

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 problem-solving skills through my study in mathematics and have honed my working familiarity with machine learning and relevant tools through academic and personal projects.

My research interest lies in learning-based decision-making, particularly in planning and deep reinforcement learning, with a current emphasis on enhancing data and computation efficiency and enabling the online acquisition of new knowledge for uncertainty-aware models.

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:** Discrete Mathematics, Data Structure and Algorithms, Computer Organization, Artificial Intelligence, Bayesian Statistics, Differential Geometry, Convex Optimization, Numerical Analysis, Game Theory, Information Theory, Theory of Computation, Stochastic Processes, Stochastic Operations Research

EXPERIENCE

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

- Led data collection and annotation of 3k+ images for armor plate detection to train a YOLOv7-tiny model.
- Applied the SORT algorithm and Kalman filters to track and predict the target's spatial motion.
- Participated in RMUL 2023 (Seattle). Our team impressively won 2nd place in the competition.
- Conducted 3 workshop sessions in the DarkNUS program to teach participants how to deploy our system.
- Led implementations of particle filters and path planning algorithms (e.g., A* and DWA) in simulations.
- Applied implicit Q learning and reward shaping to investigate learning-based navigation in simulations.

PROJECTS

Gaussian Processes for Model-Based Reinforcement Learning Aug 2024 - now

- MA4198+MA4288x Mathematics Capstone Project under the supervision of Prof. Jonathan Scarlett.
- **Initiative:** Apply GPs in the MBRL setting and try to enjoy the best of both worlds - data efficiency, uncertainty quantification, and incremental ability of GPs; and flexibility of neural networks in architectures and objectives - while retaining computation efficiency for real-time applications.
- **Ongoing Plan:** (1) Investigate and develop GP regression models that are online, scalable, and non-stationary; (2) Study and apply state abstraction techniques for reinforcement learning combined with regularizations to ease GP-based planning.
- **Current Progress:** Applied Lanczos estimation to update both the mean cache and LOVE cache (inspired by existing papers), resulting in around 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

- Summer undergraduate research project under the supervision of Prof. Jonathan Scarlett. Submitted a written report and gave an oral presentation of the work done.
- Investigated the unknown hyperparameter issue of Bayesian optimization in high-dimensional settings, without imposing assumptions on low-dimensional structures or restricting to local regions.