Gao Xinwei

College of Computing and Data Science, Nanyang Technological University, Singapore

xinwei.gao@ntu.edu.sg | xinweigao.com | github.com/GAO-XINWEI | linkedin.com/in/sherwin-xinwei-gao

Personal Profile

I am a highly motivated researcher with a Master's degree in Mechanical Engineering from the National University of Singapore, and currently working in AI Singapore and Nanyang Technological University's CPS Research Group. I have developed skills in designing safe ML navigation algorithms, trust assessment in AI training, and enhancing multi-agent pathfinding for robotics applications. My research interests focus on reinforcement learning, safety mechanisms in machine learning, and multi-agent systems. I am eager to apply my robust analytical and practical skills in advancing the frontier of recommender systems, data mining, and federated learning technologies.

Education

Master of Science in Mechanical Engineering, National University of Singapore *Singapore*

GPA: 4.40/5.00 *July 2021 – June 2022*

Modules: Deep Learning for Robotics, Neural Networks, Machine Vision

Bachelor of Science in Mechanical Engineering, Nanjing University of Science and Technology *Nanjing, China*

GPA: 3.22/4.00 *August 2017 - July 2021*

Modules: Artificial Intelligence; Modern Control System; Electrotechnics; Mechanical Manufacture

Work Experience

Research Associate, CPS Research Group, NTU *Singapore*

Prof. Arvind Easwaran *Nov 2022 - Present*

ML safety navigation algorithm design and robot control architecture development for CPS system; research on automated assessment of trustworthiness for AI Training Programs (ATP).

Student Researcher, MARMOT Lab, NUS *Singapore*

Prof. Guillaume SARTORETTI *April 2022 - May 2022*

Multi-agent Pathfinding research for warehouse systems; reinforcement learning-based path planner design; algorithm performance testing, baseline comparison and results summarization.

Publications

CRLLK: Constrained Reinforcement Learning for Lane Keeping in Autonomous Driving *Detroit, Michigan, USA*

International Conference on Autonomous Agents and Multiagent Systems *May 2025*

Abstract: Formulated a lane-keeping system as a constrained reinforcement learning problem, maximizing driving distance and setting lane deviations and collisions as constraints. This approach eliminated the need for scenario-specific tuning, with weights automatically learned alongside the policy. Validated in both simulated and real-world scenarios, achieving superior performance over baselines.

Projects and Experience

Short-Horizon Regret Reinforcement Learning in Trainer-Trainee System *NTU, Singapore*

AI Singapore *December 2023 - Present*

- Introduces a theoretical approach that leverages regret minimization within a teacher-student framework to provide a immediate training feedback, fairness evaluation and trustworthiness guarantee. This approach allowing real-time updates with sample efficiency while preserving optimal solution for the long-horizon problem.

Constrained Lane Keeping in Simulation-to-Real Environment *NTU, Singapore*

AI Singapore *October 2022 - Dec 2024*

- Formulate a constraint Lane Following problem which is sensitive to the lane deviation for safety consideration. Design a Lane Following algorithm on continuous and discrete space. This approach outperforms various baselines in terms of performance.
- Technical Skills: Embedded System, ROS Development, Docker GPU Training, ML Related Skills

Individual Voting for RL and Search-based Algorithm Combination in Multi-agent Pathfinding *NUS, Singapore*

Mechanical Engineering Project *Aug 2021 - July 2022*

- Proposed a mechanism optimize the pathfinding algorithm in dead/livelock situations by learning to combine a decentralized RL algorithm and a search-based algorithm. This approach outperforms various baselines in terms of the runtime of planning algorithm and the completion rate of robot path planning tasks.

Reinforcement Learning in Continuous Control Problem *NJUST, China*

Final Year Project *Sept 2020 - May 2021*

- Developed a RL-based algorithm for robust manipulator operation using RGB image inputs and Cartesian coordinate outputs. Achieved autonomous grasping for arbitrary workpiece structures.

Skills

Programming Python (Pandas, NumPy, PyTorch, Tensorflow), C++, MATLAB, Origin

Operation Platforms Linux, ROS, Docker, Arduino, Raspberry Pi, Jetson Nano

Tools AutoCAD, SolidWorks, Latex, Unity, OpenAI Gym

Softskills Teamwork, Problem-solving, Documentation, Engaging Presentation.

Achievements

2021 **Outstanding Graduate Award in Mechanical Engineering**, NJUST *Nanjing, China*

2020 **School of Mechanical Engineering School-level Scholarship**, NJUST *Nanjing, China*

2019 **Second Prize in Jiangsu Province Mechanics Competition**, Society of Theoretical and Applied Mechanics *Jiangsu, China*

2019 **School of Mechanical Engineering School-level Scholarship**, NJUST *Nanjing, China*

2018 **School of Mechanical Engineering School-level Scholarship**, NJUST *Nanjing, China*

Extracurricular

Sports Love to running, hiking, swimming, sky diving and Scuba diving

Hobbies Watching movies, reading books, playing the violin and the piano

References

Prof. Arvind Easwaran
College of Computing & Data Science
Nanyang Technological University
Singapore
arvinde@ntu.edu.sg

Prof. Guillaume Adrien Sartoretti
Department of Mechanical Engineering
College of Design and Engineering
National University of Singapore, Singapore
guillaume.sartoretti@nus.edu.sg

Prof. Chew Chee Meng
Department of Mechanical Engineering
College of Design and Engineering
National University of Singapore, Singapore
chewcm@nus.edu.sg