Matthew C. Davis Curriculum Vitae, November 2025

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RESEARCH INTERESTS

I believe that software engineers can get more done---and enjoy their work more---when using tools that consider the strengths and needs of human cognition within the context of engineering software.

My Accelerated Testing research program within Carnegie Mellon University's Software and Societal Systems Department invents and investigates interventions that aim to improve the human ability to quickly write tests that find more software bugs than is possible with current tools. My inter-disciplinary research uses empirical and theoretical methods and builds upon a wide base of prior work in software engineering, human-computer interaction, programming languages, and artificial intelligence.

I publish and speak about my research at top journals and venues such as TOSEM, ICSE, and FSE as a PhD candidate under the advisement of Dr. Brad A. Myers and Dr. Joshua Sunshine. My research program is funded by the US government via multiple NSF grants and by industry partners via CyLab awards.

My research is motivated and contextualized by more than twenty years of industry experience as a software engineer to a global engineering director building, operating, and managing complex critical global software systems across a variety of domains and contexts.

EDUCATION

- **Ph.D., Software Engineering** (expected graduation: 2026)
  Carnegie Mellon University School of Computer Science, 4.0 GPA
  Advisors: Dr. Brad A. Myers, Dr. Joshua Sunshine
- **Non-degree-seeking Mathematics Student**
  North Carolina State University, 4.0 GPA
- **M.Sc., Software Engineering** (research track)
  East Carolina University, 4.0 GPA, Advisor: Dr. Mark Hills
- **B.A., Computer Information Systems**
  Lenoir-Rhyne University

PAPERS

- **Matthew C. Davis**, Amy Wei, Brad A. Myers, and Joshua Sunshine. "TerzoN: Human-in-the-Loop Software Testing with a Composite Oracle." At FSE'25. In Proceedings of the ACM on Software Engineering, 2025. https://dl.acm.org/doi/abs/10.1145/3729359
- **Matthew C. Davis**, Sangheon Choi, Amy Wei, Sam Estep, Brad A. Myers, and Joshua Sunshine. "TestLoop: A Process Model Describing Human-in-the-Loop Software Test Suite Generation." ACM Transactions on Software Engineering and Methodology, 2025. https://dl.acm.org/doi/10.1145/3765754
- **Matthew C. Davis**, Sangheon Choi, Sam Estep, Brad A. Myers, and Joshua Sunshine. "NaNofuzz: A Usable Tool for Automatic Test Generation." In Proceedings of the 31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering, 2023. https://dl.acm.org/doi/abs/10.1145/3611643.3616327

- **Matthew C. Davis**, Emad Aghayi, Thomas D. LaToza, Xiaoyin Wang, Brad A. Myers, Joshua Sunshine. "What's (not) Working in Programmer User Studies?" Transactions on Software Engineering and Methodology. 2023. https://dl.acm.org/doi/10.1145/3587157
- **Matthew C. Davis** and Mark Hills. "Escaping the Clone Zone: Java Runtime-Managed Snapshots Current and Future Work." Southeastern Regional Programming Language Seminar. Paper & Talk. 2019. http://www.cs.ecu.edu/hillsma/publications/davis-hills-2019-serpl.pdf
- **Matthew C. Davis**. "Applying Mutable Object Snapshots to a High-level Object-Oriented Language." M.Sc. Thesis. 2018. http://thescholarship.ecu.edu/handle/10342/7032
- **Matthew C. Davis**. "A Student's Perspective of a Capstone Course**"** (Software Engineering Team Dynamics). 14th Annual CCSC Regional Conference. https://dl.acm.org/doi/10.5555/369274.369349

HONORS

Unit of the Year award, Boy Scouts of America Piedmont Council
Software Process Excellence Award, Corning, Inc.
Various Division Cash Awards, Corning, Inc.
Junior Award, Lenoir-Rhyne University
Man of the Year Award, Lenoir-Rhyne University
#8 best online utility (stree) by a Japanese-language IDG publication
Phi Beta Lambda

- National Award – 2nd Place Website
- National Award – 2nd Place Computer Concepts
- National Award – 3rd Place Emerging Business Issues
- Regional Award – 1st Place Website
- Regional Award – 1st Place Telecommunications

MENTORING

Undergraduate Mentees, CMU REUSE

- Tai Nguyen (Princeton University) (2025-)
- Amy Wei (University of Michigan) (2023-)
- Sangheon Choi (Rose Hulman Institute of Technology) (2022-25)

TEACHING

17-950: Crafting Software (CMU) (2024)
Head TA. Doctoral-level course intended for non-CS PhD students such as mechanical and chemical engineers. Primarily led by discussion and whiteboard. Formalized course content by building outlines and content for each lecture. Designed and delivered new lectures on complex topics such as testing. Designed new homework assignments and a new property-based testing unit. **https://cmu-crafting-software.github.io/**

17-214/514: Principles of Software Construction (CMU) (2023)
Head TA. Graduate/Undergraduate-level course. Seven sections, >100 students, two instructors (Dr. Jonathan Aldrich and Dr. Bogdan Vasilescu). Designed and gave lectures, lead grading, managed 13 TAs. https://cmu-17-214.github.io/s2023/

INVITED TALKS AND PANELS

- "TerzoN: Human-in-the-loop testing with a Composite Oracle" FSE (2025)
- "NaNofuzz to TestLoop: Empirical to Theoretical Research" PSU (2025)
- "What's (Not) Working in Programmer User Studies?" ICSE (2024)
- "NaNofuzz to TestLoop: Empirical to Theoretical Research" UCSC (2024)
- "TestLoop: A Process Model of Test Suite Generation" PLATEAU (2024)

- "NaNofuzz: A Usable Tool for Automatic Test Generation" FSE (2023)
- "Academia and Industry" Seminar Talk (2023)
- Invited Panel: NSF CSGrad4US (2023)

SUPPORTING GRANTS AND AWARDS

- NSF Grants 191026, 2150217, and 2339775 (2021-2024)
- CyLab Seed Funding Award: Usable Test Generation for Security (2023-2024)

SERVICE

- Student Organizer, PLATEAU (2023-2025)
- Mentor, CMU Research Experience for Undergraduates in Software Engineering (2022-2025)
- Student Representative to Department Faculty Meeting (elected) (2023-2025)
- Student Representative to Department Marketing Committee (appointed) (2022-2023)

EXPERIENCE

Carnegie Mellon University School of Computer Science

PhD Candidate and Lead, Accelerated Testing Research Program (2021-)

My PhD research creates and evaluates novel interventions that aim to help software engineers more quickly write tests that find more bugs than with current industrial tools. The NaNofuzz project provides a platform for empirical testing research, and the TestLoop project builds theoretical models that can help tool designers describe how software engineers actually use testing tools. This program is featured at top journals and venues such as TOSEM, ICSE, and FSE and is funded by government and industry CyLab awards. https://github.com/nanofuzz/

DEFCON Generative AI Red Team / AI Village, Student Volunteer (2023-2024)

Assisted with the operations of the AI Village's Generative AI Red Teaming competition. This competition was featured in major news outlets and was a highly-attended event at DEFCON 31. https://aivillage.org/

IRIS Lunar Rover, Mission Control Operator (2022-2024)

Iris Lunar Rover was successfully launched into space aboard a Vulcan Centaur rocket on January 8, 2024. During this student-led project, I served as Telemetry Operator, Communications Officer, Lunar Cartographer, and Science Officer. A fuel leak on our ride to the lunar surface terminated our mission early. https://irislunarrover.space/

Penrose, Software Engineering Researcher (2021-2023)

Contributed improvements to the Penrose diagram tool. As part of this work, I expanded the functionality of the Penrose renderer and implemented a research-focused semantic debugger. https://penrose.cs.cmu.edu/

Shurtape Technologies, LLC

Director, Global Technology Infrastructure and Operations (2014-2021)

Engineer and deliver "always on" global business-critical software systems, including applications, databases, networks, datacenter, compute, storage, security, endpoints, and end user support.

- Operate datacenters: compute, storage, network, power, cooling, DR, IAM, security.
- Operate global business critical software systems in a 24x7 high-availability landscape
- Manage full life-cycle end-user services: 24x7 support, field services, reverse logistics, app and desktop virtualization, PCs, Macs, printers, phones, mobile devices, policies, etc.
- Manage global network spanning three continents including wireless, LAN, WAN, SD-WAN, NAC, and a privately owned and operated metro single-mode fiber ring.
- Responsible for roadmaps, strategy, budget, cybersecurity, and leading impactful change across the environment. A cost-conscious leader, I seek smart long-term opportunities to streamline nd simplify operations, improve reliability and performance, and direct investment to high-value priorities.
- Manage strategic vendor relationships including contracts and leading negotiations with large technology vendors, such as Microsoft, IBM, Oracle, EMC, NetApp, Cisco, Google, and Amazon.
- Deliver executive communications informally and in formal settings with meaningful messages in everyday language. Frequently regarded as a "top speaker" by executives.
- Exhibited key traits necessary in this role: flexibility, persistence, persuasion, partnership, professionalism, long-range planning, candor, and a persistent positive attitude

Director, Network and Data Center (2012-2014)
Same as above minus end user services and SAP basis operations.

Manager, E-Commerce (2009-2012)
Hired to solve a difficult problem for the CEO and CIO: the company planned to purchase a large carve-out divestiture of a global CPG company, which would require integrating numerous challenging retailers, vendors, and 3PLs--in short order and in concert with an ERP migration. The CEO and CIO knew the existing in-house technology and team were not up to the task. The team I built and led quickly engineered a new business-critical software system using a combination of off-the-shelf and custom software to integrate Wal-Mart, Target, Lowe's, Home Depot, carriers, vendors, 3PLs, and many other large companies. I delivered this change with a net decrease in headcount and no go-live issues. The company has continued to expand its business using this platform and team for more than ten years.

Corning, Inc.
Supply Chain Applications Technical Lead (2004-2009)
Full-cycle SAP implementation core team experience at a global Fortune 500 company
- Led dev team implementing SAP Product Configuration, including full EDI integration
- Led dev team implementing re-designed integration solution for new SAP back-end
- Recruited, selected, evaluated, and managed contingent labor to augment internal staff
- Managed timelines, budgets, scope, and deliverables. Provided hands-on leadership
- Mentored team, advocated design, adapted, and maintained solution integrity
- Designed business processes, reports, interfaces, conversions, and subsystems
- Configured pricing, output, copy control, texts, credit, batch jobs, ports, and partners
- Provided support, training, troubleshooting, and maintenance for SAP and integrations
- By the post-go live stages, my role's scope expanded to include cross-module initiatives across North America encompassing any combination of SD, LE, MM, PP, WM, FI, and CO
- Worked closely to lead a team of on- and off-shore developers during this timeframe
- During this period, I was frequently writing and deploying code in Java, ABAP, COBOL, and CL with back-end databases including Oracle, MySQL, and DB2

Senior Applications Analyst (2002-2004)
- Led implementation of web-based product configurator
- Led software development team to build and successfully deploy configurable pricing engine using Java, Oracle, XML, JEP, Tomcat. This flexible and custom system had a long life and remained in active use long after I left Corning.
- Pricing engine included a novel, intuitive interface for product management to easily define pricing rules for complex, configurable products using a formula engine.
- Site lead for IT ISO 9001 implementation. Externally audited w/no site non-conformities.
- Provided support for Configurator, Pricing, EDI, ERP, and Cable Data Sheets systems.

Applications Analyst (2001-2002)
- Implemented consignment and vendor managed inventory software system projects with complex and demanding customers such as AT&T, Bell Canada, and Verizon.
- Configured and coded new functionality across multiple modules of ERP system
- Created XML schemas and XSLT transformations to present Cable Data Sheets to end-users in a familiar PDF format on the web using a Java-based Formatting Objects Processor. (emerging technology at the time)
- Implemented numerous new or enhanced integrations with Fortune 50 companies allowing automation of manual business processes such as consignment processing and order entry.
- Maintained, enhanced, and supported ERP software interfaces as part of a team.

Software Engineer / Programmer (2000-2001)
I had not yet graduated from university and balanced full-time work while finishing my degree.
- Through hard work and methodical knowledge acquisition, successfully supported the business software system, implementing new functionality, and solving problems.
- Developed and maintained high-profile integrations into and out of the ERP system. (i.e., those with customers, suppliers, and financial institutions)
- Documented and improved existing processes. Created new processes as needed and drove process standardization and improvement within the team.

Information Technology Intern (1999-2000)
Worked as an IT intern while at university. This involved solving technology problems for several hundred people, including the CEO and CFO. During this time, I started an internal monthly technology news magazine that received positive feedback within the company, documented and improved our team processes, and trained new interns and co-ops. During this time, I received frequent recognition from users via the company's recognition program.

Lenoir-Rhyne University
Information Technology Intern (1998-1999)
While an undergraduate, I worked in the IT department helping people who called the help desk, maintaining equipment inventories, and updating the university website. One of my early tasks was putting the academic catalog online for the first time because I had web experience.

SBC Development
Independent Software Engineer (1994-1999)
During high school and my undergraduate years, I developed various software systems and utilities. Some were freeware, some were shareware, and others were published via BMT Micro in Wilmington, NC. E.g.,

- McList (a mailing list processor reviewed favorably by c't magazine in 1997)
- stree (ranked #8 best online utility by a Japanese-language IDG publication in 1999)
- McD-CBV (popular call-back verifier for AdeptXBBS)
- Mail Center Professional (SMTP and POP3 mail server), etc.

People and organizations around the world used this software, and I enjoyed working with and supporting them. My largest customer was a Canadian government agency, the Ontario Ministry of Housing, which used the McList system to distribute building code proposals and changes to a large base of stakeholders and constituents.