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Personal Profile

As an MSc Robotics and Computation student at University College London, my academic pursuits are deeply rooted in mathematics and computer science, with a specialized focus on Embodied Artificial Intelligence. My research is centered around integrating perception, reasoning, and action in real-world environments, leveraging foundational models to enhance robotic autonomy. I am particularly interested in how large-scale pre-trained models can be adapted for robotics, enabling systems to generalize across tasks and environments with minimal human intervention. My ultimate goal is to develop a robotic foundational model that can generalize across platforms and tasks, contributing to the creation of more intelligent, adaptable robotic systems.

Education

University College London

MSc Robotics and Computation

London

Sept 2023 - Oct 2024

- Expecting First Class Honours
- **Relevant Modules:** Robotic Control Theory and Systems, Robotic Vision and Navigation, Robotic Sensing, Manipulation and Interaction, Computer Vision, Multiagent Intelligence, Bayesian Deep Learning

University College London

BSc Computer Science

London

Sept 2020 - Jun 2023

- First Class Honours
- **Relevant Modules:** Robotic Systems, Machine Learning and Neural Computing, Machine Learning for Visual Computing, Intelligent Systems

Epsom College

A-Levels

Epsom, Surrey

Oct 2017 - Jul 2020

- Mathematics (A*), Further Mathematics (A*), Computer science (A*), Physics (A*)

Research Experience

University College London 🌐

See it. Do it. Sorted.

London

April 2023 - Oct 2024

- Spearheaded research to create a reinforcement learning-based interface for quadruped robots, integrating foundational models to synthesize low-level actions from a single demonstration video. This research aims to overcome the limitations of platform-specific low-level quadruped control APIs, enhancing cross-platform integration of imitation.
- Utilized Isaac Gym for simulation and PPO algorithm for learning, where I designed and implemented adaptable reward functions that translate demonstration videos into actionable tasks for robots with similar morphologies. The interface enables robots to learn from diverse, multimodal single-video demonstrations.
- The project, supervised by Professor Dimitrios Kanoulas, is currently under review for ICRA 2025.

University College London

Learning to Communicate under Noise

London

Oct 2022 - Jun 2023

- Led a project focused on developing a Multi-Agent Reinforcement Learning (MARL) algorithm that enables agents to establish robust communication protocols over noisy discrete channels, essential for cooperation in Multi-Particle Environments.
- The algorithm was designed and implemented in Python using PyTorch. I engineered self-designed Guide and Scout environments to rigorously test the algorithm, ensuring its effectiveness in diverse noisy conditions. The research involved experimentation with various communication strategies to optimize agent interactions.
- Supervised by Professor Mirco Musolesi, this research successfully demonstrated that agents could learn to communicate effectively even in highly noisy environments, paving the way for advancements in cooperative robotics and multi-agent systems.

UCL Centre for Artificial Intelligence

Multi-agent Traffic Prediction Research Internship

London

Dec 2021 - Feb 2022

- Conducted pivotal research on traffic motion forecasting, a critical aspect of autonomous driving systems, under the supervision of Dr. Haitham Bou Ammar and Professor Jun Wang.
- Collaborated with a leading research team to explore the integration of cutting-edge models, such as Social LSTM and Social GAN, into the THOMAS framework. My role involved deep dives into existing state-of-the-art methods, analyzing their potential for enhancing motion forecasting accuracy.
- The internship culminated in the successful identification of key components from various models that could be integrated into the THOMAS framework, contributing to its top-scoring performance in UC Berkeley's INTERPRET Challenge. This work advanced the understanding of how multi-agent systems can predict and respond to complex traffic patterns in real-time.

Vision and Imaging Science Group, UCL

London

Invariant Scattering Networks Research Internship

Oct 2021 - Nov 2021

- Explored the integration of Invariant Scattering Networks into Deep Reinforcement Learning frameworks to achieve enhanced agent performance with reduced training data requirements.
- Developed a novel deep reinforcement learning agent in PyTorch, embedding invariant scattering layers within the policy network.
- Supervised by Professor Lewis Griffin and Augustine Mavor-Parker, the research demonstrated that incorporating invariant scattering layers led to a 5% reduction in the required training samples while maintaining comparable agent performance. This research has implications for the development of more data-efficient learning algorithms in AI and robotics.

Key Projects

Robot Arm Manipulation and Sensing

London

University College London

Mar 2024 - Apr 2024

- Developed robot manipulator control system for achieving pick and place tasks on the Pandas manipulator using **C++, ROS, Gazebo, MoveIt!, OpenCV** and **Point Cloud Library**
- The system can achieve real-time shape identification and differentiation as well as perform pick and place tasks under cluttered environments while doing collision avoidance.

Drone Simulation and Control

London

University College London

Nov 2023 - Dec 2023

- Developed a simplified environment for simulating quadcopter kinematics and dynamics in MATLAB
- Successfully implemented a full-state feedback controller with Linear Quadratic Regulator and Observer for the quadcopter in completing the desired trajectory under turbulent conditions

Playing Super Mario With Deep Reinforcement Learning

London

University College London

Jun 2020 - Apr 2021

- Investigated Dynamic Programming algorithms, Model-Free algorithms and non-linear function approximations with neural networks in Reinforcement Learning.
- Developed and trained a DQN agent with PyTorch in Python to play games of Super Mario Bros using the gym-super-mario-bros environment.

Certification

IBM Data Science Professional Certificate

Online

Coursera

- Applied foundational knowledge of SQL on the IBM Cloud using real-life data, as well as various data science and machine learning toolkits including **Scikit-learn, TensorFlow, pandas** and **seaborn**
- Led a capstone project to analyze data from SpaceX Falcon 9 rockets to predict the probability of successful first-stage landings, ultimately determining the corresponding launch cost. Presented the results to fellow course participants, receiving commendation and positive feedback.

Competitions

UKSEDS Olympus Rover Trials Competition

London

Best CDT Award, Software Lead

October 2023-July 2024

- Engaged in the design, construction, and operation of a fully autonomous rover for a simulated Mars sample return mission. The project presents complex challenges in systems engineering, requiring adherence to authentic space mission parameters.
- As the software lead, I directed the precise simulation processes in Gazebo, utilizing ROS2 and RViz. My role involved integrating a comprehensive Simultaneous Localization and Mapping (SLAM) system and developing sophisticated path-planning algorithms. Furthermore, I designed control algorithms for the onboard robotic arm, enabling accurate execution of pick-and-place tasks with MoveIt!.

Southampton University Robotics Competition

Southampton, Hamshire

1st Place Participant, Team Lead

Jul 2019 - Aug 2019

- Led the development of an autonomous carrier robot, tasked with navigating and executing a series of complex path-planning and item collection tasks under constrained sensor inputs.

Skills

Programming	Python, C++, MatLab, Java, Haskell, C, HTML, CSS, JavaScript, SQL
Robotics	ROS1, ROS2, Gazebo, RViz, Isaac Sim, MoveIt!, ORB-SLAM
Soft Skills	Problem-solving, Independent thinking, Quick and Keen Learner, Leadership, Time-management, Perseverance
Languages	English, Mandarin, French