



ALI AHMAD

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Education

Stanford University

Expected Graduation: June 2026

B.S. Mathematics, B.S. Computer Science

GPA: 3.71

Coursework: Natural Language Processing, Reinforcement Learning, Markov Decision Processes, Data Structures & Algorithms, Real Analysis, Probability Theory, Linear Algebra & Matrix Theory, Differential Equations, Statistical Methods

Experience

Stanford AI Lab - Student Researcher

November 2024 – Present

- Conducting robotic manipulation, controls, & planning research under Albert Wu @ The Movement Lab (PI: Karen Liu)
- Developing a contact estimation algorithm for a dextrous robotic hand without the use of external sensors
- Utilizing motor currents filtered by a Kalman filter and manipulator dynamics to estimate contact points accurately

Stanford AUV - Software Lead

April 2024 – Present

- Developing the autonomy stack for an autonomous submarine to support marine research (Advisor: Oussama Khatib)
- Leading a team of 10 people to win semi-finalists at the RoboSub competition out of 40 teams from 7 countries
- Creating an auto-tuner to find optimal controller gains using the Harmonic Search Algorithm and Gazebo for simulation
- Built a 6-degree-of-freedom PID controller and path follower, achieving 98% accurate pose and velocity control
- Streamlined development workflows using Docker to containerize ROS2 & dependencies and Git for version control

Trestle - Software Engineer Intern

July 2024 – September 2024

- Engineered search features for a platform that connects construction firms to pre-qualified vendors and sub-contractors
- Refactored data collection pipeline by pre-computing frequent queries, improving search efficiency by 25%
- Built caching and migration scripts for a large-scale MongoDB database, enhancing scalability of the service
- Resolved 20+ tickets for bug fixes and feature implementations, cutting bundle size by 12% and server load by 10%

Projects & Involvements

(WIP) DRIVE: Drive Robots In Virtual Environments | *Rust, raylib-rs*

- Building a simulator for omni-wheeled differential drives that allows users to develop motion algorithms for VEX robots

Learning2048 | *Python, C++, PyTorch, Pandas, NumPy*

- Developed a novel method to solve the game 2048 through Deep Behavioral Cloning (DBC), using Monte Carlo Tree Search (MCTS) to generate synthetic expert data, validating results against a random agent
- Built a C++ pipeline to simulate 320K games of 2048 using multithreaded MCTS rollouts, generating 55M+ data points
- Implemented parallel game processing and efficient data collection strategies, reducing overall computation time
- Developed and trained a DBC model using PyTorch with cosine annealing, achieving 50% improvement over baseline

Pupper | *Python, ROS2, Whisper API, MuJoCo, RTNeural, HailoRT*

- Trained a robust walking policy for an autonomous quadruped using MuJoCo for simulation and RTNeural for inference
- Developed a vision-language-action pipeline using GPT-4, Whisper API, and Hailo API to convert spoken instructions and computer vision input into a sequence of movement primitives
- Achieved superior benchmark performance against pretrained CNN and ResNet methods in longer-horizon planning

Arm Visualizer | *C++, SFML, Eigen, CMake*

- Developed a simulator for a 3DoF arm to follow a path defined by user-clicks using C++, Eigen, and SFML
- Enabled arm control through inverse kinematics and path following through the pure-pursuit algorithm
- Implemented path generation using linear interpolation over cubic splines between points chosen by the user

VEX Robotics Team 1353V | *C++, PROS, PROS CLI*

- Led a team of 3 to rank in the top 3% globally in 2022 (out of 4,651) and top 0.08% in 2023 (out of 7,173)
- Developed an object oriented codebase in C++ with PROS, utilizing multithreading for efficient task management
- Implemented odometry, PID motion control, and vision algorithms for precise navigation and targeting

Technical Skills

Languages: C++, Python, Julia, Typescript, HTML/CSS, Rust

Technologies: PyTorch, ROS2, Linux, Gazebo, RTNeural, HailoRT, Pandas, Numpy, SciPy, PROS, MySQL, MongoDB, Vercel, CMake, React, Next.js, PrismaORM, Tailwind

Concepts: Robotics, Machine Learning, Deep Learning, Reinforcement Learning, Imitation Learning, Controls, Planning, Perception, Localization, Computer Vision, NLP, Simulation, Research, Web Frameworks, Frontend, Backend