Hu Hanyang

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EDUCATION

University of California San Diego, M.Sc. in Electrical and Computer Engineering — Sept 2025 – June 2027

- **GPA:** 4.0/4.0
- **Specialization**: Intelligent Systems, Robotics & Control
- **Relevant Courses:** Statistical Learning, Random Processes, Geometric Numerical Integration

National University of Singapore, B.Sc. (Hons) with Major in Mathematics — Aug 2021 – July 2025

- **GPA**: 4.74/5.0 (Highest Distinction)
- **Awards**: Ho Family Prize (as the **best overall student in applied mathematics**), AY24/25 Sem 2 Dean's List.
- Participant of the **Special Programme in Mathematics (SPM)** for selected students with strong aptitude.
- **Specialization**: Operations Research & Data Analytics
- **Relevant Courses:** Bayesian Statistics, Convex Optimization, Data Structures and Algorithms, Data Modelling and Computation, Differential Geometry, Game Theory, Information Theory, Numerical Computation, Stochastic Operations Research, Stochastic Processes, Theory of Computation

EXPERIENCE

Graduate Student Researcher, Advanced Robotics and Controls Lab @ UCSD — Sept 2025 – Now

- Working on rendering-based online pose estimation and video calibration of surgical robots.

Software Team Lead, NUS Calibur Robotics — Aug 2022 – July 2024

- Led data collection and curation of over 6000 images to train lightweight models for robot detection.
- Applied the SORT algorithm and Kalman filters for motion tracking and prediction.
- Applied Perspective-n-Point (PnP) pose computation for robot localization.
- Achieved 2nd place as a team in the RoboMaster University League (RMUL) 2023, Seattle.
- Conducted multiple workshop sessions in the DarkNUS program to teach participants about our systems.
- Implemented particle filters and various path planning algorithms in simulations, including A* and DWA.

SELECTED PROJECTS

Lie Group Forced Variational Integrator Networks on Unit Quaternion Groups — Sep 2025 - Dec 2025

Course Project for Advanced Techniques in Computational Mathematics | Instructor: Prof. Melvin Leok.

- Extended the existing Lie group forced variational integrator networks (LieFVIN) on the rotation group $\mathbf{SO}(3)$ to the unit quaternion group S^3.
- Proposed the sign-invariance trick to ensure physically plausible predictions, resulting in $2\times$ faster training convergence on a planar pendulum task.
- Improved training convergence for the original LieFVIN by adding an internal conversion $\mathbf{R} \mapsto \mathbf{q}$.

Efficient Gaussian Processes for Model-Based Planning — Aug 2024 - Apr 2025

Mathematics Capstone Project | Supervisor: Prof. Jonathan Scarlett.

- Integrated efficient GP inference methods (e.g., variational conditioning, local kernel interpolation, etc.) with TD-MPC (no latent).
- Validated performance across five MuJoCo environments in Gymnasium (Pendulum, Reacher, Pusher, Swimmer, and Half Cheetah). Performing a total runtime comparable (about $1.5\times$) to the baseline.

Neural ODE for Optimal Control — Feb 2025 - Apr 2025

Course Project for Modeling and Numerical Simulations | Instructor: Prof. Li Qianxiao.

- Implemented Neural ODE from scratch using PyTorch to solve a simple control problem, compared with an LQR baseline, and visualized results of different initializations.

Nonlinear Dimensionality Reduction with UMAP Aug 2024 - Dec 2024

Course Project for Data Modelling and Computation | Instructor: Prof. Soh Yong Sheng

- Studied and summarized the curse of dimensionality and the (parametric) UMAP algorithm in a written report.
- Implemented parametric UMAP from scratch using PyTorch. Tested on synthetic and real-world datasets.
- Applied concepts in smooth manifolds to estimate intrinsic dimension (via probabilistic PCA on tangent spaces).

Unstructured High-Dimensional Bayesian Optimization May 2024 - Aug 2024

Advanced UROPS in Mathematics | Supervisor: Prof. Jonathan Scarlett.

- Investigated the unknown hyperparameter issue of Bayesian optimization in high-dimensional settings, without imposing assumptions on low-dimensional structures or restricting to local regions.
- Proposed a soft approximation of Winsorization to address outliers and complex objective functions, achieving more robust results in finding controller parameters for a robotic task in the Gymnasium.

SKILLS

Languages: English (GRE: 160+168+4.0; IELTS Academic: 8.0), Chinese (Native)
Technical Skills: Python (PyTorch, NumPy, KeOps, OpenCV, etc.), Linux (basic commands, vim, SSH, etc.), LaTeX