HU LIFAN

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EDUCATION

National University of Singapore **Aug 2024 - Present**
Bachelor of Engineering in Computer Engineering (Specialization: IoT)

- Second Major: Innovation and Design Program
- Minor: Mathematics
- GPA: 4.5/5.0

Shanghai Jiao Tong University (Summer School) **Jun 2025 - Jul 2025**
Courses: Algebra, Statistics Inference

- Score: A

PREVIOUS EXPERIENCE

National University of Singapore, Lead Developer **Jan 2025 - May 2025**

- Designed and programmed an autonomous robot integrating ROS2, SLAM, and AMG8833 thermal sensing for heat target identification and projectile firing.
- Implemented multi-pass exploration (random walk, frontier-based, validation) and custom A* navigation with real-time obstacle avoidance through LiDAR.
- Developed robust exclusion-zone logic, adaptive wall-avoidance, and goal prioritization using tf2 pose tracking.

National University of Singapore, Robotics Group Leader **Feb 2025 - Apr 2025**

- Designed interrupt-based encoder tracking, direction control, and command parsing for Arduino Mega.
- Developed a C++ serial communication interface on Raspberry Pi for teleoperation and claw actuation. Integrated infra-red sensing, ultrasonic braking, and servo-based multi-fingered claw control.

PUBLICATIONS

Lifan Hu, "Learning Lie Group Generators From Trajectories," arXiv.org, April 4, 2025, https://arxiv.org/abs/2504.03220.
Lifan Hu, "GNN-Augmented RL for Fraud Detection in Decentralized Finance," CONF-SEML 2025(accepted), April 14, 2025, link to be updated.

AWARDS & CERTIFICATES

- Worldquant BRAIN Challenge Silver Medal, Worldquant, Feb 2025.
- 2025 Mathematical Contest In Modelling - Meritorious Winner, COMAP, May 2025.

SKILLS

- Chinese (Native), English (Proficient), Japanese (Intermediate), German (Basic)
- Programming Languages: Python (advanced), C++, JavaScript, HTML/CSS, Bash

- AI Frameworks: PyTorch, TensorFlow, scikit-learn, RLlib, PettingZoo
- Graph Neural Networks: PyTorch Geometric (PyG), DGL, NetworkX
- Reinforcement Learning & MARL: PPO, Multi-Agent RL, Gymnasium, Stable-Baselines3
- Mathematics & Modeling: Linear Algebra, Graph Theory, Lie Groups/Algebras, Probability, Optimization
- Frontend & Web Development: React, Vite, Tailwind CSS, React Router, GitHub Pages
- Tools & Platforms: Git, Docker, VS Code, Jupyter, ROS2, Linux (Ubuntu)

RESEARCH WORK

GNN + MARL for DeFi Fraud Detection (Researcher) **Jan 2025 - May 2025**

- Created multi-agent PPO model in a custom PettingZoo ParallelEnv with GNN-based transaction graphs. Supervisor: Prof. Pietro Lio' @CambridgeUK
- Benchmarked hybrid GNN-RL-GAN model against RL-only and traditional ML with 50k Ethereum records

Lie Group Trajectory Encoder (Independent Project) **Feb 2025 - Apr 2025**

- Trained neural encoders for SE(2), SE(3), SO(3), SL(2,R) using supervised MLPs on Lie group trajectories
- Visualized embeddings and tested model robustness under noise and fast angular motion through Gradient Loss

CO-CURRICULAR ACTIVITIES

Member, NUS Astronomy Society **Oct 2024 - Present**

- Participated in and assisted organization of AstroBash, a stargazing expedition to Langkawi, Malaysia.
- Regularly attended weekly astronomy sessions to deepen understanding of celestial observation and astrophysics.

INTERESTS

- Mathematical Structures: Group theory, Algebraic Topology, Lie algebras, and applications in robotics and machine learning
- IoT & Embedded Systems: Sensor fusion, real-time control, microcontroller design
- Machine Learning: Reinforcement learning, graph neural networks, adversarial modelling
- Coding for Fun: Automating puzzles, building mini compilers, experimenting with generative visuals

PROFILE SUMMARY

Engineering undergraduate with a strong research orientation in robotics, machine learning, and embedded systems. Proven experience leading autonomous systems projects that combine real-time control, sensor fusion, and reinforcement learning. Skilled in integrating ROS2, GNNs, and Lie group mathematics into practical applications — from heat-seeking robots to blockchain fraud detection. Comfortable working across software-hardware boundaries with hands-on experience in Python, C++, and microcontroller programming. Published and in-progress papers demonstrate a capacity for rigorous technical work, while team projects reflect initiative, system-level thinking, and fast learning in applied environments. Eager to contribute to cutting-edge research or engineering teams through internships or assistant roles.