

Dr Fan Zhang

Contact Information

Imperial-X, Personal Robotics Lab
Imperial College London, UK

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Research Interests

Human-Robot Interaction, Sim2Real Learning, Self-Supervised Learning, Reinforcement Learning, General Robot Manipulation

Professional Appointments

Eric and Wendy Schmidt AI in Science Postdoctoral Fellow, 2022-present
Research Associate, 2021-2022

Imperial College London

Projects: Innovate UK D-RISK: Learning Edge Cases for Autonomous Vehicles;

UKRI Closed-Loop Multisensory Brain-Computer Interface for Enhanced Decision Accuracy;

UKRI Trustworthy Autonomous Systems Node in Trust

Holding **UK Global Talent Visa**, sponsored by Royal Academy of Engineering

Education

Ph.D. in Electrical and Electronic Engineering (Robotics), 2016-2020

Imperial College London, UK

Thesis: Perception and Manipulation in Robotic-Assisted Dressing

Supervisor: Prof. Yiannis Demiris

M.Sc in Mechatronics Engineering, 2014-2016

B.Eng. in Mechanical Engineering, 2010-2014

State Key Laboratory of Robotics and System

Harbin Institute of Technology, China

Awards

The Queen Mary UK Best PhD in Robotics Award 1st place 2020

Best Student Paper Award, IEEE International Conference on Mechatronics and Automation 2016

Best Msc Thesis Award Finalists, Harbin Institute of Technology (<10%) 2016

Selected Journal Publications

Visual-Tactile Learning of Garment Unfolding for Robot-Assisted Dressing

Zhang F, Demiris Y.

IEEE Robotics and Automation Letters (RA-L), 2023. (paper, video)

Learning Garment Manipulation Policies towards Robot-Assisted Dressing

Zhang F, Demiris Y.

Science Robotics, 2022. (paper, video)

Probabilistic Real-Time User Posture Tracking for Personalized Robot-Assisted Dressing

Zhang F, Cully A, Demiris Y.

IEEE Transactions on Robotics, 2019. (paper, video)

Preoperative Optimization of the Surgical Robot considering Internal Diversity of Workspace

Yan Z, Du Z, Zhang F, Wang W.

Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering, 2018. (paper)

Selected Conference Publications

Contrastive Self-Supervised Learning for Automated Multi-Modal Dance Performance Assessment

Zhong Y, Zhang F, Demiris Y

IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023

Grasp-Oriented Fine-grained Cloth Segmentation without Real Supervision

Ren R, Rajesh MG, Sanchez-Riera J, Zhang F, Tian Y, Agudo A, Demiris Y, Mikolajczyk K

The 6th International Conference on Machine Vision and Applications (ICMVA), 2023

Learning Grasping Points for Garment Manipulation in Robot-Assisted Dressing

Zhang F, Demiris Y.

IEEE International Conference on Robotics and Automation (ICRA), 2020. (paper, video)

Personalized Robot-Assisted Dressing using User Modeling in Latent Spaces

Zhang F, Cully A, Demiris Y.

IEEE International Conference on Intelligent Robots and Systems (IROS), 2017. (paper, video)

Preoperative Planning for the Multi-Arm Surgical Robot using PSO-GP-based Performance Optimization

Zhang F, Yan Z, Du Z.

IEEE International Conference on Robotics and Automation (ICRA), 2017. (paper)

Preoperative Setup Planning for Robotic Surgery Based on a Simulation Platform and Gaussian Process

Zhang F, Yan Z, Du Z.

IEEE International Conference on Mechatronics and Automation (ICMA), 2016. (paper)

Best Student Paper Award

An Under-Actuated Manipulation Controller Based on Workspace Analysis and Gaussian Processes

Zhang F, Su Y, Zhang X, Dong W, Du Z.

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2015. (paper, video)

Talks

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| AI seminar in Statistics, Imperial College London, | 2023 |
| State Key Laboratory of Intelligent Technology and Systems, Tsinghua University | 2022 |
| Apple Weekly Seminar | 2022 |
| Chinese Association Artificial Intelligence (video, live audience: 150,000) | 2020 |
| Human Motion Analysis for Healthcare Applications, IET (video) | 2019 |
| The Hamlyn Centre, Imperial College London | 2017 |

In the Press

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| Robotic nurse can dress a mannequin in a hospital gown, New Scientist | 2022 |
| Baxter the nursebot to help care for ageing population, The Times | 2019 |
| Robotic nurse that helps you dress could aid staff shortage, Bloomberg | 2019 |
| Others: Daily Mail, Telegraph, South China Morning Post, IndustryWeek, TexhXplore | |

Technical Skills

Programming: MATLAB, Python, ROS, Linux

Design: 3D Printing, ADAMS, Autodesk Fusion 360, Maya, Blender

Others: Anaconda, OpenAI Gym, Event Camera, Tensorflow, PyTorch

Academic Service

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| ICRA 2023 Workshop: Emerging Paradigms for Assistive Robotic Manipulation | Organizer |
| Frontiers in Robotics and AI - Robot Learning and Evolution | Review Editor |
| Scientific Reports | Reviewer |
| IEEE Transactions on Robotics | Reviewer |
| IEEE Robotics and Automation Letters | Reviewer |
| IEEE Robotics and Automation Magazine | Reviewer |
| IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) | Reviewer |
| IEEE International Conference on Robotics and Automation (ICRA) | Reviewer |
| Winter Conference on Applications of Computer Vision (WACV) | Reviewer |

Research Mentorship & Teaching Activities

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| Nikki Zhong (PhD at Imperial college London), research on human motion modeling | 2021-present |
| Human-Centered Robotics, graduate teaching assistant, Imperial College London | 2017-2022 |
| Intelligent Robotics, graduate teaching assistant, Harbin Institute of Technology | 2014-2016 |

Research Projects:

---- Robot-Assisted Dressing for Bedridden Patients

- Garment **grasping/manipulation** using imitation learning and deep Q learning from demonstration.
- **Visual-tactile** fusion for garment unfolding using a framework of model-based reinforcement learning.
- Building **real and synthetic dataset** of garment, including RGB-D and event images.
- Understanding garment configurations for garment **semantic segmentation and depth estimation**.
- **Sim-to-real** robot manipulation policy transfer (PyBullet, Blender engine): GAN in image domain; self-supervised learning in physics domain with Transformer and event cameras.
- Real-time **user posture tracking** using: multi-modal (vision and haptic) information with a probabilistic particle filter; pointcloud with graph neural networks.
- Building **personalized** user model using a dimensionality reduction approach that captures the specificities of different upper-body impairments.
- **Hierarchical multitask control** for robotics relating force and velocity adaptation.
- The above works have been published in top journals and conferences: Science Robotics, IEEE Transactions on Robotics, ICRA, IROS.
- The above works have been covered by several news outlets, including The Times, Bloomberg, Daily Mail, Telegraph, South China Morning Post, IndustryWeek, Chinese Association Artificial Intelligence, TexhXplore, New Scientist, etc. Live demo for NHS, ABB, Apple, MURI, etc.

---- Preoperative Planning for Multi-Arm Surgical Robots

- Optimizing preoperative robot arm positioning using Gaussian Process, for surgeons to perform efficient intervention with multi-arm surgical robot systems (ICRA, ICMA, Best Student Paper Award).

---- Under-Actuated In-Hand Manipulation

- An under-actuated gripper with two three-phalanx fingers for mobile robot in extreme environments, using Gaussian Processes to compensate kinematics errors (IROS 2015).

References available upon request

