Madhav Rapelli

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Education

Stony Brook University – *BS in Computer Science* **Expected May 2028**

- **Relevant Coursework:** Data Structures and Algorithms, Applied Linear Algebra, Foundations of Computer Science
- **Expected Coursework:** Introduction to the Theory of Computation, Computer Networks, Fundamentals of Software Development, Systems Fundamentals II, Analysis of Algorithms, Machine Learning, Fundamentals of Computer Vision, Natural Language Processing.

Experience

Nylock Nuts Robotics **March 2024 – Present**
Robotics Instructor *Jericho, NY (Hybrid)*

- Teaching a new competitive VEX Robotics team to design, build, program and document robots focusing on Design, C++ Programming involving motion control and position tracking.
- Led the team to be ranked 13 in their division in the Middle School VEX Worlds Championship in their first season competing (Top 0.01% of all Middle School VEX Robotics teams **worldwide**).

Competitive VEX Robotics **September 2021-May 2024**
Lead Programmer *Farmingdale, NY*

- Developed a robotics program utilizing C++ and the PROS (Purdue Robotics Operating System) framework. Implemented features including motion control algorithms, real-time position tracking, robot localization using distance sensors, and multi-threaded operations to enhance robot performance.
- Led my team to win a dozen awards over our high school career ranging from regional to the international level. We also ranked in the top 0.005% of VEX Robotics teams **worldwide** in 2024.

Projects

MazeSolver **September 2024 – Present**

- Developing an adaptive maze-solving agent using Python, Utilizing Gymnasium for custom dynamic environments and PyTorch for implementing a Deep Q-Network (DQN) model with experience replay, epsilon-greedy exploration, and target networks for improved stability.
- Utilizing various libraries such as NumPy for efficient computations, Matplotlib for real-time metric visualization, Pygame for environment rendering, and PyQt5 for an interactive GUI, enabling real-time adjustments to the maze environment

DocSage **July 2024 – Present**

- Developing a web application for intelligent document analysis, featuring PDF upload (up to 10MB) and storage in AWS S3, with a interface for document management and interaction.
- Implementing a text processing pipeline, integrating embedding with OpenAI's embedding models as well as document chunking and vectorization techniques with PineconeDB for efficient storage and retrieval of processed data.
- Utilizing OpenAI's language models to create a chatbot capable of understanding and responding to document-specific queries, enabling users to better understand their documents.

Robot Tour **January 2024 - February 2024**

- Worked in a two-person team to design and build a custom robot from scratch for Science Olympiad, utilizing CAD software and 3D printing for the robot chassis.
- Used an Arduino Uno board as the base and servo motors for the wheels.
- Implemented a PID algorithm for accurate path following.
- Placed in the top 15% at our regional competition.

Skills

Programming Languages: Python, C++, Java, Javascript, Typescript, CSS, LaTeX
Technologies and Frameworks: Git, Linux, PROS, Next.js, React, Tailwind, Drizzle ORM, AWS S3, Arduino, PyTorch