Curriculum Vitae: Atticus Rex

NSF Graduate Research Fellow, Georgia Tech
Dept. of Computational Science & Engineering
Atlanta, GA 30318

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Education

Georgia Tech, Atlanta, GA
Ph.D. in Computational Science & Engineering (Aug 2024-Present)
Thesis: *Multi-Fidelity Surrogate Modeling and Uncertainty Quantification*
Advisor: Elizabeth Qian

M.S. in Computational Science & Engineering (May 2025, GPA: 4.00/4.0)

Virginia Tech, Blacksburg, VA
Summa Cum Laude
B.S. in Computational Modeling & Data Analytics (May 2023, GPA: 3.92/4.0)
B.S. in Mechanical Engineering (May 2023, GPA: 3.83/4.0)

Research Interests

Scientific machine learning, surrogate modeling, multi-fidelity modeling, uncertainty quantification, reduced-order modeling, Gaussian Processes/kernel methods, inverse problems, non-convex optimization.

Research Experience

Georgia Tech (2024 - Present) **Multi-Fidelity Surrogate Modeling**: Developed novel data-driven surrogate modeling techniques with Gaussian Processes to replace expensive simulations when data from cheaper simulations are available. Analysis of existing model reduction, uncertainty quantification, and information theoretic approaches to multi-fidelity modeling. Advisor: Elizabeth Qian, Ph.D.

Air Force Research Lab (2025) **Interpolating and Extrapolating Scarce High-Fidelity Data with a Multi-Fidelity Surrogate Model**: Implemented novel multi-fidelity surrogate modeling techniques to interpolate scarce high-fidelity experimental data when fast approximate computer models are available. Applied new method to extrapolation problems in which ground experiments cannot reproduce full range of flight conditions. Supervisor: David Peterson, Ph.D.

Virginia Tech (2023) **Echo State Networks for Dynamical Systems Modeling**: Proposed a framework for improving upon traditional operator inference methods to model discrete nonlinear dynamical systems using Echo State Networks (ESNs). Compared new methodology to Sparse Identification of Nonlinear Dynamics (SINDy) developed by Brunton et al. Proposed a direct, discrete method for differentiating noisy signals based on the Total Variation Regularized Derivative (TVD). Supervisor: Serkan Gugercin, Ph.D.

(2022-2023) **Mechanical Engineering Capstone**
Designed, simulated, validated, manufactured, and tested a prototype to emulate shock impacts on naval communication antennas for the Naval Surface Warfare Center - Dahlgren Division (Dahlgren). The team produced an active and a passive solution with priority on modeling irregular, high-frequency and high-velocity shocks. Supervisors: John Ferris, Ph.D. & Luke Martin, Ph.D.

(2023) **CMDA Capstone**: Designed, manufactured and tested a swinging multiple-mass pendulum system with an image tracking system to extract the eigenvalues of a physical system. This was used as a teaching aid in CMDA Math Modeling courses. Supervisor: Mark Embree, Ph.D.

(2023) **Philosophy Capstone—Dopamine, Mimicry, and Value Alignment: Artificial Intelligence and Addiction**: senior thesis on artificial intelligence's ability to manipulate humans at scale. Work drew on principles of Kantian ethics, mathematical modeling, and microeconomic theory. Supervisor: Melinda Miller, Ph.D.

(2022) **Conservation Agriculture in Ecuador**: oversaw the collection, storage, and statistical analysis of a survey on conservation agriculture in Riobamba, Ecuador. Interviewed hundreds of farmers in Spanish to collect responses. Supervisors: Jeffrey Alwang, Ph.D., Darryl Bosch, Ph.D., George Norton, Ph.D.
(2021) **Data Science for the Public Good Internship**: implemented neural network forecasting algorithms to predict Normalized Difference Vegetative Index (NDVI) year-to-year from remote sensing imagery. Reconstructed a multidimensional poverty index for the Statistical Agency of Zimbabwe (ZimStat). Supervisors: Susan Chen, Ph.D. and Brianna Posadas, Ph.D.

Publications

- (2025 working paper) A. Rex, E. Qian, and D. Peterson. Multifidelity-Augmented Gaussian Process Inputs for High-Fidelity Surrogate Modeling.
- (2025) A. Rex and D. Peterson. Interpolating and Extrapolating Scarce High-Fidelity Data with a Multi-Fidelity Surrogate Model. 2025 HPCMP Symposium Proceedings.

Conference Presentations & Talks

- (2025) UT Austin Workshop for Scientific Machine Learning: poster session.
- (2025) Air Force Research Lab: seminar on multi-fidelity surrogate modeling with Gaussian Processes.
- (2025) HPCMP Internship Symposium: interpolating and extrapolating scarce high-fidelity data with multi-fidelity surrogate models.

Honors & Awards

- (2025) National Science Foundation: Graduate Research Fellowship Program
- (2024) First Place Winner: Best Buy Project Week competition
- (2023) VT Honors Laurate Diploma: awarded for completing honors extracurricular track.

Teaching Experience

- AE4803—Foundations of Machine Learning for Aerospace Engineers: developed first offering at Georgia Tech with advisor Elizabeth Qian. Created assignments, delivered lectures, held office hours, conducted oral exams, and graded assignments.
- CSE6040—Computing for Analytics: held live coding sessions, office hours, troubleshooting, and exam development. Course typically had over 1,000 students enrolled.
- Atlanta Mission—Communication Skills: Taught a free course on communication skills at an unhoused shelter in downtown Atlanta, focused on improving verbal and written communication. Course attended by around forty adult men.
- Virginia Tech Student Athletic Academic Support Services: one-on-one tutoring in over forty subjects and math lectures for student athletes. Over 1000+ hours of experience. Earned highest-paid undergraduate position at Virginia Tech.
- UH2104—John Keats Literary Seminar: Taught literary seminar through the Honors Student Teaching Practicum at Virginia Tech. Delivered lectures, facilitated discussion, and assigned reading material.

Skills

- **Programming**: Python, MATLAB, Julia, Java, C/C++, SQL, Git, Linux, Slurm, R
- **Machine Learning**: Deep Neural Networks (DNNs), Unsupervised Learning, Bayesian Inference, Time-Series Analysis, Operator Learning, Gaussian Processes (GPs) , Deep/Sparse Variational GPs, Surrogate Modeling, Physics-Informed Machine Learning, Dimensionality Reduction, Spectral Methods, Inverse Problems, Graph Theory, Empirical Bayes/Type-II Maximum Likelihood Estimation, Information Theory, Constrained Non-Convex Optimization, Monte-Carlo, Variance Reduction, Optimal Sampling/Transfer Learning/Active Learning
- **Software**: Jax, PyTorch, Tensorflow, NumPy, SciPy, Pandas, AWS (Sagemaker, Athena, Lambda), Solidworks
- **Certifications**: Fundamentals of Engineering (FE Mechanical), Computational Data Analysis Ph.D. Qualifying Exam, Discrete Algorithms Ph.D. Qualifying Exam