Kai **Lu**

"My dream is to make robots actively perceive and embrace the world."

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Education

Tsinghua University — *Beijing, China*

B.E. in Automation(anticipated) — *Aug. 2016 - PRESENT*

- GPA in 3 years: 3.4/4.0 (87/100), GPA in grade 3 Spring: 3.7/4.0(90/100)
- Core courses: Computer Languages and Programming, Computer Principles and Applications, Signals and System Analysis, Introduction to Artificial Intelligence, Digital Image Processing, Automatic Control Theory, Project of Electronic Circuits, Process Control, Numerical Analysis and Algorithms

Publications

Deep Reinforcement Learning for Robotic Pushing and Picking in Cluttered Environment — *IROS 2019, Published.*

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

Semi-Empirical Simulation of Learned Force Response Models for Heterogeneous Elastic Objects — *ICRA 2020, Submitted.*

Second Author — *Sep, 2019*

- Yifan Zhu, **Kai Lu** and Kris Hauser

An Active Robot Picking Method Based on Deep Reinforcement Learning — *Patent, 201910608017, Submitted.*

Co-Author — *Jul 2019*

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

A Composite Robot Manipulator Based on Gripper and Suction Cup — *Patent, CN109465840A, Published.*

Co-Author — *Mar 2019*

- Bin Fang, Huaping Liu, Yuhong Deng, Xiaofeng Guo, **Kai Lu** and Yixuan We

Experience

Robotics Lab Internship in Duke University and University of Illinois at Urbana-Champaign — *Durham and Champaign, USA*

Advisor: A.P. Kris Hauser, Department of Computer Science, UIUC. — *July 2019 - Sep 2019*

- Submitted a paper to ICRA 2020.
- Presented a semi-empirical method for simulating contact with elastically deformable objects.
- Proposed a 2-stage framework: model learning via robot poking a few times, then semi-empirical simulator predicts the contact wrench by integrating analytic calculation and the learned point model.
- My role: Main developer of model learning. Main operator in data collection and robot controlling

RoboCup 2019 Humanoid League Contest — *Sydney, Australia*

Advisor: A.P. Mingguo Zhao, Department of Automation, Tsinghua University. — *Sep 2018 - July 2019*

- Won 2nd in Technical Challenge, 2nd in Drop-in Contest, 3rd in 2v2 Soccer Competition.
- Applied Darknet and Yolo V3 in robot vision, and particle filter algorithm in localization.
- My role: Main developer of localization group. Co-developer of the CV model training group.

Pocket Instrument Based on Internet of Things — *Beijing, China*

Advisor: S.E. Yanpin Ren, Department of Automation, Tsinghua University. — *Jun 2018 - Jul 2018*

- Prize winning project: “The best project of the class”.
- Realized an multifunctional platform based on the miniaturization of oscilloscope and sensor instrument. The hardware is STM32 microcomputer and an app was developed to Android and IOS.
- My role: Team leader.

Active Robot Picking in Cluttered Environment based on Reinforcement Learning

Beijing, China

Advisor: A.P. Huaping Liu, State Key Laboratory of Intelligent Technology and Systems. *Mar 2018 - Jun 2019*

- Published a paper and gave an oral presentation in IROS 2019 at Macau, China. We also submitted a patent of the system.
- Won 1st prize in Tsinghua Challenge Cup and 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 International AI Educational Conference - Tsinghua Exhibition
- Proposed an active robot picking algorithm which employs the deep reinforcement learning - deep Q-Network (DQN) to facilitate the robot to actively explore the environment and pick objects. And we applied our suction cup - gripper hand for picking.
- My role: The main designer of the robot control circuit and algorithm and the co-developer of our CNN and DQN models. The first author of the prize-winning project. The co-first author of our IROS paper and patent.

Composite Grasping Robot Based on Multi-modal Perception

Beijing, China

Advisor: A.P. Huaping Liu, Department of Computer Science and Technology, Tsinghua University. *Apr 2017 - Mar 2018*

- Won 1st prize in National Robotics and AI Competition 2018. Published a patent of the robot hand.
- Designed a composite robotic hand which could compound operations.
- Developed a multi-modal-perception algorithm of vision and tactile and an electronic circuit board independently.
- My role:The main developer of robot vision & tactile sensation.

Honors & Awards

2019	**Technological Innovation Scholarship**, Department of Automation	*Tsinghua University*
2019	**2nd in Technical Challenge, 3rd in Soccer Competition**, RoboCup 2019 Humanoid	*Sydney, Australia*
2019	**A-level Project (The best level)**, Overseas Internship Promotion Program	*Tsinghua University*
2019	**Project Representative**, International AI Educational Conference - Tsinghua Exhibition	*Beijing, China*
2019	**Best Project Nominee**, Beijing Challenge Cup Competition	*Beijing, China*
2019	**1st Prize**, Tsinghua Challenge Cup Competition	*Tsinghua University*
2019	**A-level Project (The best level)**, Academic Promotion Program	*Tsinghua University*
2018	**1st Place**, 20th National Robotics and AI Competition	*Foshan,China*
2017	**Student Representative**, HAGE Self-Reliant Encouragement Scholarship	*Tsinghua University*
2017	**Best Volunteer**, Supported Education Program to Mountainous Area	*Guizhou, China*

Skills

Machine Learning Python, C/C++/C#/QT, MATLAB, Pytorch, TensorFlow, Torch, Darknet/Yolo

Robot Related ROS, V-REP, Klampt, Universal Robot(UR), RGB-D Camera(Kinect, Realsense), STM32/Arduino