

# MOHAMMAD SHAMIM AHSAN

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## EDUCATION

**Bangladesh University of Engineering & Technology**

*Bachelor of Computer Science and Engineering*

Department of Computer Science and Engineering

April 2018 - May 2023

CGPA: 3.64/4.00

**St. Joseph Higher Secondary School, Dhaka**

*Higher Secondary Certificate (HSC)*

Division of Science

July 2015 - July 2017

GPA: 5.00/5.00 (90.3%)

**Bangladesh Navy School and College, Chittagong**

*Secondary School Certificate (SSC)*

Division of Science

January 2013 - April 2015

GPA: 5.00/5.00

## RESEARCH INTEREST

**Cybersecurity and Privacy**, focusing on Web security, Social aspects of security, Computer and Network Security

## WORK EXPERIENCE

**Lecturer**

Department of Electrical and Computer Engineering (ECE)

Presidency University, Dhaka, Bangladesh

July 2023 - Present

**Undergraduate Research Assistant**

Department of Computer Science and Engineering

Bangladesh University of Engineering & Technology

2022 - 2023

## WORK IN PROGRESS

★ **[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)**

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, including binary-type and multi-type events, 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, PINGPONG (NDSS 2021), 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**

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 (**Colgate University, USA**)

- Double Coverage (DC) Line* algorithm is a deterministic algorithm for online  $k$ -server problem which is proved to be

January 2023 - June 2023

$k$ -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 exact and approximate algorithms, randomized algorithms, online algorithms, heuristics, metaheuristics, and low-memory algorithms.

## ACADEMIC PROJECTS

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

- Explored the *TCP-CERN* technique to enhance congestion control which is a sender-side modification of *TCP-Reno*.
- Whenever 3 duplicate acknowledgments are received, TCP-CERN attempts to distinguish between random loss and congestive loss and treats both cases differently.
- Implemented this technique in NS3 *which was not done before* (authors used NS2). Tested on two wireless networks: *Wi-Fi* and *LR-WPAN*. Calculated 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](#)

- Recognized the context of an image and annotated it with relevant captions using *deep learning* and *computer vision*.
- *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 *BLEU* and *METEOR* metrics.

**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 doctor, patient, and blood bank were the main modules.
- Used Django as a framework in Back-end and HTML, CSS as Front-end. The (Oracle-based) database of the project was designed extensively following the relevant ER diagrams.

## 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 4<sup>th</sup> year (with average GPA: 3.97/4.00)
- ★ **Government Scholarship, Bangladesh**, in Higher Secondary Certificate Examination, 2017- 2022 (Region position: 83)
- ★ **Government Scholarship, Bangladesh**, in Secondary School Certificate Examination, 2015- 2017 (Region position: 135)
- ★ **College Final Examination**, 2016 (Merit position: 1, in the whole college)

## 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. [\[Certificate\]](#)