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 of 3 years: 3.4/4.0 (87/100), GPA of 2019-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

Nanning No.2 Middle School *Nanning, China*

- National College Entrance Examination: Top 5 of 42,153 examinees(0.01%) in Nanning *Sep. 2013 - Jul. 2016*

Publications

Deep Reinforcement Learning for Robotic Pushing and Picking in Cluttered Environment *IEEE/RSJ 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 *IEEE ICRA 2020, Accepted.*

SECOND AUTHOR *To appear in Jun, 2020*

- 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

Experiences

**Visiting Scholar 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 2020 IEEE International Conference on Robotics and Automation (ICRA). The paper is accepted for publication.
- Presented a semi-empirical method for simulating contact with elastically deformable objects.
  Proposed a 2-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.
- 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 place in Technical Challenge and Drop-in Contest, 3rd place 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 orally presented in 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). Submitted a patent of the system.
- Won 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 employed 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 was STM32 microcomputer and an app was developed to both 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 place in 20th 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 Place 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*
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
Robotics ROS, V-REP, Klampt, Universal Robot(UR), RGB-D Camera(Kinect, Realsense), STM32/Arduino