Dr Fan Zhang

Contact Information

Personal Robotics Lab, Imperial College London
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Research Interests

Robot Perception and Manipulation, Human-Robot Interaction, Sim2Real Learning, Self-Supervised Learning, Reinforcement Learning

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

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

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)

Probabilistic Real-Time User Posture Tracking using Visual and Haptic Information for Robot-Assisted Dressing
Zhang F, Cully, A, Demiris, Y
IET Human Motion Analysis for Healthcare Applications, 2019

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)

Personalized Robot-assisted Dressing using Hierarchical Multi-task Control and User Modeling
Zhang F, Cully, A and Demiris, Y.
The 2nd UK Robot Manipulation Workshop, 2017.

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

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

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

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

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 a framework of 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; contrastive learning in physics domain.
- 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.
- Such works have been accepted to ICRA, ICMA (Best Student Paper Award), and Proc. Inst. Mech. Eng.

---- 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