

MARIE LOUISE UWIBAMBE

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PERSONAL PROFILE

Software Security Researcher specializing in vulnerability detection in Industrial Control Systems (ICS) with a strong focus on applying advanced machine learning techniques to detect vulnerabilities. Proven research experience in leveraging Reinforcement Learning (RL), Large Language Models (LLMs), Auto-Encoders, and statistical models to enhance security in ICS. Passionate about advancing the resilience of critical infrastructure through innovative, data-driven approaches.

WORK EXPERIENCE

Machine Learning research intern, Sandia National Laboratories **09/2024 - 05/2025**

- Main responsibility: researching machine learning techniques for data fusion across distributed power grid components to improve system security and situational awareness.
- Designed AI-based threat detection models that leverage categorical features.
- Engineered entropy-based features from non-ordinal and symbolic data sources to improve classification.

Graduate Research Assistant, University of Arkansas **08/2022 - To date**

- Main responsibility: Conducting research on vulnerability detection in industrial systems.
- Built a framework for fuzzing control logic programs.
- Designed methods to optimize fuzzing using different machine learning techniques.
- Algorithms and technologies used: Fuzzing, LLMs, and reinforcement learning.

Graduate Teaching Assistant, Carnegie Mellon University **01/2021 - 05/2022**

- Main responsibility: Assisting instruction in core data structures concepts: arrays, linked lists, trees, graphs, stacks, queues, and others.
 - Designed and maintained auto-grading systems using Bash, C++, and Docker
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EDUCATION

Ph.D. in Computer Science **2022 - 2025**

University of Arkansas

- Research Area: Software Security
- GPA: 4.0

Master of Science in Information Technology **2020 - 2022**

Carnegie Mellon University

- Concentration in Software Engineering
- GPA: 3.65

Bachelor of Science in Computer Engineering **2015 - 2019**

University of Gitwe

- GPA: 4.0

RESEARCH PUBLICATIONS

1. **Marie Louise Uwibambe**, Qinghua Li, and Yanjun Pan. "Towards Robust LLM-Enabled Fuzzing: Enhancing Test Generation Prompts via Execution Feedback", 2026 *IEEE International Conference on Communications (ICC)*. (under review).
2. **Marie Louise Uwibambe**, Akanksha Tyagi, and Qinghua Li. "A Reinforcement Learning Approach to Multi-Parametric Input Mutation for Fuzzing," 2025 *IEEE International Conference on Cyber Security and Resilience (CSR)*.
3. **Marie Louise Uwibambe** and Qinghua Li. "Safeguarding Industrial Automation: A Fuzzing Framework for PLC Control Logic," 2025 *International Conference on Computing, Networking and Communications (ICNC)*.
4. **Marie Louise Uwibambe**, Yanjun Pan, and Qinghua Li. "Fuzzing for Power Grids: A Comparative Study of Existing Frameworks and a New Method for Detecting Silent Crashes in Control Devices," 2023 *IEEE Design Methodologies Conference (DMC)*.
5. Kylie McClanahan, Sky Elder, **Marie Louise Uwibambe**, et al. "When ChatGPT Meets Vulnerability Management: the Good, the Bad, and the Ugly", 2024 *International Conference on Computing, Networking and Communications*.

PROJECT CONTRIBUTIONS

griDNA (<https://ip.sandia.gov/opportunity/gridna/>)

- Description: griDNA is a technology developed by Sandia National Laboratories that fuses cyber-physical data using AI/ML to provide unified situational awareness.
- My Role: Research and develop machine learning techniques for data fusion.

Power4ALL (<https://www.powerforall.org/>)

- Description: PowerForAll merges centralized and decentralized energy data to generate insights about power demand, supply, and access, enabling more reliable, affordable, and inclusive electrification strategies.
- My Role: Integrating software engineering workflows with machine learning components.

TECHNICAL SKILLS

- Programming Languages: Python, Java, C, C++, C#, R, Bash, SQL
- Software Engineering specialty: Data structures, DevOps, software analysis, secure coding practices, and database systems.
- AI Specialties: Reinforcement Learning (RL), Natural Language Processing (NLP), Large Language Models (LLMs), Auto-Encoders, Computer Vision, Self-supervised Learning.
- Tools & Frameworks: PyTorch, TensorFlow, Scikit-learn, Keras, Cuda, Docker.

OTHER SCHOLARLY INVOLVEMENT

- **Member of the Research Council** at Graduate-Professional Student Congress, University of Arkansas, 2025
- **Graduate Fellow** at Reginald R. "Barney" & Jameson A. Baxter Graduate Fellowship, 2023
- **Scholar** at Mastercard Foundation, 2020 - 2022