

ELIAS OLIVER CHANG

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EDUCATION

UC Santa Cruz (3.88 GPA)

Ph.D. Computer Science

M.Sc. Computer Science

Pomona College (3.68 GPA)

B.A. Computer Science

B.A. Statistics

Santa Cruz, CA

September 2022 - Current

September 2022 - December 2023

Claremont, CA

September 2018 - May 2022

EXPERIENCE

UC Santa Cruz CSE

Graduate Student Researcher

Santa Cruz, CA

September 2022 - Current

- **Developed and Implemented Advanced DRL Algorithms:** Applying deep reinforcement learning algorithms within high-fidelity autonomous vehicle simulators to teach vehicles to navigate complex environments autonomously while adhering to lane rules. Successfully trained an agent to follow a lane and avoid other cars using significantly less data compared to conventional deep learning algorithms.
- **Enhanced Neural Network Architectures with Attention Mechanisms:** Distinguishing my work by incorporating attention mechanisms, such as transformers, into neural network architectures, improving the model's ability to capture relevant information and optimize decision-making.
- **Accelerated Learning Speed:** Employing cloud computing resources across multiple simulators to scale up training efforts, achieving a 20% reduction in the training time required for autonomous vehicle agents to reach stable and safe performance levels when compared to standard baseline models.
- **Submitted papers to AAAI 2024 and BayLearn 2023** - currently awaiting acceptance status.
- **Team management, growth, and mentorship:** Provided guidance and mentorship to a team of five undergraduate students who applied my algorithms in diverse driving environments. Their work increased my algorithms' robustness to perform well across different driving settings.

Pomona College ARCS Lab

Computer Vision and Robotics Research Assistant

Claremont, CA

May 2021 - July 2022

- **Trained a simulated robot to achieve a 95% Maze Completion Rate:** Using convolutional neural networks (CNNs), I taught a simulated robot to appropriately take steering actions given visual signals. The simulator and dataset were both self-made.
- **Enhanced Robustness in machine learning:** Implemented a comprehensive strategy to boost the robot's robustness and adaptability by exposing it to diverse environments. Created bots to create datasets from various environments which increased navigation performance by at least 50%.
- **Wrote robust Python scripts:** Tabulated and visualized data results using various Python packages like NumPy, Pandas, and Matplotlib. These Python programs are still used today by new lab members after graduating.
- **Establishing a collaboration between UCSC and Pomona College:** Working with Pomona researchers to create diverse environments for reinforcement learning training.

- **Developed Predictive Model for Police Searches:** Utilized logistic regression to create a predictive model that estimated the probability of police searches based on a set of variables, including race, age, and city. This model achieved a true positive rate of 74%, effectively identifying individuals at risk of being searched by law enforcement.
- **Streamlined Data Preprocessing with SQL:** Wrote an R script that used SQL to efficiently query and consolidate multiple small datasets. This approach allowed for the creation of a novel, comprehensive dataset, facilitating more comprehensive and insightful analyses.
- **Published research as a R bookdown:** The bookdown features research methods, exploratory data analysis, and data tutorials for applying data science in police stop data in an effort to highlight racial discrimination among police in multiple cities.

SKILLS

Programming Languages:	Java (expert), Python (expert), R (expert), C (proficient)
Database:	MySQL, RMySQL
Machine Learning:	Logistic Regression, K-Means Clustering, Random Forest, SVM
Deep Learning:	Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs) Long Short-Term Memory (LSTM), Transformers
Version Control System:	Git, GitHub, GitLab
Software Development:	Object-Oriented Programming, Data Structures & Algorithms, System Design and Scalability
Containerization and Orchestration:	Docker, Kubernetes

PUBLICATIONS

Chang, O., Marchese, C., Mejia, J., and Clark, A. (2021) "Investigating Neural Network Architectures, Techniques, and Datasets for Autonomous Navigation in Simulation" *IEEE Symposium Series on Computational Intelligence*

PROJECTS

DRIVE-Sim Deep Reinforcement Learning Integrated Vehicle Environment Simulator. This is the companion code for my most recent paper. It is a PyTorch-based framework to conduct deep reinforcement learning research in multiple autonomous vehicle simulators. Deep learning applications feature, CNNs, RNNs, LSTMs, and transformers. A substantial amount of effort went into designing a scalable system for other lab members to use.

StatDiamond AI-Driven insights into baseball performance, business, and analytics. I use Python to model baseball pitch sequences as a Markov chain. I then use Dynamic programming and Bayesian statistics to determine the best batting strategy for a batter to use against a specific pitcher. This works for any pitcher in major league baseball. Other applications include K-means clustering, logistic regression, and support-vector machines (SVMs). Built my own dataset.

GRANTS AND AWARDS

CASMI Grant Recipient	Northwestern University 2022, 2023
Cal Grant Recipient	California Student Aid Commission 2018, 2019, 2020, 2021
Pell Grant Recipient	Federal Student Aid 2018, 2019, 2020, 2021
NCAA DIII Cross Country Champion Personal bests: half marathon (01:09:11) and 5k (14:22)	NCAA 2019, 2021