

# Mingxuan Li (李明暄)

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## EDUCATION BACKGROUND

**Master: Tsinghua University**, Beijing, China 09/2023–Present

- Laboratory: [AutoRobot Lab](#), Department of Mechanical Engineering
- GPA: Overall: 3.89/4.00
- Advisors: Prof. [Yao Jiang](#)

**Visiting: Massachusetts Institute of Technology**, Cambridge, U.S. 01/2025–Present

- Laboratory: Computer Science and Artificial Intelligence Lab ([CSAIL](#))
- Supervisor: Prof. [Edward H. Adelson](#)

**Bachelor: Tsinghua University**, Beijing, China 09/2019–07/2023

- Major: Mechanical Engineering
- GPA: Overall: 3.72/4.00

## PUBLICATIONS & PATENTS

- Research Interests: ***Robotics Tactile Perception & Grasping, Vision-Based Tactile Sensors, Contact Modelling***
- Skills: C/C++, Python, OpenCV, PyTorch, MATLAB, AutoCAD, SolidWorks, Abaqus, Ansys, Unity, PS, PR, *et al.*

## Research Papers

- Mingxuan. Li**, Lunwei. Zhang, Tiemin. Li, and Yao. Jiang, “Continuous marker patterns for representing contact information in vision-based tactile sensor: principle, algorithm, and verification”, *IEEE Transactions on Instrumentation and Measurement*, vol. 71, Aug. 2022, Art no. 5018212. [\[Publication\]](#) [\[Preprint PDF\]](#)
  - This article innovatively proposes the idea of the continuous marker pattern (CMP) and three basic design principles to optimize tactile representation and extraction in visuotactile sensors. Simulation and prototype experiments prove the tactile sensors with CMP outperformed the distributed marker pattern (DMP) regarding measurement precision, resolution, and reliability.
- Mingxuan. Li**, Tiemin. Li, and Yao. Jiang, “Marker displacement method used in vision-based tactile sensors—from 2D to 3D: A review”, *IEEE Sensors Journal*, vol. 23, no. 8, pp. 8042-8059, Apr. 2023. [\[Publication\]](#) [\[Preprint PDF\]](#)
  - This article presents a detailed review and categorizing of the marker displacement method (MDM) used in vision-based tactile sensors. We classify MDM into three typical categories based on the dimensionality perspective for the first time: 2D MDM, 2.5D MDM, and 3D MDM.
- Mingxuan. Li**, Yen. Hang. Zhou, Tiemin. Li, and Yao. Jiang, “Improving the representation and extraction of contact information in vision-based tactile sensors using continuous marker pattern”, *IEEE Robotics and Automation Letters*, vol. 8, no. 2, pp. 1109-1116, Sep. 2023. [\[Publication\]](#) [\[Preprint PDF\]](#)
  - This article highlights the importance of raw representation and extraction in visuotactile perception. We propose a new multicolor CMP method (including pattern design, algorithm optimization, and preparation process) for enhancing the performance of vision-based tactile sensors.
- Mingxuan. Li**, Yen. Hang. Zhou, Tiemin. Li, and Yao. Jiang, “Real-time and robust feature detection of continuous marker pattern for dense 3-d deformation measurement”, *Measurement*, vol. 221, Nov. 2023, Art no. 113479. [\[Publication\]](#) [\[Preprint PDF\]](#)
  - This article achieves the measurement of dense 3-d contact deformation (10.7 markers per square millimeter). We propose a feature detection method applicable to visuotactile sensors based on continuous marker patterns (CMP), which reflects a clear superiority in real-time and reliability performance.
- Mingxuan. Li**, Yen. Hang. Zhou, Tiemin. Li, and Yao. Jiang, “Incipient slip-based rotation measurement via visuotactile sensing during in-hand object pivoting”, *2024 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 17132-17138. [\[Publication\]](#) [\[Preprint PDF\]](#) [\[Video\]](#) [\[Poster\]](#) [\[Slides\]](#)
  - This paper describes a generalized 2-d contact model under pivoting and a measurement method of rotation angle based on the line features in the stick region. It could achieve the average errors of  $0.17^{\circ} \pm 0.15^{\circ}$  (static) and  $1.34^{\circ} \pm 0.48^{\circ}$  (dynamic).

- **Mingxuan. Li**, Lunwei. Zhang, Yen. Hang. Zhou, Tiemin. Li, and Yao. Jiang, “EasyCalib: Simple and low-cost in-situ calibration for force reconstruction with vision-based tactile sensors”, *IEEE Robotics and Automation Letters*, vol. 9, no. 9, pp. 7803-7810, Sep. 2024. [\[Publication\]](#) [\[Preprint PDF\]](#) [\[EasyCalib\]](#)
  - This article describes an in-situ calibration device, EasyCalib, for routinely measuring mechanical parameters (Young’s modulus and Poisson’s ratio) of visuotactile sensors. Detailed derivations of theories ensure that it is low-cost, user-friendly, and does not require F/T sensors.
- **Mingxuan. Li**, Yen. Hang. Zhou, Lunwei. Zhang, Tiemin. Li, and Yao. Jiang, “OneTip: A soft tactile interface for 6-D fingertip pose acquisition in human-computer interaction”, *Sensors and Actuators: A. Physical*, vol. 379 Sep. 2024, Art no. 115896. [\[Publication\]](#) [\[Preprint PDF\]](#) [\[Video\]](#)
  - This article introduces visuotactile sensing technology into the field of human-computer interaction. We present a novel HCI device, OneTip, which can achieve 6-DOF input with just one fingertip. Evaluations and application explorations were conducted to explore the performance and usability of OneTip.
- **Mingxuan. Li**, Lunwei. Zhang, Tiemin. Li, and Yao. Jiang, “Learning Gentle Grasping from Human-Free Force Control Demonstration”, Sep. 2024, arXiv:2409.10371. [\[arXiv\]](#) [\[Preprint PDF\]](#)
  - This article utilizes objects with known contact characteristics to automatically generate reference force curves without human demonstrations. The described method can be effectively applied in vision-based tactile sensors and teaches robots to gently and stably grasp objects from the ground.

## Patent Application

- **Mingxuan. Li**, Yanping. Xu, Xue. Qi, Dongqin. Li, and Fan. Wang, “Method and apparatus for touch screen detection”, Application No. 202111074563.1, Publish No. CN 113984337A, 2022-01-28.
- **Mingxuan. Li**, Aijun. Yang, Yanping. Xu, Xue. Qi, and Dongqin. Li, “Method, apparatus, and electronic device for detecting image sticking in display screen”, Application No. 202211286586.3, Publish No. CN 115509040A, 2022-12-23.
- Yao. Jiang, **Mingxuan. Li**, Lunwei. Zhang, and Tiemin. Li, “Tactile sensor, robot, method and apparatus for achieving tactile information acquisition”, Application No. 202210061023.8, Publish No. CN 114544052B, 2023-03-28.

## SELECTED AWARDS AND HONORS

### Research Performances

- **First Prize of Excellent Oral Presentation**, The 734th Doctoral Academic Forum of Tsinghua University 04/2024
- **Excellent academic paper**, The 16th National Conference on Undergraduate Innovation 12/2023
- **Outstanding Graduation Thesis** of Tsinghua University, 2023 06/2023
- **1st Place** in “New Engineering” Undergraduate Graduation Thesis Competition 06/2023
- **Project leader** of iStar Program from the Fundamental Industry Training Center, Tsinghua University (**Excellent rating**) 05/2023
- **Best Poster Award** and **Excellent Oral Presentation Award** at Tsinghua Youth Science and Innovation Forum 03/2023
- **Grand Prize of Outstanding Project** of 2022 Tsinghua University Student Research Training (SRT) Program for Undergraduates (Top 5 of 1938, and was **the only single person study** among them) 12/2022
- **Project leader** of National Training Program of Innovation and Entrepreneurship for Undergraduates (**Excellent rating**) 06/2022
- **Project leader** of A-level Tsinghua University Initiative Scientific Research Program (**Excellent rating**) 05/2022
- Served as the co-first author, led the team to win the **only Grand Prize in Tsinghua Craftsmanship Awards, 2022** (Received the award from **the President of Tsinghua University as the only representative**, and was **widely reported by mainstream medias in China**, including the report of **Xinhua News** with over **1.3 million views**) 04/2022
- Selected to **“Spark” Innovative Talent Cultivation Program** (**Top 2%** for outstanding research performance) 03/2022

### Academic Awards

- Awarded the Wang Dazhong Scholarship (**One of the highest awards for students at Tsinghua University**) in 2024 Tsinghua Scholarship Awards Ceremony 12/2024
- **Shortlisted for Tsinghua Top Grade Scholarship (Prestigious Scholarship, 清华大学特等奖学金) in 2024 (five master students per year from all departments and grades)** 11/2024
- Exceptionally awarded the **Comprehensive Excellent First-Class Scholarship** as a first-year graduate 11/2023

- **Excellent Graduates** of Tsinghua University, 2023 06/2023
- Named the **Person of the Year** in the Department of Mechanical Engineering, Tsinghua University 04/2023
- **Neng Ke Scholarship**, Tsinghua University (**Highest amount** in M.E. department, **Top 2%** of 300) 11/2022
- **Comprehensive Outstanding Award Scholarship**, Tsinghua University (**Top 5%** of 126) 11/2021
- **1st Prize** in National Zhou Peiyuan Mechanics Competition, 2021 (**Top 0.2%**) 08/2021
- **1st Prize** in National Undergraduate Physics Competition, 2020 (**Top 1%**) 12/2020

## Innovation & Entrepreneurship

**Student head** of the '*ClearTactile*' tech startup team

- **Team of Excellence**, 2024 China-U.S. Young Maker Centers Annual Conference 05/2024
- **Grand Prize** in the 2023 "Challenge Cup" Capital Science and Technology College of Extra-curricular Academic Competition 06/2023
- **4th Place** in the "Kunshan Cup" 24th Tsinghua University Entrepreneurship Competition 03/2023
- **Bronze Award** in the 8th China College Students' "Internet+" Innovation and Entrepreneurship Competition, National Finals 12/2022
- **3rd Place** in the special invitation track of the 4th "Beijing-Tianjin-Hebei and Guangdong-Hong Kong-Macao" Youth Innovation and Entrepreneurship Competition 09/2022
- **1st Prize** in the 8th China College Students' "Internet+" Innovation and Entrepreneurship Competition, Beijing Area 07/2022
- **The Top Ten Teams** in the China College Students' "Internet+" Innovation and Entrepreneurship Competition, Tsinghua University, 2022 (**The only undergraduate student team**) 06/2022

## COMMUNITY SERVICE AND LEADERSHIP

- Reviewer: *ICRA 2024, ICRA 2025 (twice), IEEE Transactions on Instrumentation and Measurement (twice), Measurement, Visual Computer, Scientific Reports, Recent Patents on Mechanical Engineering*
- Serves as the **Vice President and Academic Affairs Representative of the Graduate Association**, Department of Mechanical Engineering, Tsinghua University
- Served as the **Chairman of the Sub-forum** "Key Components and Equipment" and the **Organizational Committee Member**, The 734th Doctoral Academic Forum of Tsinghua University.
- **Former Vice President** of Hunan Cultural Student Association of Tsinghua, in charge of science & innovation and lecture activities.
- **Invited to give a keynote speech** at the 2022 Tsinghua Maker's Day New Age Creativity Education Forum.

## FORMER RESEARCH EXPERIENCE

**Research on the Artificial Intelligence Industry and Market** 07/2024–09/2024

*Interned in Equity Investment Department, Tsinghua Tongfang Technology Co., Ltd.*

- Research and analyze the development, industrial layout, and investment opportunities of the artificial intelligence industry.

**Research on Representation and Extraction of Robotic Tactile information** 04/2021–07/2023

*Student Research Training Program, supervised by Prof. Yao Jiang, Tsinghua University*

- Served as the sole participant (student), focused on improving the representation and extraction of tactile representation.

*Self-Initiated Research Interest Group for Undergraduates, supervised by Prof. Yao Jiang, Tsinghua University*

- Served as the **student leader** of "Tactile Information Representation and Extraction" undergraduate research group.

**Research on Innovation and Application of Intelligent Software Testing** 01/2021–02/2021, 07/2022–08/2022

*Interned in LCFC Luzhou Laboratory, LCFC (Hefei) Electronics Technology Co., Ltd.*

- Studied the detection device of LCD touch screen based and the detection method of image sticking in LCD screen.

**Studying on Under-Actuated Robotic Hands and Soft Robots** 09/2020–04/2021

*Independent Research, supervised by Prof. Wenzhen Zhang, Tsinghua University*

- Proposed a soft robot hand based on self-curling underactuated structure and developed the prototypes.