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 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

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.), LaTeX