Nengneng Yu

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EDUCATION

University of Maryland College Park　　　　　　　　　　　　　　　College Park, MD
Doctor of Philosophy in Computer Science　　　　　　　　　　　　　*Aug 2023 - Present*
Advisor: Zaoxing(Alan) Liu

Boston University　　　　　　　　　　　　　　　　　　　　　　　Boston, MA
Bachelor of Science in Computer Engineering　　　　　　　　　　　*Sep 2019 - May 2023*
Magna cum Laude, Highest honors in the major

PUBLICATION & WORKS

[1] Yajie Zhou*, **Nengneng Yu*** , Zaoxing Liu, " Towards Interactive Simulacra of Internet Investigation by Human Researchers", Hot Topics in Networks (HotNets), 2023

[2] Yajie Zhou, **Nengneng Yu**, Simiao Zuo, Yue Yu, Haoming Yi, Chao Zhang, Tuo Zhao, Zaoxing Liu, "SENTINEL: A Fine-Grained, Online Advanced Persistent Threats Detector with Transformer Model", Under Submission

WORKING & RESEARCH EXPERIENCE

Research Assistant　　　　　　　　　　　　　　　　　　　　　　Sep 2022 – Present
FROOT Lab, supervised by Professor Zaoxing(Alan) Liu　　　　　　　*College Park, MD*

- Researched on network and system related problems and applying robust algorithm on real world challenges.
- Designed, Implemented, and evaluated a generative AI system around Large language Model (GPT-4) that automatically collect information from internet to predict large network failures incidents. Compared the generated results with the conclusions of an existing ACM SIGCOMM paper on the impact of solar storms on Earth's network equipment and achieved a high level of consistency.
- Continued Red Hat's project, Further used the Transformer model to improve detection accuracy for Advanced Persistent Threat(APT). And through a series of innovative approaches to enhance the explainability and granularity of attacks analyzing.

Red Hat collaborative Research Assistant　　　　　　　　　　　　Feb 2022 – Sep 2022
Red Hat & Boston University　　　　　　　　　　　　　　　　　　*Boston, MA*

- Trying to find a generalized, systematic approach to detect Advanced Persistent Threat(APT), utilized both LSTM and Transformer model and compared the performances of different model backbone.
- Built custom data cleaning pipeline, which could help ignore unimportant tokens to reduce token noise and improve consistency across different data sets.
- Implemented a pre-process method that leverages directed graph and clustering to help better use the DARPA data set, solving the token number explosion problem.
- Designed and implemented a automatic tokenizer to solve the tokenization problem of system path, create a semi-supervised model training framework in order to handle the data lacking problem in real world scenario.

SERVICES

University of Maryland College Park Department of Computer Science　　　Aug 2023 - Present

- Graduate Teaching Assistant for CMSC414 Network and Security
- Graduate Teaching Assistant for CMSC250 Discrete Structure

Boston University College of Engineering　　　　　　　　　　　　Sep 2022 - Dec 2022

- Teaching Assistant for EC440 Operating System

Boston University College of Engineering　　　　　　　　　　　　Jan 2022 - May 2022

- Teaching Assistant for EC414 Machine Learning

COURSE PROJECTS

Accelerate Raychasing Using OpenMP Sep 2023 – Dec 2023

- The project focuses on improving the performance of the Octomap system, a prevalent mapping tool used in UAVs (Unmanned Aerial Vehicles) and robotics. The system was facing bottlenecks in its ray-tracing component.
- The objective was to identify and alleviate the bottleneck in the Octomap system to enhance the overall performance of UAV mapping.
- Implemented parallel computing techniques using the OpenMP library to accelerate the ray-tracing component of Octomap. This involved redesigning the original open-sourced system's workflow and data structure to allow for efficient parallel processing.
- The acceleration of the ray-tracing component led to a significant performance improvement: up to a 60.173% increase in ray-tracing speed with a guaranteed correctness.

eBPF Modularity Project Sep 2022 – Dec 2022

- Work with Professor from Brown University and IBM engineers to further their research on building a widely used eBPF module library.
- Run OPENED, the tool they developed that can be used to analyze and decompose eBPF programs, on top open-source projects to extract modules.
- Create a framework to transform the extracted module into a format with which Bumblebee tools can be run on it to create OCI images.
- Create a framework that adds "glue logic" to allow for integration of module with L3AF/Polycube.

Basic Unix-like Operating System Jan 2022 – May 2022

- Implemented a shell able to execute commands via system call, redirect the standard input/output (stdin/stdout) of commands to files, managing multiple commands piping, and background execution with "&".
- User-mode-only implementation of a subset of the POSIX threads API. Allowed the creation and execution of multiple threads, as well as their scheduling in a round-robin fashion.
- Worked on memory management at the thread level. Completed a copy-on-write (COW) thread local storage (TLS) allows threads to share data while ensuring that changes to internal data have no impact on other threads.