

# DELIN HU

Multi-scale Medical Robotics Center (803A), Building 6W, Hong Kong Science Park, Hong Kong

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## PROFESSIONAL SUMMARY

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I am currently a **Jockey Club Global STEM Postdoc Fellow** at the Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong (CUHK), Hong Kong. My research interests encompass AI-assisted manipulation of miniature robots for minimally invasive interventions, implantable and flexible sensors for deep tissue monitoring and learning-based perception for soft robots and miniature machines.

## EDUCATION

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### Ph.D., Engineering

School of Engineering, **The University of Edinburgh**, UK  
Research area: soft robotics, flexible sensors, machine learning

2019 – 2023

**Supervisor:** A/Prof. Yunjie Yang  
A/Prof. Francesco Giorgio-Serchi

### M.S., Control Science & Engineering

Department of Automation, **Tsinghua University**, China  
Research area: flow measurement, spatiotemporal sensing data analysis, machine learning

2016 – 2019

**Supervisor:** A/Prof. Yi Li  
Prof. Lihui Peng

### B.E., Automation

Department of Automation, **Sichuan University**, China

Sep. 2011 – 2015

**Mentor:** A/Prof. Xiaomei Yang

## EMPLOYMENT

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### **Jockey Club Global STEM Postdoc Fellow, The Chinese University of Hong Kong (CUHK), Hong Kong** Sep. 2024 – Present

- Supervisor: Prof. Li Zhang
- Research area: miniature magnetic robots, implantable sensors, AI-driven sensing data interpretation
- Main duty: carry out research and produce publications, write proposals for funding applications, co-supervise PhD students and research assistants

### **Postdoc Fellow, Multi-scale Medical Robotics Center & CUHK, Hong Kong** Oct. 2023 – Sep. 2024

- Supervisor: Prof. Li Zhang
- Research area: miniature magnetic robots, implantable sensors, AI-driven sensing data interpretation
- Main duty: carry out research and produce publications, write proposals for funding applications, co-supervise PhD students and research assistants

### **Tutor & Demonstrator (Part-time), The University of Edinburgh, UK** Sep. 2019 – Jun. 2023

- Course: Engineering Mathematics, Digital Signal Processing Laboratory, Signals and Communication Systems
- Main duty: tutorial class teaching, lab practical preparation and demonstration, coursework assessment and examination marking

## RESEARCH EXPERIENCE

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### **Zhang Research Lab, The Chinese University of Hong Kong** Oct. 2023 – Present

- Magnetic sensor arrays to capture signals emitted by miniature magnetic robots
- Deep learning approaches for tracking and navigating miniature magnetic robots across different in vivo environments
- AI-driven localization, shape reconstruction and close-loop control for magnetic catheters
- Magnetic implants and AI-based sensing data processing methods for deep tissue monitoring

### **SMART Group, The University of Edinburgh** Sep. 2019 – Jun. 2023

- Stretchable capacitive sensor arrays toward wearable devices and perception of soft robots
- Deep learning approaches for 3D deformation recovery from the structured and high-dimensional sensory data
- AI-driven multi-modal sensing (i.e., tactile sensing and morphological sensing)
- Soft robotic perception with self-supervised learning

### **Intelligent Sensing Lab, Tsinghua University** Sep. 2016 – Jun. 2019

- Machine learning aided multi-modal sensory data fusion toward petroleum industrial process monitoring and measurement
- Flowrate prediction for gas-liquid multiphase flows across different domains based on transfer learning

## PUBLICATIONS

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### Published Journal Papers

1. **Delin Hu**, Huazhi Dong, Zhe Liu, Zhou Chen, Francesco Giorgio-Serchi and Yunjie Yang. Touch and deformation perception of soft manipulators with capacitive e-skins and deep learning. *IEEE Sensors Journal*, Early Access, 2024. <Link>
2. **Delin Hu**, Francesco Giorgio-Serchi, Shiming Zhang and Yunjie Yang. Stretchable e-skin and transformer enable high-resolution morphological reconstruction for soft robots. *Nature Machine Intelligence* 5 (3), 261–272, 2023. <Link> <Media>
3. **Delin Hu**, Haotian Li, Francesco Giorgio-Serchi and Yunjie Yang. Coupling field simulation of soft capacitive sensors towards soft robot perception. *IEEE Sensors Journal* 23 (10), 10588-10596, 2023. <Link>
4. **Delin Hu**, Jinku Li, Yinyan Liu and Yi Li. Flow adversarial networks: flowrate prediction for gas–liquid multiphase flows across different domains. *IEEE Transactions on Neural Networks and Learning Systems* 31 (2), 475-487, 2020. <Link>
5. Zhou Chen, Haijing Zhang, **Delin Hu**, Chao Tan, Zhe Liu and Yunjie Yang. Point-cloud transformer for 3-D electrical impedance tomography. *IEEE Transactions on Instrumentation and Measurement* 73, 1-9, 2024. <Link>
6. Haokun Wang, **Delin Hu**, Maomao Zhang, Nan Li and Yunjie Yang. Multiphase flowrate measurement with multimodal sensors and temporal convolutional network. *IEEE Sensors Journal* 23 (5), 4508-4517 2023. <Link>
7. Shengnan Wang, **Delin Hu**, Maomao Zhang, Jiawang Qiu Lin, Wei Chen, Francesco Giorgio-Serchi, Lihui Peng, Yi Li and Yunjie Yang. A digital twin of electrical tomography for quantitative multiphase flow imaging. *Communications Engineering* 1 (1), 41, 2022. <Link>
8. Haokun Wang, **Delin Hu**, Maomao Zhang and Yunjie Yang. Multiphase flowrate measurement with time series sensing data and sequential model. *International Journal of Multiphase Flow* 146, 103875 2022. <Link>
9. Jinku Li, **Delin Hu**, Chen Wei, Yi Li, Maomao Zhang and Lihui Peng. CNN-Based volume flow rate prediction of oil–gas–water three-Phase intermittent flow from multiple sensors. *Sensors* 21 (4), 1245, 2021. <Link>

### Under Review Journal Papers

1. **Delin Hu**<sup>†\*</sup>, Zhaoyang Qi<sup>†</sup>, Yihang Jiang<sup>†</sup>, Xurui Liu, Moqiu Zhang, Haojin Yang and Li Zhang\*. AI-driven actuation-compatible tracking for autonomously navigating miniature robots in vivo. (Out to Review at Nature)
2. **Delin Hu**, Huazhi Dong, Francesco Giorgio-Serchi and Yunjie Yang. A self-supervised learning framework for soft robot proprioception. Under Revision at *IEEE Transactions on Neural Networks and Learning Systems*.
3. Huazhi Dong, Ronald B. Liu, Sihao Teng, **Delin Hu**, Peisan (Sharel) E, Francesco Giorgio-Serchi and Yunjie Yang. Tactile perception learning from real-world large-scale tactile sensor. (Submitted)
4. Huazhi Dong, Xiaopeng Wu, **Delin Hu**, Zhe Liu, Francesco Giorgio-Serchi and Yunjie Yang. Learning-enhanced electronic skin for deformable tactile sensing based on electrical impedance tomography. (Submitted)

### Published Conference Papers

1. **Delin Hu**, Keming Lu and Yunjie Yang. Image reconstruction for electrical impedance tomography based on spatial invariant feature maps and convolutional neural network. *IEEE International Conference on Imaging Systems and Techniques* (Oral, 2019). <Link>
2. Huazhi Dong, Zhe Liu, **Delin Hu**, Xiaopeng Wu, Francesco Giorgio-Serchi and Yunjie Yang. Tactile sensing on deformed surfaces with electrical impedance tomography. *IEEE International Instrumentation and Measurement Technology Conference* (Oral, 2024). <Link>
3. Haokun Wang, **Delin Hu**, Yunjie Yang and Maomao Zhang. Multiphase flowrate measurement with time series sensing data and sequential model. *IEEE International Instrumentation and Measurement Technology Conference* (Oral, 2021). <Link>

### Patent

1. **Delin Hu**, F Giorgio-Serchi and Y Yang. Soft Robot 3D Proprioception System. UK patent (GB2204054.7) and PCT filing, 2023. <Link>

## ACADEMIC SERVICES

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### Teaching

- **Tutor:** Engineering Mathematics 2A 2023
- **Demonstrator:** Digital Signal Processing Laboratory 2022
- **Tutor:** Signals and Communication Systems 3 2021

### Mentoring & Supervising

- PhD Co-Supervisor: Zhaoyang Qi (CUHK, 2023-present), Huazhi Dong (UoE, 2022-present)
- MSc, BEng & RA Co-Supervisor: Ze Chen (CUHK, 2024), Haijing Zhang (UoE, 2022), Haitian Li (UoE, 2021), Zixuan Shen (UoE, 2020), Chenyi Zhang (UoE, 2020)

### Peer Reviewer in Journals

- IEEE Transactions on Robotics
- IEEE Transactions on Neural Networks and Learning Systems
- IEEE Transactions on Mechatronics
- IEEE Transactions on Instrumentation and Measurement
- IEEE Robotics and Automation Letters and so on ...

## RESEARCH GRANTS

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### 1. Jockey Club Global STEM Post-doctoral Fellowship

Project title: AI-assistive optimal design and control of magnetic soft robots for minimally invasive interventions <Link>

Role: Principal Investigator

Funding body: The Hong Kong Jockey Club Charities Trust

Year awarded: 2024

Duration: 4 Years

Value: HKD \$ 2,640,000

### 2. Scottish Research Partnership In Engineering: Postgraduate and Early Career Researcher Exchanges Awards

Project title: Soft robot perception: fabrication and deployment of a flexible capacitance sensor array <Link><Media>

Role: Principal Investigator

Funding body: Scottish Funding Council

Year awarded: 2020

Duration: 6 Months

Value: GBP £1,500

### 3. Industrial sponsorship

Project title: Machine learning aided petroleum industrial process monitoring and measurement <Link>

Role: Co-investigator

Funding body: LeEngSTAR Technology Co., Ltd

Year awarded: 2019

Duration: 3 Years

Value: CNY ¥300,000

## AWARDS

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- Jockey Club Global STEM Post-doctoral Fellowship (10/HK) 2024
- Chinese Government Award for Outstanding Self-financed Students Abroad (600/Worldwide) 2022
- Scottish Research Partnership In Engineering: Postgraduate and Early Career Researcher Exchanges Awards (8/UK) 2020
- School of Engineering Doctoral Scholarship, UoE (tuition fees plus living costs) 2019
- Tsinghua University Scholarship 2017
- Sichuan University Scholarship 2014