Kai **Lu**

☐ (+44) 7529980223 | ✉ kai.lu@cs.ox.ac.uk | 🌐 deerkk.github.io |

Robert Hooke Building, Parks Road, Oxford, OX1 3PP, UK

Education

University of Oxford	*Oxford, UK*
PH.D. (ANTICIPATED) IN COMPUTER SCIENCE , SUPERVISOR: PROF. ANDREW MARKHAM	*Oct. 2020 - Present*

- Research interests: Robotic Learning, Reinforcement Learning, Healthcare Robotics

Tsinghua University	*Beijing, China*
B.E. IN AUTOMATION	*Aug. 2016 - Jul. 2020*

- GPA: 3.44 (87/100), with outstanding graduate honor (top 24/153 graduates)

University of Illinois at Urbana-Champain	*Champain, USA*
VISITING SCHOLAR, SUPERVISOR: PROF. KRIS HAUSER	*Aug. 2019 - Sep. 2019*

- Visiting Intelligent Motion Lab, working on robotic learning for elastic objects

Duke University	*Durham, USA*
VISITING SCHOLAR	*Jul. 2019 - Aug. 2019*

- Visiting Intelligent Motion Lab (transferred)

Publications

Semi-Empirical Simulation of Learned Force Response Models for Heterogeneous Elastic Objects	*Paris, France*
SECOND AUTHOR	*May. 2020*

- Yifan Zhu, **Kai Lu** and Kris Hauser
- Published in IEEE International Conference on Robotics and Automation (ICRA) 2020

Deep Reinforcement Learning for Robotic Pushing and Picking in Cluttered Environment	*Macau, China*
CO-FIRST AUTHOR (*DEVOTES EQUAL CONTRIBUTION)	*Nov. 2019*

- Yuhong Deng*, Xiaofeng Guo*, Yixuan Wei*,**Kai Lu***, Bin Fang, Di Guo, Huaping Liu and Fuchun Sun
- Published in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2019

An Active Robotic Picking Method Based on Deep Reinforcement Learning	*Beijing, China*
CO-AUTHOR	*Jul. 2019*

- **Kai Lu**, Yixuan Wei, Yuhong Deng, Xiaofeng Guo, Bin Fang and Huaping Liu
- Patent, 201910608017

A Composite Robotic Manipulator Based on Gripper and Suction Cup	*Beijing, China*
CO-AUTHOR	*Mar. 2019*

- Bin Fang, Huaping Liu, Yuhong Deng, Xiaofeng Guo, **Kai Lu** and Yixuan Wei
- Patent, CN109465840B

Experience

Accelerating Reinforcement Learning for Robotic Manipulation via Decoupling Skill Dynamics	*Oxford, UK*
ADVISOR: PROF. ANDREW MARKHAM, DEPARTMENT OF COMPUTER SCIENCE, UNIVERSITY OF OXFORD	*Jul. 2021 - Present*

- Propose a modular robotic control method based on reinforcement learning. The skill dynamics is decoupled to operational space and then recover to configuration space via robot singularity estimation and convex optimization.
- My role: main developer.

Hierarchical Motion Control for Humanoid Robots via Quadratic Programming	*Beijing, China*
ADVISOR: PROF. MINGGUO ZHAO, DEPARTMENT OF AUTOMATION, TSINGHUA UNIVERSITY	*Dec. 2019 - Jun. 2020*

- Propose a hierarchical control method based on convex optimization, utilizing the full robot dynamic model for whold body control.
- Apply this method to Tsinghua-Walker, an advanced adult-size humanoid robot. Evaluate robot dancing, walking, yoga and soccer playing in simulation.
- My role: developer (of my bachelor thesis).

Healthcare Robot Learning Force Responce Model of Elastic Objects   *Durham and Champaign, USA*

ADVISOR: PROF. KRIS HAUSER, DEPARTMENT OF COMPUTER SCIENCE, UIUC   *Jul. 2019 - Sep. 2019*

- Propose a two-stage framework: firstly a point model was learned via robot poking the object, then a semi-empirical simulator predicted the contact wrench by integrating analytic calculation and the learned point model.
- Publish a paper in ICRA 2020.
- My role: main developer of model learning, robot control engineer.

RoboCup 2019 Humanoid League Contest   *Sydney, Australia*

ADVISOR: PROF. MINGGUO ZHAO, DEPARTMENT OF AUTOMATION, TSINGHUA UNIVERSITY   *Sep. 2018 - Jul. 2019*

- Apply Yolo V3 in robotic vision, and particle filter algorithm in localization.
- Win the second place in Technical Challenge and Drop-in Contest, the third place in 2v2 Soccer Competition.
- My role: main developer of vision-localization group.

Active Robotic Picking in Cluttered Environment via Reinforcement Learning   *Beijing, China*

ADVISOR: PROF. HUAPING LIU, STATE KEY LABORATORY OF INTELLIGENT TECHNOLOGY AND SYSTEMS.   *Mar. 2018 - Jun. 2019*

- Propose an active robot picking algorithm which employed the deep reinforcement learning - deep Q-Network (DQN) to facilitate the robot to actively explore the environment and pick objects.
- Publish a paper in IROS 2019. Publish a patent of the system.
- Win the best project nominee in Beijing Challenge Cup, the biggest university technological competition series in China.
- Give an oral presentation to the United Nations official in Tsinghua Exhibition of International AI Educational Conference.
- My role: main developer of RL, robot control engineer, team leader of the prize-winning project.

Composite Grasping Robot Based on Multi-Modal Perception   *Beijing, China*

ADVISOR: PROF. HUAPING LIU, DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY, TSINGHUA UNIVERSITY. *Apr. 2017 - Mar. 2018*

- Fabricate a composite robotic hand of gripper and suction cup, with the multi-modal perception of vision and tactile sensing.
- Win first place in 2018 National Robotics and AI Competition. Published a patent of the hand.
- My role: main developer of multi-modal perception.

Honors & Awards

2020	**Outstanding Graduate Honor**, Department of Automation,Tsinghua University	*Beijing, China*
2019	**Technological Innovation Scholarship**, Department of Automation,Tsinghua University	*Beijing, China*
2019	**Runner-up**, Technical Challenge of RoboCup Humanoid League Contest	*Sydney, Australia*
2019	**Oral Presentation**, Tsinghua Exhibition of International AI Educational Conference	*Beijing, China*
2019	**Best Project Nominee**, Beijing Challenge Cup Competition	*Beijing, China*
2019	**First Prize**, Tsinghua Challenge Cup Competition	*Beijing, China*
2018	**First Place**, National Robotics and AI Competition	*Foshan,China*
2017	**Tsinghua HAGE Scholarship**, Department of Automation, Tsinghua University	*Beijing, China*
2016	**Tsinghua Leading Talent Program**, Tsinghua University	*Beijing, China*
2015	**First Prize (Top 0.01%)**, Chinese Physics Olympiad (CPhO) Provincial Final	*Nanning, China*
2014	**First Prize (Top 0.01%)**, Chinese Mathematical Olympiad (CMO) Provincial Final	*Nanning, China*

Mentoring & Activities

2018	**Committee Member**, College C Language Programming Competition	*Tsinghua University*
2018	**Summer Project Mentor**, Student Association of Science and Technology	*Tsinghua University*
2017	**Volunteer Teacher**, Support Education Program in Underdevelped Areas	*Guizhou,China*

Skills

Machine Learning	Python, C++/ C#/ QT, MATLAB, Pytorch, TensorFlow
Robotics	ROS, V-REP, Klampt, Universal Robot (UR), Kinect, Realsense, STM32/ Arduino