Dr Fan Zhang

Contact Information

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Research Interests

Assistive Robot, Tactile Manipulation, Sim-to-Real Learning, Self-Supervised learning, Visual-Language Model, Prompt Tuning, Flow Matching

Professional Appointments

Guest Scientist, 2024-present
Honda Research Institute EU
Projects: Assistive Robot Manipulation using Prompt Tuning and Flow Matching

Visiting Researcher, 2024-present
Eric and Wendy Schmidt AI in Science Postdoctoral Fellow, 2023-2024
Research Associate, 2021-2023
Imperial College London, UK
Projects: Closed-Loop Multisensory Brain-Computer Interface for Enhanced Decision Accuracy
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

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

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

Guest Lecture, TAMS, University of Hamburg,	2024
Talks on Assistive Robotics, King's College London,	2023
AI seminar in Statistics, Imperial College London,	2023
Tsinghua University, (video, live audience: 150,000)	2022
Apple Weekly Seminar	2022
Human Motion Analysis for Healthcare Applications, IET (video)	2019
The Hamlyn Centre, Imperial College London	2017

In the Press

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

RSS 2024 Workshop: Learning for Assistive Robotics	Organizer
Imperial-X Breaking Topics in AI conference, Schmidt Futures	Organizer
ICRA 2023 Workshop: Emerging Paradigms for Assistive Robotic Manipulation	Organizer
Frontiers in Robotics and AI-Robot Learning and Evolution	Review Editor
Scientific Reports, T-RO, ICRA, IRSO, RA-L, RSS, WACV	Reviewer
IEEE Robotics and Automation Magazine	Reviewer
UKRI Trustworthy Autonomous Systems Node in Trust	Participant
Innovate UK D-RISK: Learning Edge Cases for Autonomous Vehicles	Participant

Research Mentorship & Teaching Activities

Amirreza Razmjoo (PhD at EPFL), research on VLM for robot manipulation	2024-present
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

Selected Research Projects:

---- Affordance-based Assistive Robot Manipulation with VLM

- Parameter-efficient learning assistive manipulation affordance with vision-language foundational models using prompt tuning.
- Generative modelling for robot imitation learning with special focus on flow matching.
- Collection of large dataset related to assistive robot tasks with human in the loop.

---- Robot-Assisted Dressing for Bedridden Patients

- Deformable objects (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) in physics domain.
- Self-supervised learning garment physics with event cameras.
- Real-time user posture tracking using multi-modal (vision and haptic) information with a probabilistic particle filter.
- Personalized user impairments model using dimensionality reduction methods.
- 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, RA-L, ICRA, IROS.
- Based on above works, I have been awarded the UK Best PhD in Robotics Award 2020 1st place.
- The above works have been covered by several news outlets, including The Times, Bloomberg, Daily Mail, Telegraph, 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).