

Rahel Joshi

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EDUCATION

California Institute of Technology (Caltech)

Graduation: June 2026

Bachelor of Science in Computer Science

GPA 4.0/4.0

Taken Courses: Linear Algebra, Intro Programming, Data Structures, Object-Oriented Programming, Theory of Computation, Intro to Tensorflow

2024-2025 Planned Courses: Computer Systems & Architecture, Machine Learning Systems, Functional Programming, Algorithms, Relational Databases, Machine Learning & Data Mining, Operating Systems, Interpreters, Discrete Math, Applied Linear Algebra

EXPERIENCE

Research Fellow

June 2024 – August 2024

Caltech - High Energy Astrophysics Group

Pasadena, CA

- Built Pytorch model with 98% accuracy to generate physics-simulated x-ray spectra of black holes & neutron stars
- Improved MSE accuracy by 85% & reduced noise significantly compared to previous Tensorflow emulator models
- Cut memory/storage usage by 95% by replacing physics simulator x-ray spectra tables with deep learning models
- Visualized model's error across 5D parameter space, identifying regions of higher error for further refinement
- Used parallelization, adaptive learning to train 10x faster; plan to open-source & submit for publication/conference

Research Scholar

June 2022 – August 2022

Texas Tech University - Cyber Physical Systems Lab

Lubbock, TX

- Developed ECG Sonification System to enhance heart irregularity arrhythmia detection through audio
- Identified 97% of ECG features with thresholds & reduced noise by 80% with Fourier, Wavelet, moving avg filters
- Mapped ECG amplitude and standard deviation to sound wave frequency, volume, and morphology
- Collected ECG data with electrodes, heart rate monitor, & Arduino, for real-time user ECG sonification

Research Intern

May 2021 - July 2021

UT San Antonio - Multiple Autonomous Robot Systems Lab

San Antonio, TX

- Researched various Robot Swarm Foraging algorithms and their performance in collecting resources
- Presented demos of foraging algorithms in ARGoS and ARGoS-Khepera IV physics simulators
- Wrote comprehensive guides for installing ARGoS physics simulators for other undergraduate students

PROJECTS

Physics Engine | C, Gitlab, Emscripten, SDL2

- Created physics engine from scratch in C, with forces, collision handling, & efficient memory & input management
- Encapsulated code into modular components such as forces, assets, bodies, and scenes for organized development.
- Made simulations & games (N-Body Simulation, Frogger, Pacman, etc) & added unit tests to ensure functionality.

Campus Path Finder | Java, Gitlab, Javascript, CSS

- Designed a campus map app with real-time route visualization, highlighting the shortest path between buildings
- Integrated Dijkstra's Algorithm with heaps and hashmaps for efficient and scalable pathfinding
- Enhanced user interaction with features like location search, zoom, and drag for better navigation

Movie Finder | Java, Gitlab, Javascript, CSS

- Developed movie finder app with efficient title autocompletion & movie details like summaries, actors, ratings, etc
- Implemented Trie data structure from scratch to store and quickly search movie titles and metadata

Chess Bot | Python

- Built chess engine with input handling and AI using Minimax algorithm, alpha-beta pruning, & Zobrist hashing

TECHNICAL SKILLS

Languages: Java, Python, C, C++, HTML, CSS, JavaScript, SQL

Technologies: Git, Jupyter Notebook, Pandas, NumPy, Matplotlib, TensorFlow, PyTorch, OpenCV, Selenium, Next.js, React, Node.js, Scipy, OpenCV

Concepts: Machine Learning, Data Analysis, Data Visualization, Data Science, Signal Processing, Software Engineering, Unit Testing, Web Frameworks, Computer Vision, Algorithm Design, Object-Oriented Programming, Databases, Front End, Back End, Fullstack, Parallel Programming, Deep Learning, Cloud Computing, Unix