MOHAMMAD SHAMIM AHSAN

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EDUCATION

Bangladesh University of Engineering & Technology (BUET) March 2018 - May 2023
B.Sc in Computer Science and Engineering (CSE) CGPA: 3.64/4.00
Thesis Title: "*Detecting Smart Home Device Activities Using Packet-level Signatures from Encrypted Traffic*"

St. Joseph Higher Secondary School, Dhaka, Bangladesh July 2015 – July 2017
Higher Secondary Certificate (HSC), Division of Science GPA: 5.00/5.00 (90.3%)

Bangladesh Navy School and College, Chittagong, Bangladesh January 2013 - April 2015
Secondary School Certificate (SSC), Division of Science GPA: 5.00/5.00

RESEARCH INTEREST

Cybersecurity and Privacy, focusing on developing machine learning (ML) and deep learning (DL) methods in
- ➔ Computer security
- ➔ Network security
- ➔ IoT security
- ➔ Web security
- ➔ Mobile and Browser security

WORK EXPERIENCE

United International University, Dhaka, Bangladesh September 2023 - Present
Lecturer
Department of Computer Science and Engineering (CSE)

Presidency University, Dhaka, Bangladesh July 2023 - September 2023
Lecturer
Department of Electrical and Computer Engineering (ECE)

Bangladesh University of Engineering & Technology 2022 - 2023
Undergraduate Research Assistant
Department of Computer Science and Engineering

WORK UNDER REVIEW

★ ***Mohammad Shamim Ahsan***, Md. Shariful Islam, Md. Shohrab Hossain, Anupam Das, "Detecting Smart Home Device Activities Using Packet-level Signatures from Encrypted Traffic," *IEEE Transactions on Dependable and Secure Computing* ***(IEEE TDSC)***.

PUBLICATION

★ ***Mohammad Shamim Ahsan***, Abu Reyan Ahmed, Md. Saidur Rahman, **"**Randomization in Double Coverage Algorithm on a Line for Online *k*-Server problem**,"** Symposium Digest, *IEEE Computer Society Bangladesh Chapter Summer Symposium* ***(IEEE CS BDC SS)*** *2023.*

RESEARCH EXPERIENCE

Bangladesh University of Engineering & Technology (BUET) May 2022 - August 2023
Title: Detecting Smart Home Device Activities Using Packet-level Signatures from Encrypted Traffic
Undergraduate Research Assistant
Supervisor: Dr. Md. Shohrab Hossain (BUET) Collaborator: Dr. Anupam Das **(NC State University, USA)**

- Developed a "*packet-based signature generation & detection system*" capable of identifying specific events associated with IoT devices by extracting features from raw encrypted network traffic.
- The significance of this work lies in determining the extent to which smart home IoT devices are vulnerable to active and passive network attacks, where even knowledge of the devices in a household can enable targeted attacks.
- The existing state-of-the-art technique for packet-level signatures relies on packet inter-arrival time, leading to inaccuracies when the traffic rate fluctuates significantly. It treats multi-type events as separate binary events during training, resulting in suboptimal detection.
- Overcame these limitations by developing a non-interval-dependent approach that automatically identified the optimal packet threshold for generating unique signatures. This ensured resilience to network jitters and efficient handling of both binary and multi-type events.
- Evaluated our signatures' effectiveness, uniqueness, and correctness using four well-known public datasets (*PINGPONG*, *UNSW*, *YourThings*, *Mon(IoT)r*), verifying known signatures and discovering new ones.
- Achieved an average recall and precision of 98-99% and 98-100%, respectively, demonstrating the effectiveness of our approach in detecting user activities of IoT devices at the packet level.

Bangladesh University of Engineering & Technology January 2023 - June 2023
Title: Randomization in Double Coverage Algorithm on a Line for Online *k*-Server problem
Undergraduate Research Assistant
Supervisor: Dr. Md. Saidur Rahman (BUET) Collaborator: Dr. Abu Reyan Ahmed **(University of Arizona, USA)**

- *Double Coverage (DC) Line* algorithm is a deterministic algorithm for online *k*-server problem which is proved to be *k*-competitive. Developed two randomized variants (*RAND, SEMI-RAND*) of the DC Line algorithm and analyzed their probabilities of being *k*-competitive**.**
- Used the *Potential Function Method* and *Interleaving Move Style* for competitive analysis of the algorithms.
- Studied diverse exact and approximate algorithms, randomized algorithms, online algorithms, heuristics, metaheuristics, and low-memory algorithms.

ACADEMIC PROJECTS

TCP CERL: congestion control enhancement over wireless networks (Networking project) February 2022
Network Simulator 3 (***NS3***), C, Python Github

- Explored the *TCP-CERL* technique to enhance congestion control which is a sender-side modification of *TCP-Reno*.
- Implemented this technique in NS3 *which was not done before* (authors used NS2). Tested on two wireless networks: *Wi-Fi* and *LR-WPAN* using various performance metrics such as throughput, end-to-end delay, and packet delivery ratio.

Image Caption Generator using CNN and LSTM (Deep Learning project) February 2023
Python, *Flickr_8k* dataset Github

- *CNN* was used to extract features from an image. Then, *LSTM* used these features to help generate a caption of the image.
- Implemented *Greedy* and *Beam* search strategies, and evaluated the accuracy of generated captions using metrics like *BLEU, METEOR*.

Spacey: Online Space Rental Platform (Software Development project) August 2022
MongoDB, Express.js, React.js, Node.js, CSS Github, Github, Demo

- Developed an online space (both personal and business) rental platform with *a team of 3 people*.
- Designed BPMN, Mock UI (using *Figma*), Class, ER, Sequence, and Collaboration diagrams.
- Used *MERN* stack for development and *Stripe* gateway for mobile banking payment methods.

MediSheba (Database project) October 2020
Django, HTML, CSS, Oracle SQL Github, YouTube

- Developed an online medical system with *a team of 3 people*, where Django was used as a framework in the Backend and HTML, CSS as Frontend with an Oracle-based database.

MAJOR ASSIGNMENTS

➔ ***SEED-LABS Attacks*** Github, Demo(CSRF), Demo(XSS), Demo(SQL Injection)
Implemented some SEED-LABS attacks such as **Buffer overflow**, **CSRF**, **XSS**, **SQL injection**, and **Morris worm** attacks.

➔ **Security Tool Presentation — *"Frida: A dynamic code instrumentation tool"*** Demo
— Inspected functions on calling, modified their arguments, and did custom calls to functions inside a target process
— Set up an Android device with Frida server and did function tracing on the device
— Hacked Android app using Frida

➔ ***Bangla Handwritten Character Recognition using CNN*** Github
Implemented CNN model from *scratch* using Python and tested on the *NumtaDB* dataset.

SKILLS

❖ **Languages**	C, C++, Java, Python, Shell Script, JavaScript, SQL
❖ **Frameworks**	Django, React.js, Express, Node.js
❖ **Databases**	Oracle, MongoDB
❖ **Web Technologies**	HTML, CSS, Bootstrap
❖ **Operating Systems**	Windows, Ubuntu, WSL
❖ **Technical Writing**	LaTeX, Beamer, Overleaf
❖ **Others**	Git (GitHub), NS3, XV6, Docker, OpenGL, MS Word, MS Excel, MS PowerPoint

AWARDS

★ **Dean's List Award,** Bangladesh University of Engineering & Technology, 2022- 2023
For outstanding academic performance in 4th year (with average GPA: 3.97/4.00)
★ **National High School Merit Scholarship,** by the Government of Bangladesh, 2017- 2022 (Region position: 83)
★ **National Elementary School Merit Scholarship,** by the Government of Bangladesh, 2015- 2017 (Region position: 135)

PRESENTATION

- Conference presentation in IEEE Computer Society Bangladesh Chapter Summer Symposium (IEEE CS BDC SS) 2023, Topic**:** Randomization in Double Coverage Algorithm on a Line for Online *k*-Server problem. (Certificate)