Chak Lam Shek

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https://stone315.github.io/MAR-Lucas/ | Maryland, USA

Summary

I'm a 3rd-year PhD student at the University of Maryland, majoring in Electrical Engineering. My research concentrates on Planning Optimization and Reinforcement Learning, with a focus on two key areas:
1) Multi-Agent Reinforcement Learning: Developing frameworks and algorithms to enhance coordination among autonomous agents. 2) Language Model Assisted RL: Integrating Language Models (LLM) into reinforcement learning to boost efficiency.

Education

University of Maryland, College Park
Doctor of Philosophy in Electrical Engineering; ***GPA: 3.75/4.0*** *Aug 2021 – May 2026*

Wichita State University
Master of Science in Electrical Engineering; ***GPA: 4.0/4.0*** *Jan 2018 – May 2020*

Wichita State University
Bachelor of Science in Electrical Engineering ; ***GPA: 3.8/4.0*** *Aug 2013 – May 2017*
Bachelor of Science in Mathematics

Skills

Python, C/C++, Git, Docker, Pytorch, Tensorflow, scikit-learn, LLM Prompt Design, Linux
Control System Design, Matlab, Simulink

Work Experience

University of Maryland College Park, Maryland
Research Assistant *May 2023 – Present*

- Conducted pioneering research in algorithm development and collaborated with the Arm Research Lab (ARL).
- Developed a MARL framework for enhanced multi-agent coordination, tested in complex environments, such as Starcraft and TightClaw.
- Designed a Greedy Algorithm to optimize the deployment of sensor networks and simulated heatmaps for measurement reception.
- Integrated Language Models (LLM) with Reinforcement Learning to improve robot locomotion by extracting environmental state information from human descriptions.

University of Maryland College Park, Maryland
Teaching Assistant *Aug 2021 – May 2023*

- Led and mentored student groups for joining the Formula SAE, a Formula-style race car competition
- Developed a Battery Management System (BMS) using bq76PL455A-Q1, ensuring efficient power management and safety for electric cars.
- Designed and implemented a UART (universal asynchronous receiver-transmitter protocol) communication system using TMS570, enabling effective data exchange between vehicle components.
- Utilized Simulink to simulate the digital control system for acceleration and braking.
- Collaborated with students to design and guide control system projects using Matlab and Simulink.

Electronic Sensors Inc. Wichita, Kansas
Engineer Internship *Aug 2015 – May 2016*

- Modeled and analyzed different types of antenna using Network Analyzer.
- Designed dual band inverted F antenna.

PUBLICATIONS

Loc-FACMAC: Locality Based Factorized Multi-Agent Actor- Critic Algorithm for Cooperative Tasks
Authors: Shek, C. L. , Bedi, A., Novoseller ,E., Basak, A., Nick, W., Narayan, P., Manocha, D., Tokekar, P.

LANCAR: Leveraging Language for Context-Aware Robot Locomotion in Unstructured Environments
Authors: Shek, C. L. , Wu, X., Manocha, D., Tokekar, P., Bedi, A.

Where to Drop Sensors from Aerial Robots to Monitor a Surface-Level Phenomenon?
Authors: Shek, C. L. , Shi, G., Asghar, A. B., Tokekar, P., Bedi, A.

Optimization of Electric Vehicle Charging Scheduling Using Distributed Network Computing
Authors: Shek, C. L., Manoharan, A., Aravinthan, V.

- Published in 52nd North American Power Symposium 2020

A Diversity-Based Clustering Technique for Implementing Decentralized Node Level Charge Scheduling of Electric Vehicles
Authors: Shek, C. L., Manoharan, A., Gampa, S.

- Published in 51st North American Power Symposium 2019

Project

Domain-Independent and HTN/HGN Planners Design

- Developed domain-independent, hierarchical task network (HTN), and hierarchical goal network (HGN) planner for both the Blocks World and Satellite Observation Scheduling problems.
- Created a planner to move objects from an initial state to match a defined goal state for the Blocks World problem
- Addressed the Satellite Observation Scheduling problem, modeling satellite observations, data collection, and downlink processes.
- Conducted in-depth analysis, evaluating project complexities, CPU running time, and the number of expanded nodes, providing valuable insights for optimization.

Convolution Neural Network Design

- Developed Convolutional Neural Networks (CNNs) with back-propagation function from scratch to solve three distinct 2-class classification problems.
- Designed dedicated kernels for image classification, adept at handling images with Gaussian noise, images with different noise distributions, and fragmented images with random shapes.

Two Players Zero Sum Game Simulation and Analysis

- Conducted an in-depth summary and analysis of the NeurIPS 2022 paper, "When is Offline Two-Player Zero-Sum Markov Game Solvable?".
- Simulated the complexity result of the two-player zero-sum game by implementing the proposed algorithm discussed in the paper

Vision Guided Grasping

- Designed human-like grasping gestures and computed the inverse kinematics to pick up different objects by finding the proper spots on the object.
- Simulated the result using power grasp and precision grasp with the Pybullet.

Neural Network Controller for Boat

- Provided data analysis, data mining, and mathematical proof for feature selection for boat trajectory control problem
- Performed training and testing on pseudo-inverse controller.

Awards & Achievements

James Maxwell Award for Outstanding Senior, EECS Dept. by Wichita State University. (2017)

William Lowell Putnam Mathematical Competition(2015-2017)

Glasco Mathematics Undergraduate Scholarship by Department of Mathematics, Wichita State University. (2016 - 2017)

Telephone Campaign Undergraduate Scholarship by Department of Mathematics, Wichita State University. (2015 - 2016)