Md. Ahsan Ayub

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Education

Tennessee Tech University — Cookeville, TN
Ph.D. Student in the Department of Computer Science. CGPA 3.93/4.00. — *Aug 2018 – Dec 2022*

Experience

Graduate Research Assistant — Aug 2018 – Present
Cybersecurity Education, Research & Outreach Center (CEROC) — *Cookeville, TN*

- Contributed to the experimental research of both static and dynamic malware analysis for ransomware to propose multi-layered endpoint protection by incorporating Data Science, Machine Learning, and Reverse Engineering techniques.
- Partnered with the external security researchers in industry, U.S. national labs, and other universities in a collaborative research environment to initiate and review the research project, perform experiments, and analyze the empirical findings.

Graduate Teaching Associate — Aug 2021 – Present
Department of Computer Science, Tennessee Tech University — *Cookeville, TN*

- Instructed a class of 75+ students to teach Introduction to Problem Solving and Programming in C++ in Fall 2021.
- Developed class materials, exam/quiz questions, and programming assignments/challenges; initiated automated programming assessments with online judging tools; and managed online quizzes and grading.

Software Project Manager — Feb 2017 – July 2018
Appinion BD Limited — *Dhaka, Bangladesh*

- Led the software development and UI/UX team to a successful launch of a learning app (Android & Web) with 1,500+ users for the sales department of one of the renowned pharmaceutical companies, *Renata Limited* (Operated by Pfizer until 90s).
- Partnered with the largest NGO in the world, *BRAC*, to automate the business process of *Human Rights and Legal Aid Services*; conceptualized the software development scope to facilitate nationwide adaptation of digitization.

Projects

Static Analysis of Ransomware to Find Similarities on PE File Metadata — Nov 2020 - Jul 2021

- Identified a unique list of suspicious indicators on the generated Portable Executable (PE) file metadata of 727 active ransomware samples based on the exploratory data analysis tasks and our domain knowledge.
- Applied One-Class Classification techniques on several feature spaces, including Imports, Libraries, and PE Sections, to find out the similarities and achieved 10.04% of testing error with the Local Outlier Factor algorithm.

I/O Request Packet (IRP) Logs Driven Ransomware Detection — Mar 2020 - Sep 2020

- Extracted data-driven encryption patterns based on time series analysis through IRP, a low-level file system I/O logs, to detect unseen ransomware samples within 15 mins of execution (testing error of 6.25%) by using One-Class SVM algorithm.
- Constructed Neural Networks architecture using Keras to effectively detect IRP logs of 21 ransomware families and achieved accuracy, precision, recall, and F_1 scores in the range of $99.7\% \pm 0.2\%$.

Adversarial Machine Learning on network-based Intrusion Detection System — Sep 2019 - Jan 2020

- Developed a Multilayer Perceptron (MLP) using Keras for an improved intrusion detection system (target) to launch the model evasion attack by sending adversarial network packets, crafted from the Jacobian-based Saliency Map method.

Parallelization of RSA Encryption Algorithm in High Performance Computing — Jun 2019 - Aug 2019

- Demonstrated significant performance improvements of the parallel implementation of RSA algorithm by using the OpenMP library comparing with its serial implementation (achieved 4.4 speed up with 8 threads).

Skills

Proficient with: Python, Object Oriented Programming (OOP), Full Stack Web Development, Git, Problem Solving, C/C++, Agile, MySQL, SQLite, Matplotlib, Scikit-learn, Network Analysis, and Software/Technical Documentation.
Familiar with: Android App Development, PHP, RESTful API, Software Design Patterns (e.g., MVC), and Cloud Computing.

Honors and Awards

- Best poster in the 2021 Student Research and Creative Inquiry Day (CS Graduate Track) at Tennessee Tech University.
- Represented (50+) Graduate Students in the Computer Science Strategic Planning Core Group during Spring 2021.

Leadership

President of the Computer Science Graduate Student Club at Tennessee Tech — Sept 2019 – Aug 2021

- Organized bi-weekly seminars to promote research environment and enable the club members to network and exchange ideas.

Certifications

- **Advanced SQL for Data Scientists**, issued on Feb 2021 by LinkedIn.
- **Learning Amazon Web Services (AWS) for Developers**, issued on Feb 2021 by LinkedIn.
- **Data Analysis and Visualization (Python)**, issued on Jun 2020 by Udemy.
- **Sequences, Time Series, and Prediction**, issued on Jun 2020 by DeepLearning.AI.
- **Neural Networks and Deep Learning**, issued on Feb 2020 by DeepLearning.AI.
- **Machine Learning A-Z: Hands-on Python & R in Data Science**, issued on Jun 2019 by Udemy.

Publications

- **M. A. Ayub**, S. Smith, A. Siraj, and P. Tinker, "Domain Generating Algorithm based Malicious Domains Detection," 2021 8th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)/2021 7th IEEE International Conference on Edge Computing and Scalable Cloud (EdgeCom), Washington DC, USA, 2021, pp. 77–82.
- **M. A. Ayub**, A. Continella, and A. Siraj, "An I/O Request Packet (IRP) Driven Effective Ransomware Detection Scheme using Artificial Neural Network," 2020 IEEE International Conference on Information Reuse and Integration (IRI), Las Vegas, NV, USA, 2020, pp. 319-324.
- **M. A. Ayub**, W. A. Johnson, D. A. Talbert, and A. Siraj, "Model Evasion Attack on Intrusion Detection Systems using Adversarial Machine Learning," 2020 54th Annual Conference on Information Sciences and Systems (CISS), Princeton, NJ, USA, 2020, pp. 1-6.
- **M. A. Ayub**, Z. A. Onik, and S. Smith, "Parallelized RSA Algorithm: An Analysis with Performance Evaluation using OpenMP Library in High Performance Computing Environment," 2019 22nd International Conference on Computer and Information Technology (ICCIT), Dhaka, Bangladesh, 2019, pp. 1-6.
- **M. A. Ayub**, S. Smith, and A. Siraj, "A Protocol Independent Approach in Network Covert Channel Detection," 2019 IEEE International Conference on Computational Science and Engineering (CSE) and IEEE International Conference on Embedded and Ubiquitous Computing (EUC), New York, NY, USA, 2019, pp. 165-170.
- **M. A. Ayub**, K. A. Kalpoma, H. T. Proma, S. M. Kabir and R. I. H. Chowdhury, "Exhaustive study of essential constraint satisfaction problem techniques based on N-Queens problem," 2017 20th International Conference of Computer and Information Technology (ICCIT), Dhaka, 2017, pp. 1-6.