Matthew Cole

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Education

05/2024 (expected)	**Ph.D. Computer Science**, State University of New York at Binghamton University, Binghamton, New York. Dissertation: *Enforcing Integrity Models Through Hardware-Software Cohesive Systems.* Advisor: Aravind Prakash
08/2018	**M.Sc. Computer Science**, State University of New York at Binghamton University, Binghamton, New York. GPA: 3.97/4.00
05/2005	**B.Sc. Computer Science**, United States Naval Academy, Annapolis, Maryland. GPA: 3.78/4.00 (major), 3.60/4.00 (overall). Graduated *With Merit*, Upsilon Pi Epsilon

Skills

Languages	C, C++, Python, x86/RISC-V/ARM assembly, LLVM IR, Rust, Java
Operating Systems	Debian/Ubuntu/Kali Linux, MacOS, Solaris Unix
Benchmarking	SPEC CPU 2006/2017, Google Benchmark, Hayai, Hyperfine
Testing	CUnit, Google Test, Boost.Test, Python unittest, LLVM Lit
Build/Deploy	GNU Make, CMake, Github Actions, Travis-CI, Git
Reverse Engineering	Ghidra, Hopper
Addtional	U.S. Citizen. Held Secret (2001-2006) and Top Secret/SCI (2006-2014).

Experience

Research Experience

08/2015 - 08/2023 **Binghamton University, Computer Science Department** Binghamton, NY
Research Assistant

- Repurposed Intel Memory Protection Extensions for generalized storage, and investigated performance implications of these register accesses
- Engineered a prototype RISC-V CPU employing inline code tagging for integrity models from compiler-driven static program analysis techniques, using the LLVM compiler toolchain and the FreeRTOS operating system
- Extended our prototype to perform out-of-band data tagging, with the ability to achieve link-time relaxation and linkage resolution using a modified LLD linker
- Developed a Clang front-end action extending data tagging for an access-limited data model that can enforce compile-time qualifier contracts as run-time assurances
- Extracted unused encoding information in the ARM A64 and AArch32 Instruction Set Architectures for steganography and binary instrumentation
- Scrutinized scientific misutilization of performance benchmark tools such as SPEC CPU2006, SPEC CPU2017, and MIBench

05/2004 - 08/2004 **United States Naval Research Laboratory** Washington, DC
Networks and Communications Systems Intern

- Prototyped a Java Management Extension (JMX) for Mobile Ad Hoc Wireless Networks (MANETs) serving real-time city-sized distributed sensor networks

Research Links

https://orcid.org/0000-0003-1743-1504
https://scholar.google.com/citations?user=GfQ-ozgAAAAJ

Experience (continued)

Professional Experience

01/2022 - Present **Binghamton University, Computer Science Department** Binghamton, NY
Lecturer
- Served as instructor of record for classes in C programming, programming tools, data structures, cryptography, security protocols, and software security for classes between 30 and 90 students
- Selected as department's only student with lecturing responsibilities for level of knowledge and pedagogical experience

08/2017 - 05/2023 **Binghamton University, Computer Science Department** Binghamton, NY
Teaching Assistant
- Assisted delivery of classes in C/C++/Python programming, software and network security, cryptography, security protocols, systems programming, computer architecture, and compiler toolchain design
- Deployed a new Github Classroom instance, facilitating expedited grading

09/2011 - 06/2014 **United States Navy, Trident Training Facility** Silverdale, WA
Instructor
- Qualified as Instructor, Instructor Evaluator and Course Supervisor. Served as Navigation Department Director. Awarded Navy and Marine Corps Commendation Medal with Gold Star
- Improved annual throughput in a ship piloting and risk management simulator by 18% (75 sessions) by repairing over 30 script files, qualifying two new instructors, and guiding a comprehensive lab redesign
- Delivered lectures for 120 submarine officers annually (66% increase) and practical skills training for 23 ships, earning a "highly effective" rating by external auditors

08/2009 - 08/2011 **United States Navy, Amphibious Squadron Six** Little Creek, VA
Department Head
- Qualified as Staff Tactical Watch Officer (operations floor manager). Served as Administrative Department Head with 6 direct reports and oversight of 4 ships' administrative and human resources departments. Awarded Navy and Marine Corps Commendation Medal
- Authored contingency plans and coordinated with 8 partner nations to deliver over 100K pounds of humanitarian supplies following the 2010 Haitian earthquake

04/2010 - 04/2011 **Headquarters, U.S. Forces Afghanistan** Kabul, AF
Operations Officer
- Guided ad-hoc, cross-functional teams of 6-8 in a position normally assigned to a more senior pay grade. Awarded Defense Meritorious Service Medal
- One of three officers selected from a theatre-level command to certify deployment readiness for 54 units and 6500+ personnel
- Expedited processing by 30% (4 days) and enabled a 144% increase (128 items) in annual traffic by improving tracking methods, reducing retention requirements, and availing new collaboration tools

12/2006 - 06/2009 **United States Navy, USS Maine (SSBN-741)** Silverdale, WA
Division Officer
- Qualified as Submarine Warfare Officer and Nuclear Engineering Officer. Guided operation, maintenance and testing of nuclear reactor instrumentation, control systems and protective features
- Held responsibility for a $2B submarine, $100M nuclear reactor plant and $50M-$75M annual operating budgets
- Resolved a decade-long persistent fault in the S8G Nuclear Instrumentation and Pump Control systems. Awarded Navy and Marine Corps Achievement Medal