Kai Lu

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EDUCATION

University of Oxford (OX) Oxford, UK
Ph.D. Candidate in Computer Science, Supervisor: Prof. Andrew Markham *Oct. 2020 - Present*
- Focus: Robot Learning, Reinforcement Learning, 3D Robotics, Robotic Manipulation
- Thesis Topic: Embodied Visual Control Policy Learning for Generalizable Mobile Manipulation

Tsinghua University (THU) Beijing, China
B.E. in Automation with Outstanding Graduate Honor *Aug. 2016 - Jul. 2020*
- Admission: Selected to Tsinghua Leading Talent Program
- Projects: RL for Active Robotic Picking (R.A. in Computer Science); QP-WBC for Humanoid Robot (Thesis)

University of Illinois Urbana-Champaign (UIUC) & Duke University (Duke) Champaign & Durham, USA
Visiting Student at IML Lab in Computer Science, Supervisor: Prof. Kris Hauser *Jul. 2019 - Sep. 2019*
- Project: Deformable Object Modeling and Manipulation

PUBLICATIONS

Learning Generalizable Manipulation Policy with Adapter-Based Parameter Fine-Tuning In Submission
***Kai Lu**, Kim Tien Ly, William Hebberd, Kaichen Zhou, Ioannis Havoutis, Andrew Markham*

See, Imagine, Plan: Discovering and Hallucinating Tasks from a Single Image Tech. Report 2024
*Chenyang Ma, **Kai Lu**, Ta-Ying Cheng, Niki Trigoni, Andrew Markham*

Learning to Catch Reactive Objects with a Behavior Predictor ICRA 2024
***Kai Lu**, Jia-Xing Zhong, Bo Yang, Bing Wang, Andrew Markham*

Decoupling Skill Learning from Robotic Control for Generalizable Object Manipulation ICRA 2023
***Kai Lu**, Bo Yang, Bing Wang, Andrew Markham*

Dynpoint: Dynamic neural point for view synthesis NeurIPS 2023
*Kaichen Zhou, Jia-Xing Zhong, Sangyun Shin, **Kai Lu**, Yiyuan Yang, Andrew Markham, Niki Trigoni*

Multi-body SE (3) Equivariance for Unsupervised Rigid Segmentation and Motion Estimation NeurIPS 2023
*Jia-Xing Zhong, Ta-Ying Cheng, Yuhang He, **Kai Lu**, Kaichen Zhou, Andrew Markham, Niki Trigoni*

Weakly Supervised Descriptor Learning for Pixel-Level Feature Matching Term Report 2021
***Kai Lu**, Andrew Markham*

Semi-Empirical Simulation of Learned Force Response Models for Heterogeneous Elastic Objects ICRA 2020
*Yifan Zhu, **Kai Lu**, Kris Hauser*

Deep Reinforcement Learning for Robotic Pushing and Picking in Cluttered Environment IROS 2019
(: Co-first Author, Equal Contribution)*
Yuhong Deng, Xiaofeng Guo*, Yixuan Wei*, **Kai Lu***, Bin Fang, Di Guo, Huaping Liu, Fuchun Sun*

A Composite Robotic Manipulator Based on Gripper and Suction Cup Patent 2019
*Bin Fang, Huaping Liu, Yuhong Deng, Xiaofeng Guo, **Kai Lu**, Yixuan Wei*

PROFESSIONAL SERVICES

Reviewer: ICRA 2024, NeurIPS 2023, ICLR 2023 **Marker**: Oxford Mathematics Admissions Test (MAT)

SKILLS

Machine Learning: Python, C++/C#, Matlab, PyTorch, Tensorflow
Robotics Related: Nvidia Isaac Gym, SAPIEN ManiSkill, RL-Games, ROS, V-REP, Klampt
Robots: UR Series, Toyota HSR, UBTECH Walker, Franka Panda, Unitree Aliengo & Z1; RealSense/STM32/Arduino

RESEARCH EXPERIENCES

Collaboration with Oxford Robotics Institute (ORI), Oxford, UK *Jan. 2024 - Apr. 2024*

- Proposed an adapter-based reinforcement learning (RL) method for generalizing learned skills from a disembodied hand to various whole-body robots, such as A2Single, Aliengo-Z1, and Toyota HSR.
- Integrated adapter techniques that are LoRA and Residual Adapter into robotic RL and introduced a feedback reward from robotic control, showing the effectiveness of cross-embodiment generalization.
- Submitted a paper to IROS 2024 (my role: first author).

Visiting Scholar at vLAR lab, PolyU, Hong Kong, China *Mar. 2022 - Oct. 2022*

- Proposed a skill learning method for generalizable manipulation of various 3D articulated objects (SAPIEN).
- Proposed a prediction-based RL approach for dynamic catching with a mobile robotic manipulator (Isaac Gym).
- Published a paper in ICRA 2023 and a paper in ICRA 2024 (oral presentation, my role: first author).

Bachelor Thesis at Robot Locomotion Lab, Tsinghua University, Beijing, China *Dec. 2019 - Jul. 2020*

- Developed a quadratic programming (QP) based whole-body control (WBC) method for humanoid robots.
- Applied the method to adult-size torque-control Humanoid Robot Tsinghua Walker, realizing balancing, dancing, and ball kicking (my role: thesis author).

Research Intern at IML Lab, Duke & UIUC, Durham & Champaign, USA *Jul. 2019 - Sep. 2019*

**The IML Lab was transitioned from Duke University to UIUC during my internship.*

- **UIUC, Champaign, USA:** Developed a semi-empirical method for simulating contact with elastically deformable objects and co-authored a paper published in ICRA 2020. *Aug. 2019 - Sep. 2019.*
- **Duke University, Durham, USA:** Collected and analyzed data on the robotic poking of heterogeneous elastic objects using various probes. *Jul. 2019 - Aug. 2019.*

Tsinghua Team Member in RoboCup 2019 Humanoid League, Sydney, Australia *Sep. 2018 - Jul. 2019*

- Won the 2nd place in Technical Challenge and Drop-in Contest, the 3rd place in 2v2 Soccer Competition.
- Applied segmentation and particle filter algorithm for vision-based localization (my role: main developer).

Research Assistant at State Key Lab in CS, Tsinghua University, Beijing, China *Apr. 2017 - Jun. 2019*

- Proposed an active robot-picking algorithm using deep reinforcement learning to facilitate the robot actively exploring the environment and picking objects. Published a paper in IROS 2019 (my role: co-first author).
- Won the first prize in the 37th Tsinghua Challenge Cup, and gave an oral presentation at the International AI Educational Conference's Tsinghua Exhibition (my role: first author).

HONORS

Outstanding Graduate Honor, Department of Automation, Tsinghua University *2020*

First Prize (Top 1% of all students), The 37th Tsinghua Challenge Cup Technical Competition *2019*

Second Place, Adult-Size Technical Challenge, Humanoid League, RoboCup 2019 World Final *2018*

Champion, Robotic Innovation Contest, The 20th Chinese Robotics and Artificial Intelligence Competition *2018*

Tsinghua Leading Talent Program (Top 1% of all students), Tsinghua University *2016*

First Prize (Top 0.01% in Province), Chinese Physics Olympiad(CPhO) Provincial Final *2015*

First Prize (Top 0.01% in Province), Chinese Mathematical Olympiad (CMO) Provincial Final *2014*

Bronze Medal, China Western Mathematical Olympiad (CWMO) *2014*

**CMO, CPhO, and CWMO are the highest-level academic competitions in China.*

MISC

Board Member, UK Tsinghua Alumni Association (UKTA) *2021 - Present*

Student Ambassador, Department of Computer Science, University of Oxford *2021 - 2023*

Member, Student Science Society, Department of Automation, Tsinghua University *2017 - 2019*

Organizer, C Language Programming Competition, Department of Automation, Tsinghua University *2018*

Volunteer School Teacher, Teaching Support Program in Underdeveloped Areas (Taiping Village, China) *2017*