

Aarathi Kumaran

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EDUCATION

University of Michigan

Ann Arbor, MI

Bachelor of Science in Mathematics, Minor in Computer Science G.P.A 3.3

Aug 2021 – Dec 2024

- Coursework: Financial Mathematics, Probability, Differential Equations, Data structures & Algorithms, Statistics & Data Analysis, Machine Learning, Combinatorics, DBMS, Linear Algebra

EXPERIENCE

Undergraduate Research Assistant

May 2024 – Present

University of Michigan

Ann Arbor, MI

- Developed and analyzed card shuffling algorithms using C++ and Mathematica, resulting in a model demonstrating recurring graph patterns and evaluating deck randomness
- Analyzed patterns on a graph using eigenvalues and eigenvectors, derived from a probability matrix determined through Markov Chains and Stochastic Processes

MMSS Course Assistant

Jul 2023 – Aug 2023

University of Michigan

Ann Arbor, MI

- Volunteered in group study sessions for 50+ students by leveraging artistic and quantitative proficiency to clarify complex concepts, and enhance overall understanding of course material
- Created engaging worksheets and art projects to demonstrate the practical application of math in art, provided personalized mentorship, and oversaw presentations and discussions

STEM Society - Board Member

Jan 2022 – Present

University of Michigan

Ann Arbor, MI

- Led a 25-member team to organize educational events for K-12 students from lower socioeconomic backgrounds resulting in improved academic performance for 100+ students
- Taught mathematical concepts like Fibonacci Series, Graph Theory, and Pythagorean Theorem to over 100 middle school students through interactive sessions

PROJECTS & COURSES

Financial Mathematics - Risk Measurement, Capital Asset Pricing Model (CAPM), Binomial Models, Arbitrage, Options Strategies, Black-Scholes, and Stochastic Processes

Probability - Conditional Probability, Random Variables, Joint Distributions, Variances, and Covariances

Differential Equations - Second-order linear equations, Euler-type equations, Laplace transforms, Runge-Kutta method

Movie Reviewer | *Python, Pytorch, SVM, scikit-learn, NLTK, WEAT, 5-fold cross-validation*

- Trained Linear and Quadratic SVMs using scikit-learn to categorize movie reviews as positive, neutral, or negative
- Evaluated model with 5-fold cross-validation and optimized hyperparameters using grid and random searches

Image Classifier | *Python, Pytorch, CNN, Grad-CAM, data augmentation, scikit-learn*

- Developed a Convolutional Neural Network (CNN) using PyTorch to classify images of various landmarks
- Evaluated model performance using cross-validation and identified potential biases with Grad-CAM visualization
- Enhanced classifier with transfer learning and data augmentation, including rotation and grayscale

Fakebook Simulator | *C++, SQL, MongoDB, Java*

- Designed an Entity-Relationship (ER) model for a fictional social media platform, incorporating user profiles, posts, tags, and followers, and implemented it using SQL scripts to create, load, and manage database objects
- Implemented the Grace Hash Join algorithm in C++, developing partitioning and probing functions

Data Structures & Algorithms | *C++, BFS, DFS, Priority Queues, MST, TSP*

- Path finder - Developed algorithms for Minimum Spanning Tree (MST), heuristic-based Travelling Salesperson Problem (TSP), and optimal TSP to efficiently navigate a graph
- BattleSim - Implemented custom priority queues (sorted array, binary heap, pairing heap) to simulate a battle

SKILLS

Hard Skills: C++, SQL, Java, Python, MongoDB, Microsoft Office Suite, Graph Theory, Pandas, NumPy, Matplotlib

Hobbies: Perspective Drawing, Crochet, Scuba Diving, Photography, Painting, Embroidery, Skiing