Kai **Lu**

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

(+86) 13121012166 | lu-k16@mails.tsinghua.edu.cn | www.deerkk.github.io |

617B, Zijing Building#2, Tsinghua University, Beijing, China, 100084

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 Wei

Experience

Internship at Intelligent Motion Laboratory in Duke University and University of Illinois at Urbana-Champaign (UIUC) — *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: first learn a point model via robot poking the object, then a semi-empirical simulator predicts the contact wrench by integrating analytic calculation and the learned point model.
- My role: Main developer of model learning and engineer of 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 robotic vision, and particle filter algorithm in localization.
- My role: Main developer of vision-localization group.

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.
- Gave 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: Main developer of vision(CNN) and decision(DQN) models. Designer of the robot control circuit and algorithm. First author of the prize-winning project. Co-First author of our IROS paper and patent.

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 sensors. The hardware is STM32 microcomputer and an app was developed to Android and IOS.
- My role: Team leader.

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 2018 National Robotics and AI Competition. Published a patent of the robotic hand.
- Designed a composite robotic hand which can perform compound operations.
- Developed a multi-modal-perception algorithm of vision and tactile and an electronic circuit board independently.
- My role:Main developer of robot vision & tactile sensing.

Honors & Awards

2019	**Technological Innovation Scholarship**, Department of Automation,Tsinghua University	*Beijing, China*
2019	**2nd in Technical Challenge**, RoboCup 2019 Humanoid	*Sydney, Australia*
2019	**A-level Project (The best level)**, Tsinghua Overseas Research Promotion Program	*Beijing, China*
2019	**Project Representative**, International AI Educational Conference - Tsinghua Exhibition	*Beijing, China*
2019	**Best Project Nominee**, 20th Beijing Challenge Cup Competition	*Beijing, China*
2019	**1st Prize**, 37th Tsinghua Challenge Cup Competition	*Beijing, China*
2019	**A-level Project (The best level)**, Tsinghua Academic Promotion Program	*Beijing, China*
2018	**1st Place**, 20th National Robotics and AI Competition	*Foshan,China*
2017	**Student Representative**, Tsinghua HAGE Scholarship	*Beijing, China*
2017	**Best Volunteer Teacher**, Education Support Program for Underdevelped Areas	*Guizhou, China*
2016	**Top 30 of 330,000 Examinees**, Chinese College Entrance Examination in Guangxi Province	*Nanning, China*
2015	**1st Prize (Provincial Top % 1)**, Chinese Mathematical Olympiad(CMO, in high school)	*Nanning, China*
2015	**1st Prize (Provincial Top % 1)**, Chinese Physics Olympiad(CPhO, in high school)	*Nanning, China*

Mentoring & Activities

2018	**Committee Member**, College C Language Programming Competition	*Tsinghua University*
2018	**First-Year Student Research Mentor**, Student Association of Science and Technology	*Tsinghua University*
2017	**Volunteer Teacher**, Student Association of Support Education	*Tsinghua University*

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