

David L. Adei

Computer Science Ph.D. Candidate, NC State University, Raleigh

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Professional Summary

- **Systems security researcher** and **software systems engineer** with **9+ years'** combined experience designing **distributed systems** and **cryptographic protocols** for telephone networks.
- **Strong technical writer** and speaker, with invited talks at major academic and industry security venues.
- **ACM CCS Distinguished Paper and Distinguished Artifact awardee** for systems security research.
- Track record translating cryptographic and systems research into **production-grade** platforms with **high throughput**.
- Early research interest in **designing and evaluating agentic systems** and **privacy-preserving ML systems**.

Expertise and Skills

- **Core:** Python, Go, JavaScript/TypeScript, C++; Java; gRPC; distributed systems; high-performance services.
- **Security Engineering:** Cryptographic protocols; Pairing-based cryptography; secure system design.
- **Cloud & DevOps:** AWS, GCP, Linux, Docker, Kubernetes, Terraform, Ansible, AWS Nitro Enclave.
- **Secondary or Prior Experience:** PostgreSQL/MySQL; Redis/MongoDB; Node.js; React.js/Vue.js; PHP/Laravel.

Employment and Experience

1. **Graduate Research Assistant**, NC State University, Raleigh, NC, USA. *Aug 2022 – Present*
 - Translated abstract research goals in 3+ projects into concrete system requirements; designed cryptographic protocols, implemented end-to-end systems, and evaluated deployability under real operational constraints.
 - Built a traceback system with ingestion, verification, and query pipelines capable of supporting 120K+ daily calls.
 - Developed a distributed transport system for call metadata delivery, achieving estimated 99.9999% availability.
 - Built a SIP controller and real-time gRPC relay for low-latency routing and graceful degradation.
 - Developed LLM-driven multi-agent workflows to recover missing program semantics in static analysis.
 - Implemented cryptographic libraries and bindings, including witness encryption, VOPRF, and BBS signatures.
2. **Senior Software Developer**, Scopic Software, Rutland, MA, USA. *Oct 2021 – Aug 2022*
 - Built and maintained SaaS integration services connecting Jira, Teamwork, and Monday, supporting synchronization, migrations, bi-directional updates, and webhook-driven workflows.
 - Implemented web-based image processing and 3D viewers, including backend processing pipelines and job queues.
 - Dockerized applications and integrated Kubernetes into CI/CD pipelines for consistent deployments.
 - Led production triage and troubleshooting, resolving 10+ issues/day; drove code reviews and mentoring.
3. **Senior Software Engineer**, Cmunily, Raleigh, NC, USA. *Nov 2020 – Oct 2021*
 - Designed the microservice architecture for an intent-based ad recommendation platform, defining service boundaries, data ownership, and failure handling.
 - Designed deployment pipelines and infrastructure automation using Terraform and Ansible across environments.
 - Led code and design reviews, establishing patterns adopted across the team.
4. **Software Engineer**, Clearcare Solutions Ltd, Stafford, England. *Nov 2019 – Oct 2020*
 - Contributed to a care-home management platform supporting adult and child care workflows.
 - Refactored and incrementally migrated a legacy PHP codebase to Laravel, focusing on performance-critical data access and background workflows while maintaining backward compatibility.
 - Redesigned portal UX for forms and documents, improving accessibility and responsive design.
5. **Senior Software Engineer**, W3MSYS Company Ltd, Accra, Ghana. *Jan 2017 – Nov 2019*
 - Served as a hands-on tech lead across healthcare management, food ordering/delivery, and artisanship platforms, owning architecture and core implementation.
 - Designed service boundaries, data models, and backend APIs; implemented security and access-control patterns.
 - Built and standardized deployment and operational workflows from development to production.
 - Managed and mentored a team of 4–8 engineers through planning, execution, and code quality practices.
6. **Software Engineer** (Freelance, Remote, Contractual) *Sept 2015 – Jan 2017*
 - Delivered client-facing software projects end-to-end, from requirements to deployment and post-launch support.

Authored Libraries and Projects

- **BBS Group Signatures** (C++, Go): Highly optimized BBS04 group signature library, minimizing pairing operations for fast computation; includes threshold variants. Available at: <https://github.com/dense-identity/bbsgroupsig>
- **Witness Encryption** (C++, Python): Efficient witness encryption scheme built on BLS signatures. Available at: <https://github.com/wspr-ncsu/BLS-Witness-Encryption>
- **Dynamic Identity Authentication** (C++, Go, Kotlin): Implements Asymmetric Message Franking, BBS+, Diffie-Hellman, VOPRF, other other protocols for identity authentication. Available at: <https://github.com/lokingdav/libdia>
- **Jäger Protocol** (Python, C++): Award-winning system integrating group signatures, BLS signatures, and witness encryption. Available at: <https://github.com/wspr-ncsu/jaeger>

Education

1. **Ph.D. Computer Science**, NC State University, Raleigh, NC, USA. Aug 2022 – 2026 (Est.)
 - Focus: Network Security, Distributed Systems, and Applied Cryptography. Advisor: Dr. Bradley Reaves.
2. **B.Sc. Computer Science**, Kwame Nkrumah Univ. of Science & Tech., Kumasi, Ghana. Aug 2015 – Jul 2019
 - First Class Honors; Best Computer Science Student.

Awards and Honors

1. **Graduate Merit Award** (\$3,000), *College of Engineering, NC State University* 2025
2. **Distinguished Paper Award**, *ACM CCS* 2024
3. **Distinguished Artifact Award**, *ACM CCS* 2024
4. **First Class Honors**, *KNUST, B.Sc. Computer Science* 2019

Selected Publications

1. **How to Recover a Cryptographic Secret From the Cloud** 2025
David Adei, Chris Orsini, Alessandra Scafuro, and Tanner Verber
ACM Conference on Computer and Communications Security (CCS 2025).
2. **Towards Declarative Blockchains: A SHACL-Based Model for Robust and Efficient Transactions** 2025
Kemafor Anyanwu, Sogolsadat Mansouri, and David Adei
IEEE International Conference on Blockchain and Cryptocurrency (ICBC 2025).
3. **Jäger: Automated Telephone Call Traceback** 2024
David Adei, Varun Madathil, Sathvik Prasad, Bradley Reaves, and Alessandra Scafuro
ACM Conference on Computer and Communications Security (CCS 2024).
★ Distinguished Paper Award & Distinguished Artifact Award

Available Preprints

1. **Multi-Agent Taint Specification Extraction for Vulnerability Detection** 2026
Jonah Ghebremichael, Saastha Vasan, Saad Ullah, Greg Tystahl, David Adei, Christopher Kruegel, Giovanni Vigna, William Enck, Alexandros Kapravelos (arxiv.org/abs/2601.10865).
2. **Secure and Efficient Out-of-band Call Metadata Transmission** 2025
David Adei, Varun Madathil, Nithin S. Soundararajan, and Bradley Reaves (arxiv.org/abs/2509.12582).

Service

- **Invited Talks:**
 - Invited Speaker, SIP Network Operators Conference (SIPNOC) 2025
 - Invited Speaker, North Carolina Annual Cybersecurity Symposium 2025
 - Paper Presentation, ACM Conference on Computer and Communications Security (CCS) 2024
- **Peer Review:**
 - Artifact Evaluation Committee, IEEE Symposium on Security and Privacy (S&P) 2026
 - Sub Reviewer, IEEE Symposium on Security and Privacy (S&P) 2024, 2025, 2026
- **Leadership:**
 - Web Development Team Lead, Google Developer Student Club 2018
 - President, Computer Science Student Association, KNUST 2017