Huaze (Patrick) Liu

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EDUCATION

Harvey Mudd College   *2022 - 2026*

B.S., Computer Science & Mathematics | Major GPA: 3.899 | Cum. GPA: 3.753

Selected Coursework: Data Structures, Algorithms, Computer Vision, Neural Networks, Machine Learning, Reinforcement Learning, Linear Algebra, ODEs, Intermediate Probability, Real Analysis, Optimization[1], Advanced Systems Engineering, Digital Signal Processing, State Estimation.

SKILLS

Programming Language: Python • C++ • C# • Java • SQL • MATLAB • LaTeX • R
Software/Tools: Visual Studio • Git • Linux • ROS/ROS2 • Issac Sim/Lab/Gym • MuJoCo • SolidWorks • Docker • Jupyter
Technical Skills: 2D/3D Computer Vision • Sensor Fusion • Autonomous Navigation • Reinforcement Learning • Robot Co-design

RESEARCH EXPERIENCE

Visiting Scholar | PI: Prof. Hao Su; Prof. Michael T. Tolley

University of California, San Diego   *June 2025 - Present*
  • Designed an egocentric object trajectory prediction module and integrated it into upper-body catching policy training for humanoid robots using Isaac Gym.
  • Built a graph-structured co-design and control pipeline for robotic hands, combining model predictive path integral control, structural mutation, and reward-driven optimization in MuJoCo.

Research Intern | PI: Prof. Adyasha Mohanty

Harvey Mudd College   *July 2024 - Present*
  • Built a multimodal anomaly detection pipeline that integrates image and LiDAR semantic segmentation, using distributional and geometric cues to identify structural scene changes in urban maps.
  • Evaluated split conformal prediction on segmentation and detection tasks using CLIPSeg and Grounding DINO, demonstrating reliable pixel-level coverage and uncovering design limitations in object-level uncertainty estimation.

Undergraduate Research Intern | PI: Prof. Yuqing Zhu

Pomona College   *April - Aug. 2024*
  • Developed a biologically inspired RNN trained via Evolutionary Algorithms and task-specific loss functions.

Research Intern | PI: Prof. Calden Wloka

Harvey Mudd College   *Aug. 2023 - May 2024*
  • Quantified the effects of padding-induced non-veridical representation on CNN performance with Mask R-CNN.

UCSF ci2 Summer Fellowship | PI: Srikantan Nagarajan | Website

University of California, San Francisco   *May - Aug. 2023*
  • Built Machine Learning models for Tinnitus classification using fMRI and MEG data, achieving 72.4% accuracy and benchmarking against Graph-CNN.

WORK EXPERIENCE

Teaching Assistant

Harvey Mudd College   *Jan. 2024 - Present*
  • CSCI153 – Computer Vision (2024 Fall, 2025 Spring, 2025 Fall).
  • ENGR207 – Digital Signal Processing (2025 Spring).
  • CSCI070 – Data Structures & Program Development (2024 Spring, 2024 Fall).

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[1] *Optimization* is a graduate-level course at Claremont Graduate University taught by Prof. Marina Chugunova.

PUBLICATIONS

[Conference Paper]   **Liu, H.***, Gao, Z*., Mohanty, A. (2025). *Language-Driven Semantic Change Detection in Urban Maps via Multi-Modal Deep Learning*. the 38th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS+ 2025), Baltimore.

[Poster]   Qu, I., **Liu, H.**, Li, J., Zhu, Y. (2024). *Evolutionary algorithms support recurrent plasticity in spiking neural network models of neocortical task learning ([Poster](#))*. Bernstein Conference, Frankfurt, Germany. https://doi.org/10.12751/nncn.bc2024.128.

PROJECTS

A Vision-based Localization and Path Planning TurtleBot System | Language: Python, MATLAB | [Report](#)   *2025*
- Developed a vision-based search TurtleBot 4 using EKF and UKF for state estimation and target tracking
- Used the A* algorithm to compute and follow an optimal path to the GPS coordinates.

A Multi-Objective Acquisition Function of Bayesian Optimization | Language: Python | [Report](#)   *2025*
- Developed a lightweight multi-objective acquisition function for Bayesian Optimization benchmarked on SVM and CNN, reducing latency by 8% compared to EI and UCB.

A Study of Vision Transformer for Traffic Object Detection | Language: Python | [GitHub Repo](#)   *2024*
- Fine-tuned DETR and RT-DETR on the KITTI dataset, Achieving 71.0% mAP (50) and 43.5% mAP (50:95) with 18.1ms inference time.

Dynamic Time Warping with Confidence Intervals | Language: Python | [GitHub Repo](#)   *2024*
- Applied Dynamic Time Warping (DTW) with dynamic programming to develop new metrics and visualizations for alignment confidence in time series.

Real-Time Object Detection Software | Language: Python | [GitHub Repo](#)   *2023*
- Developed an efficient YOLO model and conducted testing using the PASCAL VOC dataset to achieve 65% mAP.

Spampede Game | Language: Java | [GitHub Repo](#)   *2023*
- Designed a custom "Snake Game" UI and backend functionality in Java using the MVC software design pattern.
- Developed an automated game mode that prompts the AI to find optimal paths using BFS algorithms.

Connect-Four Board Game | Language: Python, JavaScript, CSS | [GitHub Repo](#)   *2022*
- Built a full-stack Connect Four app with a Flask backend and React frontend.
- Integrated AI for automated gameplay and RESTful APIs for client-server interaction.

AWARDS & SCHOLARSHIP

- Harvey Mudd College Dean's List   *2022 – 2025*
- Harvey Mudd College Shanahan Projects Fund – Awarded **$11,000** for the development of an underwater autonomous pool-cleaning system.   *2024 – 2025*
- Harvey Mudd College Leeds Student Travel Grant – Awarded **$2,700** to attend the 38th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS+) in Baltimore, Maryland.   *2025*