School Address: North Ave NW, Atlanta, GA 30332

Alexandra Freeman
astewart95@gatech.edu

860-912-2173
Website: astew-95.github.io
linkedin.com/in/alexa-r-f/

Career Objectives

Recent Computational Science and Engineering graduate pursuing full-time research or data scientist roles in Machine Learning, Data Science, or Scientific Computing.

Education

Georgia Institute of Technology, M.S. in Computational Science and Engineering
Expected August 2025

Massachusetts Institute of Technology, B.S. from the Department of Physics
June 2022

Publications

Ahrens, J., Arienti, M., et al., (2024). The ECP ALPINE project: In Situ and Post Hoc Visualization Infrastructure and Analysis Capabilities for Exascale.

Stewart, A., Terece L. Turton, David Rogers, James P. Ahrens, Soumya Dutta, (2022). Visualizing MFIX-Exa Codes for Chemical Looping Combustion.

Stewart, A., Lo, L.T., Korobkin, O., Sagert, I., Loiseau, J., Lim, H., Kaltenborn, M., Mauney, C., & Miller, J.. (2021). Realistic Kilonova Up Close.

Awards & Leadership

The International Conference for High Performance Computing: Scientific Visualization & Data Analytics Showcase, Finalist (2022).

The International Conference for High Performance Computing: Scientific Visualization & Data Analytics Showcase, Finalist (2021).

Community Service Chair, Boston AO Downtown Ministry (2021-2022).

Musical Director, MIT Asymptones (2019-2021).

Student Research Projects

Multifidelity Modeling of Lagrangian Hydrodynamics Simulation
For a course at the Georgia Institute of Technology (Fall 2023)
https://github.com/astew95/nsm_sml

- Proposed a framework for learning a latent space within multi-fidelity SPH simulations of compact objects.
- Utilized a multilayer perceptron (MLP) architecture.
- Collaborated with team members to investigate a learned correction term inside the simulation, a novel approach when compared with current Scientific ML research methods.
- Produced a technical presentation as part of the Scientific Machine Learning Course Symposium at the Georgia Institute of Technology.

Physics-Informed Gram Matrix for Style Transfer
For a course at the Georgia Institute of Technology (Spring 2024)
https://github.com/astew-95/physical-style-transfer/tree/main

- Deployed Style Transfer algorithm on novel dataset to extract meaningful patterns from CFD simulation data.
- Demonstrated proficiency in implementing and understanding Convolutional Neural Networks (CNNs) through extracting and analyzing intermediate features in the Network.
- Proposed a novel physical interpretation of the Gram Matrix within Scientific Machine Learning applications.

Machine Learning for Drug Discovery of Lipid Nanoparticles
Undergraduate Research at the MIT Anderson Laboratory (Spring 2020)

- Applied machine learning algorithm to SMILES representation data to support the discovery of molecular candidates for the activation of luciferase for LNP (lipid nanoparticles).
- Conducted data cleaning, cross-validation, and performance evaluation to understand limitations in generalizability.
- Improved lab-developed PyTorch ML pipeline through evaluating model performance, implementing cross-validation, and enhancing code readability.

Selected Experience

Teaching Assistant – Georgia Institute of Technology, Atlanta, GA August 2022 – May 2024

- Graduate Teaching Assistant for Undergraduate courses Mathematical Physics and Introductory Physics I.
- Responsible for Grading and Student Evaluation.

Graduate Research in the John Wise Lab September 2023– December 2023

- Leveraged The yt Project, a Python-based science toolkit to process and analyze HDF5 simulation data of cosmological particle simulations.
- Managed and processed data at scale through distributed computing practices, utilizing Georgia Tech's distributed HPC clusters.
- Created visualizations of large-scale simulations and conducted data analysis.
- Demonstrated proficiency in Python-based scientific computing and data tools, supporting high-impact research.

Summer Student/Student Developer – Los Alamos National Laboratory, Los Alamos, NM May 2021 – November 202

- Integrated a many-core capable visualization framework with LANL-developed physics simulation code leveraging git, BASH programming, Spack, python, and C++ API.
- Systematically determined bugs and installation issues of Ascent on Virtual Machines, working closely with developers to understand user-end software outcomes.
- CCS-3 Summer Student Finalist at the Scientific Visualization Showcase for HPC (2021 / 2022)
- Produced visualization of Lagrangian fluid simulations of compact objects using ParaView from LANL developed code. Rendered a realistic image of kilonova ejecta as it would appear for a nearby observer (2021).

Undergraduate Research –MIT **Undergraduate Research Program (UROP)** January 2020 – August 2020

- Implemented a machine learning package in PyTorch to analyze historical and present data on recipients of prestigious fellowships at the MIT Media Lab
- Applied machine learning algorithm to chemical structure data to support the discovery of molecular candidates for the activation of luciferase for LNP (lipid nanoparticles).
- Aided implementation for CFD models of Heat Transfer in Evaporative Cooling Devices for the MIT D-Lab.