Hayden Outlaw

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https://outlawhayden.github.io

Objective: To leverage an intelligent and creative approach to computing, statistics, and modeling to drive innovative solutions and communicate knowledge.

Work Experience

Vanderbilt University Medical Center — ***Database Developer*** May 2024 - Aug 2024
- Created JPA and Hibernate Java framework for interacting with VUMC patient databases.
- Constructed Angular frontend application for filtering, querying, and extracting data in a codeless and accessible manner.
- Collaborated with VUMC developers, engineers, and researchers under an Agile framework to improve research, patient confidentiality, and security workflows.

Tulane Mathematics — ***Research Assistant*** Aug 2021 - Dec 2023
- Researched graphLasso covariance estimator, developed novel algorithm to bypass convex optimization using algebraic geometry.
- Successfully numerically modeled a novel probability function, and demonstrated unknown behavior with high confidence and interpretabillity.
- Presented findings in SIAM 2023 Algebraic Geometry conference at Technische Universiteit Eindhoven in Eindhoven, NL in July 2023 on behalf of Tulane University.

National Center for Atmospheric Research — ***Machine Learning Intern*** May 2023 - Aug 2023
- Streamlined distributed neural network used to decompress cloud particle algorithms in PyTorch, to improve performance and decrease computational load, as a part of the NCAR in Summer Internship in Parallel Computational Science Program and Computational and Information Systems Lab.
- Conducted data management and processing, as well as model training and evaluation in parallel on the NSF Cheyenne and Derecho computers.
- Collaborated with NOAA and NCAR developers, atmospheric scientists, and hardware engineers to ensure a practical, effective, and meaningful model framework.
- Presented findings at NCAR SIPARCS Seminar in August 2023.

Tulane University — ***Supplemental Instructor*** Jan 2021 - May 2024
- Assisted in instruction of undergraduate single and multi-variate calculus courses as a part of the Supplemental Instruction program.
- Created review materials, lectures, and resources to help students navigate assignments and exams in conjunction with faculty and graduate assistants.

Georgia Institute of Technology — ***Biomathematics Researcher*** May 2021 - Aug 2021
- As a part of the Southeast Center for Mathematics and Biology, utilized NetLogo to create an interactive and real-time agent-based model of an savannah ecology system, including agent behavior, atmospheric conditions, and reproduction rates.

Skills

Mathematics
- Statistical Inference, Probability Theory, Machine Learning Theory, Stochastic Process Modeling, Natural Language Processing, Algorithmic Analysis, Number Theory, Abstract Algebra

Computer Programming
- Python, R, MATLAB, Java, C, C++, HTML/CSS, JavaScript, TypeScript, NetLogo, SQL and DBMS Software, HPC/Cloud Resource Management, Git/DVC

Languages
- Fluent Spanish, Novice German

Education

North Carolina State University — ***PhD Applied Mathematics*** Aug 2024 - Present

Tulane University of Louisiana — ***BS Mathematics/Computer Science*** Aug 2020 - May 2024
Bachelor of Science in Mathematics and Computer Science, minor in Philosophy
GPA: 3.93/4.0 – Advised by Dr. Daniel Bernstein

Selected Projects
- Developed retrieval augmented generation language model tool to parse local council meeting transcripts from language queries
- Analyzed effects of climate events on rates of police and service calls across different groups and locations across time
- Created embedded space control vectors training mechanism, visualizer, and query application for Mistral-7B language model.

Publications

Hayden Outlaw, Daniel Irving Bernstein. Maximum likelihood thresholds of Gaussian graphical models and graphical lasso. arXiv preprint, 2024. https://arxiv.org/abs/2312.03145

Conferences

American Meteorological Society Annual Conference 2024 - Baltimore MD, January 2024
Tulane University Undergraduate Research Symposium - New Orleans LA, October 2023
National Center for Atmospheric Research SIPARCS Seminar - Boulder CO, August 2023
Presentation Recording — Poster
SIAM Algebraic Geometry 2023 - Eindhoven, Netherlands, July 2023
Poster

Background

I am student, programmer, and mathematician in Raleigh, North Carolina, currently pursuing a PhD in Applied Mathematics from North Carolina State University. I predominantly focus on scientific computing, deep learning, and research engineering applications. Before I lived in Raleigh, I lived in New Orleans, LA, and before that in Boulder, CO. In my free time I like to run, SCUBA dive, ski, study German, Spanish, and Philosophy, and see live music whenever I can.