

SYNOPSIS

Ph.D. in mathematics and extensive IT experience. Prior to my degree, I developed software applications managing business processes for financial companies. I earned my doctorate at NC State, focusing on manifold topology and knot theory, and attended a semester-long research program at SL Math (formerly MSRI). Afterward I worked as a consultant on NIST validation of cryptographic products. I am a long-time computing enthusiast with an avid interest in the interplay of mathematical theory and technology, seeking to bring my skills in mathematics, technology and advanced research to a new opportunity.

EMPLOYMENT

- 2023-2025 **IT Security Consultant**, [atsec information security corp.](#), Austin, TX
Performed and reported on code review and testing for validation of compliance to FIPS 140-3 requirements as part of the [Cryptographic Module Validation Program](#) (CMVP). Trained in NIST-approved security functions, such as AES/Rijndael, Keccak, RSA, ECDSA, and the post-quantum module-lattice-based algorithms. Individually developed software:
- Rust library integrating the driver of an HSM with an existing C-code test harness. (Built a Docker container in which to cross-compile this.)
 - Python CLI client-side implementation of NIST's [Automated Cryptographic Validation Protocol](#) (ACVP). Handles SSL client certificates, TOTP, JSON Web Tokens and paginated results.
- 2017-2023 **Graduate Research & Teaching Assistant**, [NC State Dept. of Mathematics](#), Raleigh, NC
Instructor of record for courses in multivariable calculus and in topics from discrete mathematics. Administered distance-education courses in geometry, differential equations and linear algebra. Teaching assistant for several calculus courses.
- 2015–2016 **Associate Software Developer**, [iPipeline, Inc.](#), Exton, PA
Front- and backend developer on an application computing projected values of actuarial financial products and writing the results to PDFs or webpages.
- 2011–2013 **Senior Developer & Systems Architect**, [BPM Specialists, Inc.](#), Alpharetta, GA
[Pega®](#)-certified Senior Developer & Systems Architect. Worked on Java-based business process management (BPM) applications for clients including Wells Fargo and TSYS.

EDUCATION

- 2017–2023 **Ph.D.**, [North Carolina State University](#), Raleigh, NC
Mathematics: [dissertation](#) on Floer theory in low-dimensional topology and knot theory, under the direction of [Tye Lidman](#).
- Aug.-Dec. 2022 **Research Program Associate**, [Simons Laufer Mathematical Sciences Institute](#), Berkeley, CA
Member of a collaborative research program on Floer homotopy theory. Participated in activities of the concurrent program on gauge theory.
- 2016-2017 **Post-baccalaureate study**, [University of North Carolina at Charlotte](#), Charlotte, NC
Graduate coursework in non-Euclidean geometry and real analysis. Additional coursework in number theory and point-set topology.
- 2007–2011 **B.A.**, [Duke University](#), Durham, NC
Double major: mathematics & philosophy.

SERVICE

- 2024 **Volunteer Teaching Assistant**, [Texas Prison Education Initiative \(TPEI\)](#), Austin, TX, Courses taught at the [TDCJ Coleman Unit](#), Lockhart, TX
Assisted delivery of credit-bearing [UT Austin](#) courses on precalculus and on mathematics in art to incarcerated students.

COMPETENCIES

I have advanced expertise across a breadth of fields in mathematics and computing, from differential geometry to cryptography and Unix system administration. Having taught undergraduate mathematics and co-directed company training in cryptographic algorithms and validation processes, I have ample mentoring experience. I am seasoned in communicating my knowledge in speaking presentations and in technical writing.

Computing

Activities A few example of personal undertakings are:

- debugging numerical experiments running in MATLAB with integrated parallel Fortran routines;
- machine learning challenges on [Kaggle](#);
- configuring the CLI email client Mutt to access IMAP email servers with OAuth;
- setting up versioned build toolchains for CUDA projects with Linux environment modules.

Languages C/C++, Rust, Java, Python, Javascript/Typescript, Perl, PHP, Lua, POSIX shell, SQL, Fortran, Haskell, VB, C#, T_EX, PostScript, (System)Verilog

Development frameworks MATLAB, Maple, Mathematica, TensorFlow (w/ Keras), scikit-learn, PyTorch, CUDA, NumPy, SymPy, SciPy, pandas, SageMath, Macaulay2

Other tools & platforms GNU Make, CMake, Ninja, Git, Subversion, Cargo, awk, sed, gdb / lldb, dracut, jq, CUDA, Jupyter, Anaconda, Docker, SSH, Tmux/GNU Screen

Mathematics

Doctoral research Applications of Floer theory to low-dimensional topology and knot theory, drawing directly upon symplectic geometry and gauge theory. More broadly this entails study of

- algebraic topology,
- algebraic geometry,
- functional analysis,
- differential geometry,
- PDEs,
- category theory.

Other interests Current research in applied topology and numerical linear algebra, including in the areas of

- persistent homology,
- randomized sketching,
- mathematics of quantum computing.
- directed homotopy theory,
- fast direct solvers,

Languages

English Native

French Advanced *Proficient reader; intermediate to advanced listening comprehension; developing speaker. Advanced undergraduate-level coursework (2019).*

German Intermediate *Intermediate-level reader; basic listening comprehension and speaking skills. Advanced undergraduate coursework (2007).*