Pratik M. Kamble

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Research

Research Profile

Computer science Ph.D. researcher building compiler and runtime tools for systems security. Published at DIMVA 2026; combines compiler instrumentation and experimental program analysis with production Java, Spring, and Kafka engineering.

Education

Binghamton University (SUNY)
Ph.D. in Computer Science; GPA: 4.00/4.00 — Expected May 2030
Advisor: Prof. Aravind Prakash. Enrolled Aug 2025.

University of Florida
M.S. in Computer Science — May 2023

University of Pune
B.E. in Computer Engineering — May 2019

Research Experience

Binghamton University (SUNY) — Binghamton, NY
Research Assistant, Research Foundation for SUNY — Aug 2025 – Present

Compiler-guided consistency in forced execution
Associated manuscript submitted; review pending.

- Built a compiler-guided forced-execution prototype that repairs a deciding operand and rechecks the branch condition, addressing contradictory state left by redirect-only execution.
- Implemented LLVM instrumentation, binary-bound metadata, and runtime validation; raised edge-condition consistency from **36.3% to 83.9%** across **4,691 paired edges in 30 subjects**.
- Measured changes in program output or called-function sets on **31.1% of 412 matched edges**, showing that operand repair affects downstream analysis observations.

WebAssembly security analysis – DIMVA 2026

- Analyzed **8,461 binaries** with staged static reachability; used Wizard and Walrus for separate dynamic measurements on controlled workloads, finding 70–85% of functions unexecuted in evaluated workloads.
- Simulated debloating of optimized libraries: **4.9–11.6× smaller average CFI equivalence classes** and up to 40.7% fewer sensitive WASI imports, quantifying potential attack-surface reduction.

Current work: Early-stage research on fault-injection attacks.

University of Florida — Gainesville, FL
Research Assistant, Embodied Learning & Experience Lab — Jan 2023 – May 2023

- Built backend APIs and a recommendation engine for a student mindfulness platform, and Android features for an AR STEM-learning assistant; contributed to two 2024 publications.

Industry Experience

Vibrent Health Fairfax, VA
Software Engineer Jun 2023 – May 2024

- Built a Kafka bulk-messaging interface that improved delivery speed and reduced server load for a platform serving NIH's All of Us Research Program and Children's National Hospital.
- Resolved an architecture defect causing duplicate records, improving platform stability.

Vibrent Health Fairfax, VA
Software Engineering Intern Jun 2022 – Aug 2022

- Built a GitHub API-based vulnerability detection tool and Spring Boot services; supported Docker, Kubernetes, and CI/CD deployment workflows.

Vignet Inc. Pune, India
Software Engineer Jul 2019 – Jul 2021

- Developed Java/Spring applications and Kafka microservices for Fitbit integration; contributed SQL-based user migration workflows for a precision-medicine platform.

Selected Publications

- S. Deshpande, **P. Kamble**, A. Carchi, and A. Prakash. "Learning Through Competition: A Retrospective on the 2026 MITRE eCTF at Binghamton University." *30th Colloquium for Information Systems Security Education (CISSE)*. Accepted; publication pending.
- **P. M. Kamble** and A. Prakash. "Dead Weight: Analyzing Code Bloat and Its Security Implications in WebAssembly Binaries." *DIMVA*, 2026.
- Y.-C. Wang, Y. Lu, S. Grunwald, S. L. Chu, **P. Kamble**, and J. Kumar. "An AI Approach to Support Student Mental Health: Case of Developing an AI-Powered Web-Platform with Nature-Based Mindfulness." *Journal of Hospitality & Tourism Education*, 36(3), 267–280, 2024.

Awards & Leadership

- **Program Committee Member**, CISSE 2026; reviewed cybersecurity education papers.
- **Distinguished Reviewer Award**, USENIX Security 2026 Artifact Evaluation; served on the committee evaluating research artifacts for reproducibility.
- **Team Co-Captain**, Binghamton MITRE eCTF 2026: **13th of 100+ teams**; directed defensive firmware and offensive exploit work.

Technical Skills

Programming: C, C++, Python, Java, SQL.

Systems: Linux, RISC-V, WebAssembly.

Security research: Static analysis, compiler instrumentation, dynamic coverage analysis, forced execution, debloating analysis, AFL++ experimentation.

Research tools: LLVM, Spike, WABT, Binaryen, Wizard, Walrus, Emscripten.

Software engineering: Git, Docker, Spring Boot, REST APIs, Apache Kafka.

Patent

Co-inventor, EEG-based user activity and device control; **Indian Patent 540976**, granted Jun 2024.