# 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: 4.6/5.0

**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 an autonomous mobile robot with ROS2, SLAM, and AMG8833 thermal imaging; navigated complex indoor environments and executed heat-targeted projectile firing with >90% directional accuracy.
- Engineered multi-pass exploration logic (random walk → frontier-based → validation) and integrated A* pathfinding with real-time LiDAR-based obstacle avoidance, improving map coverage efficiency by ~35%.

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

- Developed a C++ serial communication interface on Raspberry Pi for teleoperation and claw actuation; synthesized 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(Published), April 14, 2025, https://doi.org/10.54254/2755-2721/2025.22856.

## AWARDS & CERTIFICATES

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

## SKILLS

- Languages: Chinese (Native), English (Proficient), Japanese (Intermediate), German (Basic).
- Frameworks: ROS2, OpenCV, PyTorch, SuperSuit, PettingZoo, RLlib.
- Hardware: Raspberry Pi 4, Arduino Mega, AMG8833, LiDAR, Servo Motors.
- Web & UI: React, Tailwind CSS, Vite, Figma.
- Programming Languages: Python, C/C++, JavaScript.
- Machine Learning: Reinforcement learning, graph neural networks, transformers.

## RESEARCH WORK

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

- Built a GNN-augmented multi-agent PPO system in a custom PettingZoo ParallelEnv to detect fraudulent behaviours in DeFi transaction graphs; validated against 50K+ Ethereum records; supervised by Professor Pietro Liò, Cambridge University.
- 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 manifold embeddings and benchmarked robustness under noise and rapid angular shifts with gradient-weighted loss functions; averaging 0.03 of prediction error.

## CO-CURRICULAR ACTIVITIES

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

- Planned and co-led AstroBash – a university-wide stargazing expedition to Langkawi, Malaysia; organized logistics and guided sky observation sessions for 30+ participants.

## 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.

## INTERNSHIP

**Shanghai MAHLE Thermal Systems Co., Ltd., Digital Developer** **May 2025 - Present**

- Wrote a real-time multilingual meeting transcriber/translator using Vosk + MarianMT; fully offline-capable, deployed in constrained industrial environments with >95% ASR accuracy in quiet speech.
- Trained YOLOv5 model on blueprint .tif images, achieving >85% precision in detecting diagrams, tables, and handwritten notes in manufacturing documents.
- Developed OCR pipeline combining Tesseract and PaddleOCR to extract structured data from multi-format scanned documents with layout reconstruction, with accuracy over 98% of texts.
- Created an OCR-based screen snipping data extractor for QM factory interfaces, integrating image hashing and keyboard automation to enable zero-integration telemetry, now operating on 90% of local factory interfaces.
- Established a predictive model (Decision Tree, Extra Trees) for factory downtime forecasting; achieved Mean Absolute Error < 0.045 across evaluation sets.
- Deployed multiple lightweight Flask APIs to serve model inference, real-time OCR, and monitoring dashboards across local networked systems.