Hu Hanyang

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SUMMARY

I am a final-year undergraduate student in Mathematics at the National University of Singapore (NUS). I have obtained solid foundational knowledge and honed my problem-solving skills through rigorous coursework, along with practical experience in machine learning and robotics through academic and extracurricular projects.

My research interests lie in learning-based decision-making, particularly reinforcement learning and model-based planning. I am currently focused on enhancing the data and computation efficiency of uncertainty-aware models and enabling the online acquisition of new knowledge.

EDUCATION

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

- **GPA**: 4.66/5.0
- Participant of the **Special Programme in Mathematics (SPM)** for selected students with strong aptitude.
- **Specialization**: Operations Research & Data Analytics
- **Relevant Coursework:** Artificial Intelligence (A+), Bayesian Statistics (A−), Computer Organization (A−), Convex Optimization (A), Data Structures and Algorithms in C++ (A), Differential Geometry on Curves and Surfaces (A+), Discrete Mathematics (A+), Game Theory (A+), Information Theory (A−), Numerical Analysis (A), Stochastic Operations Research (A−), Stochastic Processes (A−), Theory of Computation (A−)

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.
- 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 reinforcement learning-based navigation through implicit Q learning and reward shaping.

PROJECTS

Gaussian Processes for Model-Based Reinforcement Learning   Aug 2024 - now
Mathematics Capstone Project (MA4198+MA4288x) | Supervisor: Prof. Jonathan Scarlett.

- **Initiative**: Focus on applying GPs in the MBRL setting to leverage the data efficiency, uncertainty quantification, and incremental ability of GPs, and incorporate the flexibility of neural networks in architectures and training objectives. Meantime, attempt to retain computation efficiency for real-time applications.
- **Ongoing Plan**: (1) Investigate and develop scalable, online, and non-stationary GP regression model; (2) Study and apply state abstraction techniques in reinforcement learning, combined with regularizations to enhance GP-based planning.
- **Current Progress**: Applied Lanczos estimation to update both mean cache and LOVE cache, achieving approximately 100x speedup in runtime on the Elevator dataset for frequently fantasizing the model compared to the implementation of exact GP with LOVE in GPyTorch.

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 learning controller parameters for the lunar lander task in OpenAI Gymnasium.
- Delivered a written report and presented findings through an oral presentation.