessee • fbarsha42@tntech.edu • (931)-252-9387 • https://www.linkedin.com/in/farhat-lamia-barsha-2b7260182/

EDUCATION

PhD in Computer Science **August 2021 – May 2027**
Tennessee Technological University • Cookeville, Tennessee

Masters (MS) in Computer Science **August 2021 – May 2024**
Tennessee Technological University • Cookeville, Tennessee
CGPA: 3.56/4.00

Bachelor of Science (BSc) in Computer Science and Engineering **February 2016 – January 2020**
Bangladesh University of Professionals • Dhaka, Bangladesh
CGPA: 3.46/4.00

SKILLS

Languages: Python, C, C++, Java, HTML, Go, Bash, Assembly, LATEX.
Databases: MySQL, Oracle, Firebase, SQLyog.
Libraries: NumPy, Pandas, Scikit-learn, TensorFlow, OpenCV.
Techniques: Static Analysis, Concolic Testing, Fuzzing, Compliance Testing.
Frameworks: Docker, tfsec, Terraform, Terratest, Android Studio, Blender.
Microsoft Tools: Excel, PowerPoint, Word

ONGOING RESEARCH

Detection, Mitigation and Explanation of Mode Collapse in Generative Adversarial Networks

The objective of this research is to address the mode collapse issue in GANs by designing an approach for early mode collapse detection, adjusting the training process through hyperparameter tuning, loss functions adjustment along with the GAN architectural changes to mitigate the issue, and utilizing explainable AI to evaluate the effectiveness of the mitigation strategy.

WORK EXPERIENCE

Graduate Teaching Assistant **August 2022 – Present**
Tennessee Technological University
• Helping students on Lab, handling group projects, proctoring examinations, monitoring student's participation, grading assignments, exams etc.
Course: Data Structure and Algorithms, Software Engineering I, Software Engineering II.

Graduate Research Assistant **August 2021 – May 2022**
Tennessee Technological University
• Performed multi-vocal literature review over Defect Categorization in Compilers to help researchers identify latent defects in compilers by conducting a review of Internet artifacts and peer-reviewed publications that study defect characteristics of compilers.
• Worked on bugs and vulnerabilities identification in the Ansible compiler to ensure compiler quality. Methodology includes identifying bugs and vulnerabilities in the Ansible compiler, categorize them and calculate frequency of those bugs and vulnerabilities category.

AI/ML Developer Intern for Infrastructure-as-Code Research **May 2022 – August 2022**
Wind River, California, USA
• Worked on a project titled "Static analysis of IaC using tfsec" where my responsibility was to do literature review over IaC scripts and develop a system to address all tfsec warnings from terraform code systematically so that developers don't need to find out high severity warnings manually.

Jr. Software Quality Assurance (SQA) Engineer **January 2021 - June 2021**
Progoti Systems Ltd, Bangladesh
• Performed test planning, executed different types of testing (unit testing, API testing etc) and do documentation of test cases, test results.
• Worked on identifying and documenting defects in user experience, usability, process flows, functionalities, prepare and review technical documents, attend daily scrum.

PROJECTS

- **Mode Collapse Detection Strategies in Generative Adversarial Networks for Credit Card Fraud Detection**
  This research addresses the vital need for accurate mode collapse detection in GANs to enhance credit card fraud detection. Employing GANs for numerical data generation, the comprehensive framework utilizes various evaluation measures, including loss metrics, Wasserstein Distance, precision, recall, and visualization tools to detect mode collapse. The introduction of an early alert mechanism allows timely intervention and modifications to the training process, optimizing GAN training and improving synthetic data quality.

• Credit Card Fraud Detection with Machine Learning Techniques

This study compared Logistic Regression, Gaussian Naive Bayes, and deep learning algorithms (ANN, CNN, GAN) for credit card fraud detection. Deep learning techniques outperform traditional machine learning algorithms, and GAN emerges as a promising choice among all other methods due to its high accuracy and advantageous precision-recall trade-off.

• Deep learning-based Anomaly Detection in Credit Card Transactions

This study demonstrates remarkable results on the performance of CNN and ANN in credit card fraud detection using a balanced dataset. The CNN algorithm demonstrates exceptional proficiency in reducing instances of false positives, which confers a significant benefit in safeguarding the authenticity of legitimate transactions. On the other hand, the ANN algorithm exhibits superior performance in minimizing false negatives, thereby enhancing the effectiveness of security measures.

• Defect Categorization in Compilers: A Multi-vocal Literature Review

The goal of this research is to help researchers to gain an understanding of compiler bug- related research by doing a multi-vocal literature review. This research work talks about different categories of compiler bugs, differences between them, current status of bugs, techniques to solve those bugs and most importantly represent research gap between academic and professional research over compiler bugs.

• An IOT based Automated Door Accessing System for Visually Impaired People

This project proposed a conceptual framework to develop an automated door access system. A prototype for the proposed system was developed integrating features like visitor authentication using face recognition, voice command to open door, suspicious activity detection using audio alert and recognizing harmful objects visitors may carry using object and metal detection. This proposed system will reduce the dependency of a visually impaired person and give them a sense of self sufficiency while strengthening security at home.

• Dimensionality Reduction based Colour Image Watermarking in Frequency Domain using Integrated Transformation Techniques

The objective of this work is to develop a modified algorithm for colored image watermarking based on fractional dual-tree complex wavelet transform using principal component analysis and singular value decomposition.

PUBLICATIONS

Google Scholar Profile: https://scholar.google.com/citations?user=FZk4QcYAAAAJ&hl=en

1. **Barsha, Farhat Lamia**, and William Eberle. "Mode Collapse Detection Strategies in Generative Adversarial Networks for Credit Card Fraud Detection." The International FLAIRS Conference Proceedings. Vol. 37. 2024.
2. Rahman, Akond, Dibyendu Brinto Bose, **Farhat Lamia Barsha**, and Rahul Pandita. "Defect Categorization in Compilers: A Multi-vocal Literature Review." *ACM Computing Surveys* 56, no. 4 (2023): 1-42.
3. Akond Rahman, **Farhat Lamia Barsha**, Patrick Morrison, Shhh!: 12 Practices for Secret Management in Infrastructure as Code. In 2021 IEEE Secure Development Conference (SecDev) (pp. 56-62). IEEE.
4. Md Jobair Hossain Faruk, Hossain Shahriar, Maria Valero, **Farhat Lamia Barsha**, Shahriar Sobhan, Md Abdullah Khan, Michael Whitman, Alfredo Cuzzocrea, Dan Lo, Akond Rahman, Fan Wu (2021, December). Malware Detection and Prevention using Artificial Intelligence Techniques. In 2021 IEEE International Conference on Big Data (Big Data) (pp. 5369-5377). IEEE.
5. Vara Vundavalli, **Farhat Lamia Barsha**, Mohammad Masum, Hossain Shahriar, Hisham Had- dad, (2021, December). Malicious URL Detection Using Supervised Machine Learning Techniques. In 2021 IEEE International Conference on Big Data (Big Data) (pp. 5369-5377). IEEE.
6. **Farhat Lamia Barsha**, Zarin Tasneem, Sanzida Mojib, Masuda Afrin, Nusrat Jahan, Marzouka Tasnim, Umma Habiba, Muhammad Nazrul Islam, "An IoT based automated door accessing system for visually impaired people" in 2019 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), 2019, pp. 1–4 [**Received "BEST PAPER AWARD" from IEEE WIECON ECE 2019**]
7. Zarin Tasneem, **Farhat Lamia Barsha**, Arnab Pal, "Dimensionality reduction based colour image watermarking in frequency domain using integrated transformation techniques" in 2019 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON- ECE), 2019, pp. 1–4. [**Received "BEST STUDENT IN RESEARCH WORK - 2019" award of ECE from MIST**]
8. **Farhat Lamia Barsha**, Zarin Tasneem. "Bestow: A location-based mobile application for religious donors in context of Bangladesh," in 2019 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), 2019, pp. 1–4.
9. **Farhat Lamia Barsha**, Hossain Shahriar. "Mitigation of Malware Using Artificial Intelligence Techniques: A Literature Review," in Security Engineering for Embedded and Cyber- Physical Systems, 2022, pp. 221-234.

AWARDS | LEADERSHIP SKILLS

• Received "**BEST POSTER AWARD**" in Research and Creative Inquiry Day-2024 of Tennessee Tech University.
• Received "**BEST STUDENT IN RESEARCH WORK - 2019**" of ECE faculty from Military Institute of Science and Technology.
• Attained "**BEST PAPER AWARD**" from IEEE WIECON-ECE 2019 in Bangalore, India.
• Received **Bangladesh-Sweden Trust Fund Scholarship** in 2022.

LICENSES & CERTIFICATIONS

• Responsible Conduct of Research for Engineers - CITI program.
• Social and Behavioral Responsible Conduct of Research - CITI program.
• Human Subjects Research (including privacy) - CITI program.