Yunfan **Lu**

Senior Robotics Software Engineer · Experienced in both academic and industry · Singapore PR

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Work Experience

Senior Robotics Software Engineer

Singapore

Dyson Technology, Upstream Robotics / Robot Learning Lab

May 2022 - Present

- Led the Development of an extensive software integration platform for evaluating robotics algorithms, ranging across perception, state estimation, planning, and control, for both mobile robots and robot arms, in both simulations (Pybullet, Unity) and real world.
- Leading the development of next-generation features for vacuum robots, focusing on intelligent cleaning behaviours that enhance robot efficiency and reduce the need for user intervention.
- Implemented and improved state-of-the-art imitation and reinforcement learning algorithms for the robot learning software stack to facilitate robot learning research.

Robotics Research Engineer

Singapore

National University of Singapore, Adaptive Computing Lab

July 2019 - Feb 2022

- Assisted research in the area of smart household robot applications under supervision of Prof David Hsu.
- Integrated research projects with state-of-the-art computer vision, speech recognition, planning, manipulation and indoor navigation to build a robot butler that communicates with and serves people.
- Delivered milestone demonstrations to external visitors. Videos available here.
- Developed robot software system architecture to enforce software consistency and cleanliness. Unified all pre-existing codes into a consistent framework.

Embedded Software Engineer

Singapore

Creative Technology Pte Ltd

July 2017 - Jun 2019

- Developed key user interaction and data communication modules for new Super X-FI flagship product series.
- Developed C++ test programs and Python test scripts across platforms to ensure the quality and stability of products.
- Collaborated extensively with other teams to ensure efficient module integration and debugging.

Education

National University of Singapore

Singapore

Master in Artificial Intelligence, Research track

Aug 2020 - Aug 2023

- CGPA 4.9/5.00.
- Academic Excellence Award for being the top graduate in the batch.
- Distinction in courses including Advanced Topics in Robotics, AI Planning and Decision Making, Uncertainty Modeling in AI and Theory and Algorithms for Machine Learning.
- Master thesis focuses on harnessing deep learning to accelerate motion planning for mobile manipulators in household environments.

Nanyang Technological University

Singapore

B.E. in Electrical and Electronic Engineering

Aug 2013 - Jun 2017

- Specialization: Intelligent system and control.
- First Class Honours / CGPA 4.55/5.00.
- Scholarship: NTU Science and Engineering Scholarship in recognition of academic excellence.
- Achieved 17 Distinctions in engineering courses, including Robotics and Automation, Computational Intelligence, Modeling and Control, Engineering Mathematics and Data Structure and Algorithms.

Publications & Projects

Neural Randomized Planning for Whole-Body Robot Motion

Master Thesis

Publication, first author

paper link

- Proposed a novel hybrid learning-planning algorithms to address the slow speed of whole-body motion planning for high DOF mobile manipulators in household environments.
- The method presents a clever and systematic combination of learning and planning. The learner helps to increase planning efficiency while the planner breaks down large global problems into local pieces that are suitable for learner.
- Performed extensive experiments in both simulation and real-world, showing that the algorithm significantly outperforms existing classical and learning-based motion planning algorithms by 100% in challenging real-world scenarios. Videos available here

INVIGORATE, Interactive Visual Grounding and Grasping in Clutter

Robotics: Science and System 2021

PUBLICATION, CO-FIRST AUTHOR

paper link

- Researched and developed a robot system that interactively grasps a user-specified target object in cluttered environments.
- The system integrates learning and planning by treating neural networks' outputs as noisy observations. Using learnt observation models, it performs principled POMDP planning to synthesize an optimal action sequence including grasping and asking questions to retrieve the target object.
- Implemented the proposed system on a Fetch robot. Conducted extensive real-world experiments to evaluate the system's performance.

Robotics Algorithms

OPEN-SOURCE PROJECT, OWNER

project link

- Implemented a collection of essential robotics algorithms in Python, with a good balance in width and depth and high code quality.
- Algorithms includes, A* and RRT for planning, PID, LQR and MPC for control, Monte Carlo learning and SARSA for reinforcement learning, and Kalman filter and Particle filter for state estimation and more.

BiGym: A Demo-Driven Mobile Bi-Manual Manipulation Benchmark

Conference on Robot Learning 2024

PUBLICATION, CO-AUTHOR

paper link

- Developed a new benchmark for mobile bi-manual demo-driven robotic manipulation which features 40 diverse tasks set in home environments.
- Conducted large-scale experiments to benchmark state-of-the-art imitation learning and reinforcement learning algorithms, including ACT, Diffusion policy, DrQV2, AWAC and IQL.

Ab Initio Particle-based Object Manipulation

Robotics: Science and System 2021

PUBLICATION, CO-AUTHOR

paper link

- Helped implementing real robot experiment to evaluate the method's performance.
- Paper published in Robot Science and Systems 2021.

Skills

Programming Python, C++, C, ROS, ROS2

Knowledge Deep learning, reinforcement learning, motion planning, planning under uncertainty, classical control, optimal control

Languages English, Chinese