Chidera "Chi" Biringa

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Education

University of Massachusetts Dartmouth — MA, US

College of Engineering — Ph.D. in Engineering & Applied Science (Computer Science) — September 2021 - May 2025 (Expected)

- **Research Statement:** The objective of my research is to reduce attack surfaces vulnerable to adversarial exploits by preventing the accidental or intentional introduction of vulnerabilities in the design and development phases of the software development lifecycle. I have also conducted research in microarchitectural security and software performance.

University of Massachusetts Dartmouth — MA, US

College of Engineering — M.S. in Computer & Information Science — September 2019 - May 2021

- Graduate Research Award Recipient

Bells University of Technology — Ota, Nigeria

College of Natural and Applied Sciences — B.Tech. in Computer Science & Information Technology — November 2013 - May 2017

Professional Experience

College of Engineering - University of Massachusetts Dartmouth — September 2020 - Present

Graduate Research Assistant

- Developing **Security-in-the-Middle (SiTM):** Framework To Prevent the Introduction of Vulnerabilities During Software Development.
- Developing **GIT-VOMMIT:** A Subset of SiTM and Vulnerability State Integrated into Git for Preventing the Commit of Secrets in Transit to GitHub.
- Developed **SARA:** Exposing Mediocre Performance Code, **SPECDET:** Detecting Spectre Vulnerabilities and Attacks, **SEAL:** Secure Design Pattern Approach Toward Tackling Lateral-Injection Attacks, and **CADE:** Context-Aware Detection of Embedded Credentials.

NSA/DHS Cybersecurity Center (PAD Lab) — May 2020 - Present

Doctoral Student Fellow & Graduate Student Research Lead

- Conducted research on software performance and security, and open-world recognition for network intrusion detection systems.
- Mentored 3 students participating in the National Science Foundation-Undergraduate Research program from the University of Massachusetts Dartmouth, University of Maryland College Park, and Arizona State University in software vulnerability and user experience testing research.

Peer-Reviewed Doctoral Publications

- **Chidera Biringa** [1], Gaspard Baye and Gokhan Kul. 2022. "Static and Microarchitectural ML-Based Approaches For Detecting Spectre Vulnerabilities and Attacks" Hardware and Architectural Support for Security and Privacy (HASP'22), in conjunction with the 55th IEEE/ACM MICRO'22.
- **Chidera Biringa** [1] and Gokhan Kul. 2022. "A Secure Design Pattern Approach Toward Tackling Lateral-Injection Attacks" The 15th IEEE International Conference on Security of Information and Networks (SIN).
- Gokhan Kul, **Chidera Biringa** [2]. 2022. "Forensics in Cyber-Physical Systems (CPS)" Springer Cyber Forensics for Cyber-Physical Systems.
- **Chidera Biringa** [1], Gokhan Kul. 2021. "Automated User Experience Testing through Multi-Dimensional Performance Impact Analysis" ACM/IEEE 2nd International Conference on Automation of Software Test co-located with the International Conference on Software Engineering (ICSE'21).

Technical Skill

Research: Intrusion Detection System, Threat Modeling, Vulnerability Assessment, Natural Language Processing & ML.

Programming Languages: C/C++/C#, Java, Python, R, SQL, MATLAB, PHP, Swift, HTML/CSS & JavaScript.

Transferable Skill

Soft: Creativity, Learning, Analytical Reasoning, Communication, Evaluation, Mentoring, Management, Collaboration & Presentation.

Selected Projects

- **Exposing Mediocre Performance Code – (September 2021- March 2022):** Developed a novel approach to detect the introduction of mediocre performance code in remote repositories. Our method achieved a 1% RMSLE, RMSE, MSE, and MAE rate in regression performance.
- **Context-Aware Detection of Credentials — (September - October 2022):** Developed a context-aware approach to detect embedded credentials and attained state-of-the-art (91%) performance (F-score, Precision), outperforming all current detection tools on Benchmark data.
- **Intelligent Fuzzing using Deep-Reinforcement Learning — (September 2021 - Present):** Developing a Markov Decision Process-enabled Actor-Critic (AC) Reinforcement learning (RL) multi-agent to identify bugs via mutation and software coverage. Agents create a policy to maximize cumulative rewards by generating quality mutation samples and causing rapid crashes.
- **Predictive Frame Inference — (April - May 2020):** Developed a generative adversarial neural network (GAN) model that interpolates in-between frames of a given video, thus increasing the frame rate. A high-definition 25 FPS video was increased to 50 FPS without loss in resolution, reduced video length, or noticeable distortion. Generated frames were stitched to create a full synthetic video.
- **SQL Engine — (February - April 2020):** Developed a SQL query evaluator. Implemented SELECT, PROJECT, JOIN, UNION, and AGGREGATE statements. Built standard optimization techniques like projection push-down, selection push-down, and cross-product to join the conversion.
- **Authorship Attribution — (November 2019):** Developed ML classifiers to detect Victorian Era (VE) authors using statistical features of authored novels. Conducted an exhaustive text mining and sentiment analysis. Best-performing classifier achieved 99% accuracy in detecting VE authors.

Services

- Startup Weekend UMassD Technical Mentor. 2022 & 2021.
- Very Large Data Base (VLDB) Reproducibility Reviewer. 2021.
- UMassD Orientation Leader. 2020 & 2019.