

# Hu Hanyang

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## EDUCATION

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

- **GPA:** 4.7/5.0
- Participant of the **Special Programme in Mathematics (SPM)** for selected students with strong aptitude.
- **Specialization:** Operations Research & Data Analytics
- **Relevant Courses:** Artificial Intelligence, Bayesian Statistics, Computer Organization, Convex Optimization, Data Structures and Algorithms (in C++), Data Modelling and Computation, Differentiable Manifolds, Differential Geometry on Curves and Surfaces, Discrete Mathematics, Game Theory, Information Theory, Numerical Computation, Stochastic Operations Research, Stochastic Processes, Theory of Computation

## EXPERIENCE

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

- Led data collection and curation of over 6000 images to train lightweight models for armor plate 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 aimbot systems.
- Implemented particle filters and various path planning algorithms in simulations, including A\* and DWA; and investigated RL-based navigation through IQL and reward shaping.

## SELECTED PROJECTS

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

*Mathematics Capstone Project (MA4198+MA4288O) | 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 Gymnasium environments (Pendulum, Reacher, Pusher, Swimmer, and Half Cheetah). Performing a total runtime comparable (about  $1.5\times$ ) to the baseline.

**Nonlinear Dimensionality Reduction with UMAP** Aug 2024 - Dec 2024

*Course Project for Data Modelling and Computation (MA4270) | 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 (MA3288) | 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 the lunar lander task in the Gymnasium.
- Delivered a written report and presented findings through an oral presentation.

## 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.),  $\text{\LaTeX}$