SHREYAS WAGHE

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EDUCATION

University of Massachusetts Amherst **Amherst, MA**
Bachelor of Science in Computer Science and Applied Mathematics Sep 2021 – Dec 2024

- **Honors**: Dean's List (Fall 2021 - Spring 2023), GPA 3.96/4.00
- **Courses**: ML & AI, Numerical Methods, Differential Equations & Dynamical Systems, Algorithms & Data Structures, Combinatorial Optimization, Calculus, Data Science, Stochastic Processes, Computational Biology, Simulations

EXPERIENCE

Fair and Explainable Decision-Making Lab – UMass Amherst Computer Science **Amherst, MA**
Undergraduate Researcher - Fair Machine Learning & Computational Mathematics Dec 2022 – Present

- Research, develop, and analyze numerical schemes to optimize "Power Mean Objectives" in Fair ML in Python, MATLAB.
- Implement efficient and modular Python code to test empirical performance of devised schemes and compare against established theory for model training in a novel Fair ML framework.

Machta Research Group – UMass Amherst Physics **Amherst, MA**
Undergraduate Researcher - Statistical & Computational Physics Aug 2023 – Present

- Study Monte Carlo methods (Population Annealing), implement them for High Performance Computing in C++.
- Develop and research variations of these methods to solve Hard problems in Physics e.g. optimizing Ising Models.

PALM Research Lab – Brown University Computer Science **Providence, RI**
Undergraduate Research Fellow - Generative Modeling (Machine Learning) Jun 2023 – Aug 2023

- Researched and implemented frameworks for Generative Image Modeling with Pytorch – Variational Diffusion models.
- Presented posters titled "Generative Modeling using Diffusion – from the Ground Up" at two Brown Research Symposia.

UMass Amherst - Departments of Mathematics, Computer Science & Physics **Amherst, MA**
Teaching Assistant - Various Subjects Sep 2022 – Present

- Computational Physics (Phy 281), Artificial Intelligence (CS 383), Pre-Calculus (various Math 100-127)
- Lecture administration, Review Sessions, Office Hours for classes of size 25-200.

PROJECTS

Models of Evolutionary Dynamics

- Analyzed novel Rock, Paper, Scissors models of ecological systems with predator-prey interactions and chaos.
- Performed Monte-Carlo simulations in C++ to understand development of populations, evolution and extinction.

Optimizing Truck Deliveries using Linear Programming

- Optimized deliveries for a food bank using Gurobi and Python to solve linear programming models derived from data.
- Provided recommendations to help assign delivery routes to drivers fairly, and reduce operational hours by 68%.

Topological Data Analysis for Cell Clustering

- Implemented Topological Data Analysis methods in Python to analyze data from cell clustering simulations.
- Interpreted and analyzed features identified through persistence homology to understand tissue formation quantitatively.

Adaptive High Accuracy Numerical Integrators

- Implemented highly accurate and efficient adaptive-time Runge Kutta integrators for stiff Diff. Eqs. in C/Python.

Age Friendliness of Book Summaries

- Analyzed textual data, built SVM prediction models to classify age-friendliness of natural language book summaries.

MNIST Image Generation using Gradient Score Matching

- Developed Langevin-sampled Score Matching models for MNIST data generation using Pytorch and CUDA GPUs.

SKILLS, TECHNOLOGIES, INTERESTS

- **Programming**: Python, SQL, PostgreSQL, MATLAB, Java, Javascript, C++/C, Julia, Flask
- **Mathematical Skills**: Numerical Algorithms, Simulations, Mathematical Programming, Mathematical Modeling
- **Technologies**: Jupyter Notebooks, Linux/Bash, Latex, NumPy, SciPy, Pandas, GPU/CUDA, Pytorch, JAX, nltk, Gurobi
- **Activities**: SIAM Student Member, UMass CICS Peer Mentor, UMass Residential Peer Mentor
- **Honors**: NSF Undergraduate Research Fellow, The Leadership Alliance Research Scholar
- **Interests**: Computational Mathematics, Physical Modeling, Machine Learning, Numerics, Theoretical Computer Science

This document was last updated on 12-25-2023. Hyperlinks provided with titles where relevant.