470 Durham Hall,
1145 Perry Street,
Blacksburg, VA

Mohannad Adel Ismail

linkedin.com/in/mohannad-adel-ismail
https://scholar.google.com/citations?user=WvWzQEIAAAAJ&hl=en

imohannad@vt.edu
mohannad.ismail.93@gmail.com
(+1) (540) 998-6885

EDUCATION

Virginia Polytechnic Institute and State University   Blacksburg, VA, USA
  PhD in Computer Engineering   2019 – 2024
   Research in system and software security. I am interested from both exploitation and defense perspectives. Specifically, utilizing the latest hardware security features to achieve memory safety.
   Supervised by Dr. Changwoo Min and Dr. Wenjie Xiong

Virginia Polytechnic Institute and State University   Blacksburg, VA, USA
  M.Sc. in Computer Engineering   2019 – 2021
   GPA 4.0/4.0
   Thesis: PACTight – Tightly seal sensitive pointers with Pointer Authentication (Published in USENIX Security 2022)

Mansoura University   Mansoura, Egypt
  B.Eng. in Communications and Information Engineering (Major in Computer Engineering)   2011 – 2016
   Distinction with honor degree, GPA 3.9/4.0 (Ranked 1st)
   Graduation Project: Leap: An outing social platform for Android (Grade: Excellent)

PUBLICATIONS

- Enforcing C/C++ Type and Scope at Runtime for Control-Flow and Data-Flow Integrity.
  Mohannad Ismail, Christopher Jelesnianski, Yeongjin Jang, Changwoo Min, and Wenjie Xiong.
  In Proceedings of the 29th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2024) [Major Revision]

- Protect the System Call, Protect (Most of) the World with BASTION.
  Christopher Jelesnianski, **Mohannad Ismail**, Yeongjin Jang, Dan Williams, and Changwoo Min
  In Proceedings of the 28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2023)

- Tightly Seal Your Sensitive Pointers with PACTight.
  Mohannad Ismail, Andrew Quach, Christopher Jelesnianski, Yeongjin Jang, and Changwoo Min.
  In Proceedings of the 31st USENIX Security Symposium (Security 2022)

- VIP: Safeguard Value Invariant Property for Thwarting Critical Memory Corruption Attacks
  Mohannad Ismail+, Jinwoo Yom+, Christopher Jelesnianski, Yeongjin Jang, and Changwoo Min.
  In Proceedings of the ACM Conference on Computer and Communications Security (CCS 2021)

- WITCHER: Systematic Crash Consistency Testing for Non-Volatile Memory Key-Value Stores
  Xinwei Fu, Wook-Hee Kim, Ajay Paddayuru Shreepathi, **Mohannad Ismail**, Sunny Wadkar, Changwoo Min, Dongyoon Lee.
  In Proceedings of the ACM SIGOPS 28th Symposium on Operating Systems Principles (SOSP 2021)

- POSEIDON: Safe, Fast and Scalable Persistent Memory Allocator
  Anthony Demeri, Wook-Hee Kim, Madhava Krishnan, Jaeho Kim, **Mohannad Ismail**, Changwoo Min.
  In Proceedings of the 21st ACM/IFIP International Middleware Conference (Middleware 2020)

TECHNICAL EXPERIENCE AND PROJECTS

- Project (1) – PACTight – Completed and published research project, providing robust and efficient memory safety to sensitive pointers using ARM's Pointer authentication mechanism. Published in USENIX Security 2022.
- Project (2) – Nvidia DOCA on Nvidia Bluefield-2 – Part of my 2nd internship at VMWare. Researching and implementing Nvidia DOCA offloads on Nvidia's SmartNIC, Bluefield-2. Proposed a possible framework for integrating DOCA into ESXi.
- Project (3) – Pointer Authentication in ESXi – Part of my internship at VMWare. Successful implementation and adding support for ARM's Pointer Authentication security feature in ESXi-ARM. Support includes detecting hardware support, initializing the keys with a pseudorandom generator, and configuring the registers. Support was added in the vmkernel.
- Project (4) – VIP: A research project (published in CCS 2021) that utilizes Intel Memory Protection Keys (MPK) to enforce efficient memory safety for security sensitive data. VIP is a custom LLVM-based compiler that automatically instruments source code and libraries.
- Project (5) – Attacking and evaluating the robustness of Federated Learning – A project that aims at attacking Federated Learning ML models and evaluating the robustness and degradation in accuracy.
- Project (6) - PAC-CFI: A control flow integrity (CFI) implementation that uses the latest ARM Pointer Authentication Code (PAC) hardware security mechanism.

- Project (7) – Linux Kernel CPU Profiler - A module that keeps track of the time spent for each task on the CPU and the call stack for each task. The profiling result was displayed using the proc filesystem. I also implemented a variety of data structures inside the kernel, including hash table, red black tree, radix tree, linked list and xarray.
- Project (8) – LLVM comprehensive compiler optimization framework from scratch including, Dataflow Analysis, Transformations and Region Analysis
- Project (9) – Leap: an outing social platform. An Android app that allows users to experience outings with friends in a unique way.
- Project (10) – Sala7ly - Android Handyman app.
- Project (11) – Internet radio application. Developed and sold to a local company in the city of Mansoura.

WORK EXPERIENCE

Software Engineer, Intern   Sunnyvale, CA, USA
Apple   05/2023 – 08/2023
- Member of the Security team in the Vision Products Group (VPG). Collaborated with many teams in VPG and in Apple.
- Enhancing data privacy by extending the LLVM compiler framework. Ported LLVM's DataFlowSanitizer to Darwin.
- Collaborating with various teams inside VPG and within Apple.

Graduate Research Assistant   Blacksburg, VA, USA
Electrical and Computer Engineering Department, Virginia Tech   08/2019 – Present
- Research in system security, memory protection and software compartmentalization. Currently working on memory protection against spatial and temporal memory attacks.
- Designing software protection techniques against a powerful threat model.
- Currently researching state-of-the-art memory safety, utilizing hardware assisted security features from ARM and Intel.

Member of Technical Staff, Intern   Palo Alto, CA, USA
VMWare   05/2022 – 08/2022
- Return offer, Member of the ESXi-ARM team
- Researched and deployed Nvidia DOCA SDK framework and architecture on Nvidia Bluefield-2.
- Drived weekly VMWare/Nvidia joint engineering call, focused on DOCA
- Experimented with various DPU offload capabilities, like host DMA, App security, regular expressions, etc., using DOCA
- Explored ESXi kernel capabilities specific to accelerator offload and proposed a reference architecture for potential DOCA integration with ESXi
- Explored Intel Mt. Evans Lookaside Crypto Engine (LCE) DMA capabilities and attended weekly meetings with Intel.

Member of Technical Staff, Intern   Palo Alto, CA, USA
VMWare   05/2021 – 08/2021
- Member of the ESXi-ARM team
- Implemented and added support for ARM's hardware security feature Pointer Authentication in ESXi-ARM. Support includes detecting hardware support, initializing the keys with a pseudorandom generator, and configuring the registers. Support was added in the vmkernel.
- Contributed a fix for ESXi-ARM on QEMU to QEMU open source.
- Participated in various tasks with the team and contributed to the ESXi source code.

Graduate Teaching Assistant   Blacksburg, VA, USA
Electrical and Computer Engineering Department, Virginia Tech   08/2019 – 01/2023
- Teaching and mentoring students, holding office hours and grading.
  - Fall 2019: ECE-4530 Hardware software co-design – Dr. Patrick Schaumont
  - Spring 2020: ECE-3054 Applied Electrical Theory
  - Fall 2022: ECE-5414G Advanced Linux Kernel Programming – Dr. Changwoo Min

Associate Project Manager   Cairo, Egypt
Product Delivery (International Markets), Mastercard   04/2019 – 08/2019
- Managed the delivery of the Mastercard Reward System (MRS) to Banque Du Caire:
  - Liaised with sales and marketing teams to align on time frames for product launch.
  - Manage communication between Mastercard HQ in Dubai and Banque Du Caire in Cairo.
  - Documented all issues in an issue log that effectively summarizes all initiated, pending and resolved issues.
  - Established time schedules with technical teams and followed up with them on progress to complete the tasks.

Teaching Assistant   Cairo, Egypt
College of Computing, Arab Academy for Science, Technology and Maritime Transport   02/2019 – 06/2019
- Taught two courses related to programming and software engineering.
  - Advanced Programming Applications
  - Introduction to Software Engineering.

Lecturer (Tenured)   Mansoura, Egypt
Computer Engineering Department, Faculty of Engineering, Mansoura University   07/2016 – Present

- Helping lecturers in teaching set of courses related to the Computer Science (CS) field such as Software Engineering, Android, Computer Programming, Computer Graphics, Artificial Intelligence, Multimedia.
- Supervising (as a secondary supervisor) a set of graduation projects related to the Computer Science, Control Systems, and IoT fields.

Online Android Tutor
UAE

One million Arab coders initiative by Sheikh Mohammed bin Rashid Al Maktoum, Udacity   01/2018 – 06/2019
- Engaging with students in a variety of ways for the initiative duration. These may include: Clearing problems with code syntax, and explanation of concepts that could be hard for some of them.

Android Freelance Developer
Egypt

Freelance   12/2015 – 08/2019
- Integrated several APIs such as Google Maps, Firebase, Social Platforms (Facebook, Twitter, etc.)
- Designed effective UML diagrams.
- Designed and built normalized, efficient databases using MySQL and NoSQL.
- Integrated the business aspects within the project, such as feasibility studies, market analysis, business model canvas

Software Engineer, Intern
Cairo, Egypt

Google, Mobile Application Launchpad (MAL)   02/2016 – 03/2016
- Training program for the Google MAL Initiative and competition. The focus was to train us with the latest tools in Android development through Google Employees, and training in the business aspects in relation to startups.

Junior Assistant to Sales Manager

AL-IEDAH Saudi Trading Est   02/2010 – 03/2011
- Assisted in developing and winning a bid for a trade agreement with Saudi Aramco.
- Assisted in developing the company inventory, including product descriptions and prices.
- Produced balance sheets using accounting software (Al-Ameen)
- Published advanced shipping notices (ASN) using Saudi Aramco logistics website.

SERVICE ACTIVITIES
- Reviewer: Computers and Security Journal
- External Reviewer, USENIX Conference on Operating Systems Design and Implementation (OSDI 2021)
- External Reviewer, USENIX Annual Technical Conference (ATC 2022)

COURSEWORK

ECE5414G – Advanced Linux Kernel Programming	CS4264 – Principles of Computer security
ECE5590 – System and software security	ECE5424 – Advanced Machine Learning
ECE5984 – Compiler Optimizations	CS6804 – AI technologies for Cybersecurity
ECE5510 – Multiprocessor Programming	CS6604 – Hot Topics in AI Cybersecurity
ECE5504 – Computer Architecture	

COMPUTER SKILLS

- **Computer languages:** C, C++, Bash, Python, Assembly, C#, JAVA, PHP, HTML, CSS, XML.
- **Compilers and tools:** GCC, Clang, LLVM, Make, CMake, Git
- **Project management:** Jira, Scrum, Agile epics, Git post and code review
- **Environments and IDEs:** Linux and Microsoft Windows, Android Studio, Microsoft Visual Studio, NetBeans, Eclipse.
- **Database Management Systems:** Microsoft SQL Server, MySQL, SQLite, NoSQL, and Firebase.
- **Other:** Linux Kernel Modules, Data structures and algorithms, Object Oriented Design using UML and BPMN, Software Engineering with Scrum, Android development with Android Studio, Office

LANGUAGE PROFICIENCY AND NATIONALITY
- Nationality: Egyptian
- Arabic ~ First/Mother language.
- English ~ Excellent/Fluent (TOEFL iBT: 110, IELTS: 8)

LEADERSHIP AND VOLUNTEERING EXPERIENCE
- Student and Engagement Campus Life (SECL) program evaluation committee - 2022
  - Studying the Council of Advancement Standards (CAS) for Higher Education standards.
  - Evaluating whether SECL meets those standards.
  - Regular meetings to discuss how to improve student engagement and confine to CAS.
- Individual student Mentoring:
  - Andrew Quach, Oregon State University – Undergraduate 2020, Graduate 2021

- Member of the Graduate Student of the year committee for 2021
- Member of the International Student Advisory Board (ISAB) at Virginia Tech since September 2020.
    - Convey the needs, questions, and issues of international students to the university.
    - Provide advice and feedback regarding different aspects concerning international students.
- Member of the Graduate Student Orientation Panel at Virginia Tech for the Spring 2021 orientation.
- Graduate Residential Fellow (GRF) at the Honors Residential Commons (HRC)
    - Living on-campus with students in East Ambler Johnston.
    - Mentoring students, serving as a role model, and building communities through conversation and engagement.
    - Worked closely with the student council, apartment fellows, resident advisors, the Faculty Principal, the Student Life Coordinator, student affairs staff and others to ensure that the goals and aspirations of the living learning community are met.
- Founding member and team leader of the CIEians group at Mansoura University:
    - Labview technical session by National Instruments
    - Seminar on "Software engineering in the enterprise" with Dell engineers.
    - Providing food to those in need during Ramadan, in collaboration with the Egyptian Food Bank