Alexandra (Stewart) Freeman

Data Scientist / Machine Learning Engineer
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A highly skilled Machine Learning researcher with a strong background in Computational Science and physics. Currently seeking a position in the field of Scientific Machine Learning or Computational Science to leverage my skills in Data Visualization and Technical Communication.

Education

M.S. in Computational Science and Engineering, Georgia Institute of Technology, August 2025 *(3.2/4.0)*
Courses: Scientific Machine Learning, Computational Data Analytics, Computational Physics, Machine Learning Theory, High-Performance Computing, Numerical Linear Algebra, Modeling and Simulation, Quantum Mechanics, High Energy Astrophysics, Deep Learning.

B.S. in Physics, Massachusetts Institute of Technology, June 2022 *(4.6/5.0)*
Courses: Differential Equations, Linear Algebra, Statistical Physics, Intro to Machine Learning, Python Programming Fundamentals, Mathematics for Computer Science, Introduction to Python, Physics Laboratory I, Wave Mechanics, Quantum Mechanics I, Introduction to Chemical Engineering, Fluid Dynamics, Chemistry Thermodynamics, Organic Chemistry, Advanced Principles of Chemical Science, Internet of Things, Spanish IV.

Skills

Data Science / Visualization Packages: Numpy, Pandas, Paraview, Jupyter Lab, MatplotLib, Ascent, yt
Machine Learning & SciML: TensorFlow, PyTorch, Scikit-learn, CNNs, Style Transfer
Computational Tools: Python, Linux OS, C++, BASH scripting, Julia, conda, Spack

Selected Experience

Research in the John Wise Lab · *September 2023 - December 2023*
- Student Researcher in the Physics department visualizing simulation data of large-scale cosmological simulations.
- Experience using Georgia Tech's Instructional Cluster Environment (PACE-ICE) and Research Computing Cluster (PACE-HIVE).
- Worked with the yt project (https://yt-project.org) package for handling hdf5 files.
- Produced Visualizations of large cosmological simulations.

Developer, Los Alamos National Laboratory · *May 2023 – September 2023*
- Tested integration of the LANL-developed visualization tool Ascent, an in-situ visualization and analysis library for HPC simulations.
- Systematically determined bugs and installation issues of Accent on Linux VM and spoke to developers to aid in implementation.
- Leveraged git, Spack, and C++ API to integrate Ascent with LANL-developed physics simulation code.
- Experience using Supercomputing Facility Environment.
- Tested integration of the LANL-developed visualization tool Ascent, an in-situ visualization and analysis library for HPC simulations.

Summer Student Researcher, Los Alamos National Laboratory · *May 2021 – September 2022*
- Presented two papers at the International Conference for High Performance Computing in Houston, TX (2022) and St. Louis, MO (Virtual, 2021).
- Implemented Visualization codes using ParaView and LANL developed simulations. Designed and produced science-explanatory videos for a general audience on scientific research at the lab, using my created visualizations and video content with the goal of communicating research findings in ways that are accessible to a nontechnical audience.
- Created Visualization of a Kilonova Explosion using Paraview Visualization Software Created Movie for General Science Audience explaining the significance of the kilonova.
- Produced Visualization of an accretion disk and Ejecta codes.
- Worked in High Performance computing environment.

Teaching Assistant, Georgia Institute of Technology · *August 2022 - June 2024*
- Assistant Graduate Teaching Assistant (TA) for undergraduate courses Mathematical Physics and Introductory Physics.
- Assisted students during lab sessions, taught lectures, graded homework, and proctered exams.
- Head Graduate Teaching Assistant for Undergraduate Advanced Electrostatics.
- Part-time Graduate Student Tutor with the Office of Minority Education (OMED).

Undergraduate Research in the MIT Anderson Laboratory · *May 2020 – August 2020*
- Applied machine learning algorithm to support work on the discovery of molecular candidates for Luciferase Activation.
- Evaluated model performance and pipeline using PyTorch through a deep understanding of training and test data and cross-validation techniques.

- Understood current scientic literature and leveraged numpy, pytorch and a lab-specific codebase.
- Implemented data pipelines that improved code workflow and usability.

MIT Undergraduate Research Program (UROP) · *October 2019 – March 2020*
- Investigated potential DNA molecule candidates for binding with Single-Walled Carbon Nanotubes (SWCNT).
- Worked in Wet Lab to Systemized a procedure for determining Single-Walled Carbon Nanotube (SWCNT) sample composition.
- Created data pipeline using MATLAB as a data processing tool for processing and studying lab results.

Undergraduate Research in the MIT D-Laboratory (UROP) · *May 2020 – August 2020*
- Implemented Computational Fluid Dynamics (CFD) Modeling for an Evaporative Cooling Device.
- Worked with MATLAB to develop mathematical models for mass transfer inside and outside the device and updated models based on current literature.

Summer Student Program, The Jackson Laboratory · *June 2019 - August 2019*
- Generated Images and conducted data analysis for large dataset (2,000+) of bacterial activation of MAIT (Mucosal Invariant T) Cell Activation, presenting high-quility images and visualizations using statistical analysis packages in R.
- Presented a Report and analysis of findings at the 2019 Distinguished Students and Faculty Symposium at Jackson Laboratories.
-Presented in weekly Journal Club sessions reviewing technical papers relevant to computational biology, participated in research ethics seminar course.

Projects

Physics-Informed Style Transfer **Link** || **Spring 2024**
- Proposed a physical meaning for the use of the Gram matrix in Style Transfer
- Extended traditional notions of Style Transfer to relationships between feature vectors in CFD simulations.
- Extracted and analyzed intermediate layer results on CFD vectors using a pre-trained image classification network.

Multifidelity Modeling of Smooth-Particle-Hydrodynamics Simulation **Link** || **Fall 2023**
- Collaborated with team members to propose novel data-based method to learn a low-to-high fidelity mapping within a latent space from simulation data.
- Ran an SPH simulation and suggested physically relevant correction term within multilayer perceptron (MLP) architecture framework with a correction function.
- Spearheaded technical presentation as part of the Scientific Machine Learning Course Symposium at the Georgia Institute of Technology.

Analyzing Demographics of Distinguished Fellowships with the MIT Media Lab **Lab** || **Spring 2020**
- Sourced datasets of nominees for CAPD Distinguished Fellowships and produced visuals of the data (40,000+ applicants) for the MIT Media Lab.
- Leveraged Machine Learning (pytorch) to predict demographic data like gender and race from the dataset using a pre-trained classification model.
- Developed methodology for determining outcomes of the classification model. Developed code from scratch and produced novel visualizations of the predicted race and gender data outcomes for the fellowships going back to 1940s. Analyzed clear trends in the results.

Awards & Publications

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

Finalist for Scientific Visualization at the International Conference for High Performance Computing. (2021, 2022)

Stewart, A. et al. (2022). Visualizing MFIX-Exa Codes for Chemical Looping Combustion.

Stewart, A. et al. (2021). Realistic Kilonova Up Close.

Service

- **Community Servings Forest Hill** Served as Volunteer, Assisted in meal processing and preparation weekly. Jamacia Plain, MA; Fall 2018–Spring 2020, Spring 2022
- **Hope Worldwide Community Service** Participated in local HOPE chapter volunteer work including community food drives and service.
- **Student mentor/volunteer** at Camp Hope For Kids in Schwenksville, PA (2016) and Camp Hope Hungary (2017).
- **Community Service Chair**, Boston AO Ministry (2021-2022)