

Yuhan Liu

<https://jaysparrow.github.io/>

RESEARCH INTERESTS

- **Robotics:** Imitation Learning, Inverse RL, Hierarchical RL, Meta Learning, Multi-task Learning, Autonomous Driving;
- **Machine Learning:** Generalization, Self-supervised Learning, Few-shot Learning, Representation Learning, Generative Models

EDUCATION

Doctor of Philosophy in Computer Science Rutgers University	Sept 2022 - Present New Jersey, U.S.
Master of Science in Computer Science (GPA: 3.95/4.00) University of California, San Diego (UCSD)	June 2021 San Diego, U.S.
Bachelor of Engineering in Electronic Information Engineering (GPA: 3.67/4.00, top 5%) The Chinese University of Hong Kong, Shenzhen (CUHKSZ)	June 2019 Shenzhen, China
• Selected awards: Academic Scholarship (2017 & 2016); Dean's List under School of Science and Engineering (2019 & 2018 & 2017 & 2016); Undergraduate Research Award (2018 & 2017).	
Visiting Student University of Cambridge	July 2017-Sept 2017 Cambridge, U.K.

PUBLICATIONS

- [1] P Yang, **Y Liu**, S Koga, A Asgharivaskasi, N Atanasov, "[Learning continuous control policies for information-theoretic active perception.](#)" ICRA 2023.
- [2] M Song, **Y Liu**, Z Li, M Chandraker, "[Learning to Rearrange with Physics-Inspired Risk Awareness.](#)" R:SS Workshop 2022.
- [3] **Y Liu***, Y Han*, D Paz, H Christensen, "[Auto-calibration Method Using Stop Signs for Urban Autonomous Driving Applications.](#)" ICRA 2021.
- [4] Z Li, TW Yu, S Sang, S Wang, M Song, **Y Liu**, YY Yeh, R Zhu, N Gundavarapu, J Shi, S Bi, Z Xu, HX Yu, K Sunkavalli, M Hašan, R Ramamoorthi, M Chandraker, "[OpenRooms: An End-to-End Open Framework for Photorealistic Indoor Scene Datasets.](#)" CVPR 2021 (Oral).
- [5] H Christensen, D Paz, H Zhang, D Meyer, H Xiang, Y Han, **Y Liu**, A Liang, Z Zhong, S Tang, "[Autonomous Vehicles for Micro-mobility.](#)" Springer Autonomous Intelligent Systems (AIS) 2021.

RESEARCH EXPERIENCE

Policy Learning for Information-Theoretic Active Perception Research Volunteer to Prof. Nikolay Atanasov, Existential Robotics Lab	Aug 2021 - Sept 2022 UCSD
• Formulated the POMDP problem of active landmark localization into the RL framework by defining the state, action and reward function, using outputs of a Kalman filter.	
• Experimented a PPO policy on basic 2D environment and demonstrated the effectiveness of the method.	
• Extended the algorithm to the setting of joint exploration and landmark localization.	
• Paper [1] accepted by ICRA 2023.	
Physics-Aware Reinforcement Learning in Simulated Indoor Scenes Graduate Research Assistant to Prof. Manmohan Chandraker	Sept 2020 - Sept 2021 UCSD
• Participated in a project that proposed a novel energy-based reward which encourages learning the physical understanding of mass and friction coefficients; Demonstrated its effectiveness on two novel and challenging indoor rearrangement tasks unifying navigation and object interaction skills.	
• Designed and derived the translational and rotational energy, normalized with historical values to have scale-free	

effect on the reward, which is one of the principal technical contributions.

- Proposed a novel “variable mass pushing task” to test the agent’s physical understanding of mass, of which the results clearly and intuitively matched human expectations.
- Run experiments and ablation studies; Showed decrease of energy consumptions in both tasks with our method.
- Open-source libraries and platforms include: RLlib, iGibson, PyBullet, OpenRooms, and PyTorch; RL algorithm used: PPO.
- Paper [4] accepted by CVPR 2021 (Oral).
- Paper [2] accepted by R:SS Workshop 2022.

Auto-calibration for Urban Autonomous Driving Applications

Sept 2019 - Sept 2020

Graduate Research Assistant to Prof. Henrik Christensen, Autonomous Vehicle Lab

UCSD

- Designed and implemented an autonomous pipeline for camera intrinsic calibration using ubiquitous stop signs as references; Techniques include: object detection with neural networks, sub-pixel edge detection, SVD, RANSAC, shape matching, planar object calibration, temporal updates with a Kalman filter.
- Experimented on cameras mounted on an autonomous vehicle driving around the UCSD campus; Showed convergences (to zero) on the relative errors of the intrinsic parameters; Achieved lowest relative errors comparable to those of the widely accepted checkerboard calibration method (Zhang, 2000).
- Paper [3] accepted by ICRA 2021.
- Paper [5] accepted by AIS 2021.

Course Design: AI and Robotics

Apr 2019 - July 2019

Research Assistant to Prof. Tinlun Lam, Shenzhen Research Institute of AI and Robot

CUHKSZ

- Designed and implemented an experimental high school robot course consisted of image recognition, voice detection, and auto navigation, based on robot operating system (ROS).
- Organized the projects into convenient API’s for different course designs and various course levels.
- Documented the algorithms (e.g. perceptron, back propagation), principles (e.g. topic/service programming, synchronized/asynchronous communication), and implementation procedures into a thorough instruction manual.

Picture Prediction on Historical Radar Reflection Images

Jan 2018 - Nov 2018

Research Assistant to Prof. Xiaoguang Han, Shenzhen Research Institute of Big Data

CUHKSZ

- Participated in the Global A.I. Challenge on Meteorology sponsored by IEEE International Conference on Data Mining (ranked 11/1739).
- Proposed a solution: converting temporal information into spatial information, treating historical image sequences as one single image, and generating future sequences based on it.
- Added ConvLSTM on top of the traditional picture generation algorithm for radar reflection images implemented in TensorFlow, achieving a 7% increase in Heidke Skill Score.

WORK EXPERIENCE

Huawei Technologies Co., Ltd.

June 2018 - Aug 2018

Technology Research Engineer (Internship)

Shenzhen, China

- Increased the recognition rate of pedestrians’ clothing and ages on surveillance videos, by empowering loss functions of a deep neural network, constructed in Caffe and CUDA.
- Clothing Color Recognition: Added a label-smoothing strategy to the one-hot labeled loss function and observed a 5% increase of recognition rate for the multi-labeled algorithm on recognizing ragged clothes.
- Age Recognition: Introduced expectation and variance to the loss function of the age identification network and demonstrated its effectiveness: mean absolute error (MAE) dropped by 1.42 years old from the original model.

TEACHING EXPERIENCE

Electricity and Magnetism

Feb 2018 - May 2018

Teaching Assistant, School of Science and Engineering

CUHKSZ

- Guided 10-15 junior students in reviewing and practicing learned content from lectures.
- Added extra materials to tutorials and explained challenging content in a weekly seminar.
- Held office hours per week for answering questions.

TECHNICAL SKILLS

- **Programming Languages:** Python, C++, ROS, MATLAB, R, CUDA, C
- **Software and Platforms:** PyTorch, Issac Sim/Gym, PyBullet, OpenCV, Docker, Bash
- **Development Board:** ARM Cortex M3, FPGA