Keyu Li

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Research Interest

My research interests include artificial intelligence in robot decision-making, medical robotics, medical imaging applications, and robot navigation.

Education

- **The Chinese University of Hong Kong**, Hong Kong **August 2019 – Present**
  Ph.D., Department of Electronic Engineering
  Supervisor: Prof. Max Q.-H. Meng
- **Harbin Institute of Technology**, Weihai, China **September 2015 – July 2019**
  B.Eng. Department of Information Science and Engineering
  GPA: 95.15 / 100 Rank: 1 / 106

Employment

- **Tencent**, Shenzhen, China **July 2018 – August 2018**
  Intern at Tencent Youtu Lab. During the two-month internship, I participated in a project on unmanned retailing and developed deep learning algorithms for image-based commodity identification and retrieval.

Honors & Awards

- **Hong Kong PhD Fellowship Scheme (HKPFS)** **2019 – Present**
  Awarded to 250 Ph.D. students that study in Hong Kong by the Research Grants Council (RGC) of Hong Kong. Eligibility: outstanding qualities of academic performance, research ability / potential, communication and interpersonal skills, and leadership abilities.
- **Hong Kong, China - Asia-Pacific Economic Cooperation Scholarship (APEC Scholarship)** **2021**
  Awarded by the Education Bureau (EDB) of HKSAR government to promote the creation of privately and publicly funded APEC-branded scholarship, training, and internship opportunities.
- **Talent Development Scholarship (2020/21)** **2021**
  Awarded by the HKSAR government in recognition of outstanding performance/ achievements in Innovation, science & technology.
- **Tutor Commendation (2019/20)** **2020**
  Awarded to 5 Ph.D. students in the Department of Electronic Engineering at CUHK for good service in teaching in 2019-20.

- **Top 10 teams in MineRL 2020 Competition Round 1** **2020**
  Our team ranked 4th among 95 teams, for work on sample-efficient reinforcement learning algorithms to solve complex, hierarchical, and sparse environments.
- **MIIT Innovation and Entrepreneurship Scholarship (Third-class)** **2019**
  Awarded to 210 students nationwide by the Ministry of Industry and Information Technology (MIIT), China.
- **Outstanding Graduate of Shandong Province** **2019**
  Awarded to 5% of graduates in Shandong Province.
- **Outstanding Student of Shandong Province** **2018**
  Awarded to 0.1% of undergraduate students in Shandong Province.
- **Top Ten Undergraduates Award & Ma Zuguang Scholarship** **2018**
  Highest honor for undergraduate students in Harbin Institute of Technology, Weihai, awarded to 10 undergraduate students (0.1%).
- **China National Scholarship** **2018**
  Highest scholarship in China, awarded to top 0.2% by the Ministry of Education.
- **China National Scholarship** **2017**
  Highest scholarship in China, awarded to top 0.2% by the Ministry of Education.
- **China National Scholarship** **2016**
  Highest scholarship in China, awarded to top 0.2% by the Ministry of Education.
- **Top Prize, National English Competition for College Students (NECCS)** **2018**
  Awarded to 0.1% of participants.
- **Top Prize, National English Competition for College Students (NECCS)** **2016**
  Awarded to 0.1% of participants.
- **Honorable Mention, Interdisciplinary Contest in Modeling (ICM) for American College Students** **2017**
  Awarded to 25% of teams.
- **First-class Prize, Chinese Mathematics Competitions (CMC)** **2016**
  Awarded to 5% of participants.

Journal Publications

(* indicates equal contributions)

- **Image-Guided Navigation of a Robotic Ultrasound Probe for Autonomous Spinal Sonography Using a Shadow-aware Dual-Agent Framework**
  Keyu Li, Yangxin Xu, Jian Wang, Dong Ni, Li Liu, Max Q.-H. Meng
  *IEEE Transactions on Medical Robotics and Bionics (**T-MRB**), 2021*
- **An Overview of Systems and Techniques for Autonomous Robotic Ultrasound Acquisitions**
  Keyu Li, Yangxin Xu, Max Q.-H. Meng

*IEEE Transactions on Medical Robotics and Bionics (**T-MRB**), 2021*

- **On Reciprocally Rotating Magnetic Actuation of a Robotic Capsule in Unknown Tubular Environments**
  Yangxin Xu*, **Keyu Li***, Ziqi Zhao, Max Q.-H. Meng
  *IEEE Transactions on Medical Robotics and Bionics (**T-MRB**), 2021*

- **Adaptive Simultaneous Magnetic Actuation and Localization for WCE in a Tubular Environment**
  Yangxin Xu*, **Keyu Li***, Ziqi Zhao, Max Q.-H. Meng
  *IEEE Transactions on Robotics (**T-RO**) (under review), 2021*

- **Trajectory Following of a Reciprocally Rotating Magnetic Capsule in a Tubular Environment**
  Yangxin Xu*, **Keyu Li***, Ziqi Zhao, Max Q.-H. Meng
  *IEEE Robotics and Automation Letters (**RA-L**) (under review), 2021*

- **Autonomous Magnetic Navigation Framework for Active Wireless Capsule Endoscopy Inspired by Conventional Colonoscopy Procedures**
  Yangxin Xu*, **Keyu Li***, Ziqi Zhao, Max Q.-H. Meng
  *IEEE Robotics and Automation Letters (**RA-L**) (under review), 2021*

- **A Novel System for Closed-loop Simultaneous Magnetic Actuation and Localization of WCE based on External Sensors and Rotating Actuation**
  Yangxin Xu, **Keyu Li**, Ziqi Zhao, Max Q.-H. Meng
  *IEEE Transactions on Automation Science and Engineering (**T-ASE**), 2020*

- **An Estimation Method for Microbial Count Based on Image Processing**
  Keyu Li, Haoxian Wang
  Journal of Harbin University of Commerce (Natural Sciences Edition), 2018

Conference Publications

(* indicates equal contributions)

- **Automatic Recognition of Abdominal Organs in Ultrasound Images based on Deep Neural Networks and K-Nearest-Neighbor Classification**
  Keyu Li, Yangxin Xu, Ziqi Zhao, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Biomimetics (**ROBIO**), 2021*

- **Human-Aware Robot Navigation via Reinforcement Learning with Hindsight Experience Replay and Curriculum Learning**
  Keyu Li, Ye Lu, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Biomimetics (**ROBIO**), 2021*

- **A Virtual Scanning Framework for Robotic Spinal Sonography with Automatic Real-Time Recognition of Standard Views**
  Keyu Li, Yangxin Xu, Li Liu, Max Q.-H. Meng
  *International Conference of the IEEE Engineering in Medicine and Biology Society (**EMBC**), 2021*

- **Autonomous Navigation of an Ultrasound Probe Towards Standard Scan Planes with Deep Reinforcement Learning**
  Keyu Li, Jian Wang, Yangxin Xu, Hao Qin, Dongsheng Liu, Li Liu, Max Q.-H. Meng

*IEEE International Conference on Robotics and Automation (**ICRA**), 2021*

- **Reciprocally Rotating Magnetic Actuation and Automatic Trajectory Following for Wireless Capsule endoscopy**
  Yangxin Xu*, **Keyu Li***, Ziqi Zhao, Fei Meng, Li Liu, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Automation (**ICRA**), 2021*

- **Unsupervised Learning based Relative Localization for WCE in a Deformable Tubular Environment** ***(Best Conference Paper Award finalist)***
  Yangxin Xu, **Keyu Li**, Max Q.-H. Meng
  *IEEE International Conference on Advanced Robotics and Mechatronics (**ICARM**), 2021*

- **A Design Approach of 3D Optimal Mobile Sensor Array for Confidence-box based Tracking of a Magnetic Capsule**
  Yangxin Xu, **Keyu Li**, Ziqi Zhao, Max Q.-H. Meng
  *IEEE International Conference on Advanced Robotics and Mechatronics (**ICARM**), 2021*

- **Improved Multiple Objects Tracking based Autonomous Simultaneous Magnetic Actuation & Localization for WCE**
  Yangxin Xu, **Keyu Li**, Ziqi Zhao, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Automation (**ICRA**), 2020*

- **A Novel Approach for Automatic State Detection of A Magnetically Actuated Capsule**
  Yangxin Xu, **Keyu Li**, Max Q.-H. Meng
  *International Conference of the IEEE Engineering in Medicine and Biology Society (**EMBC**), 2020*

- **Towards External Sensor based Simultaneous Magnetic Actuation and Localization for WCE**
  Yangxin Xu, Ziqi Zhao, **Keyu Li**, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Biomimetics (**ROBIO**), 2019*

- **SARL*: Deep Reinforcement Learning based Human-Aware Navigation for Mobile Robot in Indoor Environments**
  Keyu Li, Yangxin Xu, Jiankun Wang, Max Q.-H. Meng
  *IEEE International Conference on Robotics and Biomimetics (**ROBIO**), 2019*

- **An Identification Algorithm for Underwater Vehicle Infrared Wake Based on GLCM Minimum Difference of Entropy**
  Haoxian Wang, Heng Dong, **Keyu Li**, Zhiquan Zhou
  *IEEE International Conference on Instrumentation & Measurement, Computer, Communication and Control (**IMCCC**), 2018.*

Patents

- **CN112515611A: Localization method, device and terminal equipment for wireless capsule endoscopy**
  MengLi Aili, Xu Yangxin, **Li Keyu**, Zhao Ziqi, Zhou Yue
  Public Review Date: 2021.03.19

- **CN112515610A: Actuation method, device and system for wireless capsule endoscopy**
  MengLi Aili, Xu Yangxin, **Li Keyu**, Zhao Ziqi, Zhou Yue
  Public Review Date: 2021.03.19

- **CN112493970A: Localization method and system for wireless capsule endoscopy**
  MengLi Aili, Xu Yangxin, **Li Keyu**, Zhao Ziqi, Zhou Yue
  Public Review Date: 2021.03.16

- **CN107644210B: Microbe quantity estimation method based on image processing**
  Wang Haoxian, Zhou Zhiquan, **Li Keyu**
  Publication date: 2020.05.12

Professional Activities & Service

- **Speaker** **2021**
  Zhejiang Lab PhD Forum on Intelligent Robots, Hangzhou, China

- **Reviewer** **2021**
  IEEE Access

- **Reviewer** **2021**
  *2021 IEEE International Conference on Advanced Robotics and Mechatronics (**ICARM**)*

- **Reviewer** **2021**
  *2021 IEEE International Conference on Intelligent Robots and Systems (**IROS**)*

- **Session Chair & Reviewer** **2021**
  *2021 IEEE International Conference on Robotics and Automation (**ICRA**)*

- **Participant** **2021**
  Our team won 4th place in MineRL 2020 Competition (Round 1) and presented our work at the NeurIPS 2020 MineRL 2020 Competition Workshop.

- **Delegate reviewer** **2020**
  *2020 IEEE International Conference on Intelligent Robots and Systems (**IROS**)*

- **Session Chair & Reviewer** **2019**
  *2019 IEEE International Conference on Robotics and Biomimetics (**ROBIO**)*

Teaching Experience

- **Teaching Assistant at CUHK** **2020 – 2021, Term 2**
  Tutorial on course ELEG3103: Robotic Perception & Intelligence

- **Teaching Assistant at CUHK** **2020 – 2021, Term 1**
  Tutorial on course ELEG4701: Intelligent Interactive Robot

- **Teaching Assistant at CUHK** **2019 – 2020, Term 2**
  Tutorial on course ELEG3103: Robotic Perception & Intelligence. Nominated for Tutor with Commendation for good teaching service.

- **Teaching Assistant at CUHK** **2019 – 2020, Term 1**
  Tutorial on course ELEG4701: Intelligent Interactive Robot. Nominated for Tutor with Commendation for good teaching service.

Professional Skills

- **Programming skills:** Python, MATLAB, C, Assembly, LaTeX, HTML.

- **Tools:** Tensorflow, PyTorch, ROS, Multisim, HFSS, Protel, Auto CAD, etc.
- **Language:** TOEFL 104.