Dr Fan Zhang

Contact Information

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Research Interests

Robot Manipulation, Sim-to-Real Learning, Self-Supervised Learning, World Model, Flow Matching

Professional Appointments

Senior Scientist, 2025-present
Guest Scientist, 2024
Honda Research Institute EU

Eric and Wendy Schmidt AI in Science Postdoctoral Fellow, 2023-2024
Schmidt Futures, Imperial College London

Research Associate, 2021-2023
Imperial College London (UK Global Talent Visa, sponsored by Royal Academy of Engineering)

Education

Ph.D. in Electrical and Electronic Engineering (Robotics), 2016-2020
Imperial College London
Thesis**:** Perception and Manipulation in Robotic-Assisted Dressing
Supervisor: Prof. Yiannis Demiris (Royal Academy of Engineering Chair in Emerging Technologies)

Awards

Outstanding Paper Award, IROS 2025 Workshop on The Art of Robustness 2025
Best Research Paper, AI & Robotics Research Awards, held by TAS Hub and the Royal Society 2025
The UK Best PhD in Robotics Award 1st place, held by Advanced Robotics @ Queen Mary 2020
Best Student Paper Award, IEEE International Conference on Mechatronics and Automation 2016

Highlighted Publications

Learning Robot Manipulation from Audio World Models
Fan Zhang, Michael Gienger
arXiv, 2025. (paper)

Affordance-based Manipulation with Flow Matching
Fan Zhang, Michael Gienger
arXiv, 2025. (paper, website, code)

Learning Garment Manipulation Policies towards Robot-Assisted Dressing
Fan Zhang, Yiannis Demiris
Science Robotics, 2022. (paper, website, code)

Probabilistic Real-Time User Posture Tracking for Personalized Robot-Assisted Dressing
Fan Zhang, Antone Cully, Yiannis Demiris
IEEE Transactions on Robotics, 2019. (paper, website, code)

Talks

Intelligent Systems and Networks (ISN) Group Seminar, Imperial College London	2025
IROS Workshop on Manipulation of Deformable Objects (RoMaDo)	2025
IPAB visitor seminar, Edinburgh Centre for Robotics	2025
YorRobots Seminar, University of York	2025
Autonomous Agents Research Group, The University of Edinburgh	2025
Adaptive and Intelligent Robotics Lab, Imperial College London	2025
Guest Lecture, TAMS, University of Hamburg	2024
Social AI & Robotics Laboratory, King's College London	2023
Tsinghua University, (live audience: 150,000)	2022
Apple	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
Robotic nurse that helps you dress could aid staff shortage, Bloomberg	2019
The Times, Daily Mail, Telegraph, TechXplore	2019

Academic Activities

Inaugural Meeting - Centre for AI in Assistive Autonomy	Invited Guest
IROS 2025 Session: Factory Automation and Failure Detection	Co-chair
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, IJRR, ICRA, IROS, RA-L, RSS, WACV, Humanoids	Reviewer
The Centre for AI in Assistive Autonomy, The University of Edinburgh	Collaborator
Doctoral annual review (Leonard Hinckeldey), The University of Edinburgh	Committee

Research Mentorship

Jonathan Sutphen (Msc, TU Darmstadt, Robot Manipulation with Audio)	2025-present
Leonard Hinckeldey (PhD, The University of Edinburgh, Multi-Agent RL)	2025-present
Amirreza Razmjoo (PhD, EPFL, Robot Failure Recovery)	2024-2025
Jenny Fu (PhD, Cornell University, Robot Character Learning)	2024-2025
Nikki Zhong (PhD, Imperial college London, Human Motion Modeling)	2022-2024

Research Experience

---- **General Multi-Modal Robot Manipulation**

- Audio world model for learning robot manipulation with latent flow matching.
- Parameter-efficient prompt tuning for learning manipulation affordance with VLM.
- Generative learning for robot manipulation with special focus on flow matching.
- Applications: robot failure recovery with compositional diffusion models, robotic expressions and characters learning with flow matching, piano playing with audio world models.
- The above works have been published in: CoRL, IROS, ROMAN, and received Outstanding Paper Award at IROS 2025 Workshop on The Art of Robustness.

---- **Robot-Assisted Dressing for Bedridden Patients**

- Deformable visual-tactile manipulation for garment grasping unfolding using deep Q learning from

demonstration and model-based reinforcement learning.

- Sim-to-real garment physics learning and robot manipulation policy transfer in physics domain using self-supervised learning.
- Contrastive learning for human motion modeling, including personalized user impairments modeling and dancing performance assessment.
- Building large real and synthetic dataset of garment, including RGB-D, event images and pointcloud.
- Real-time user posture tracking using vision and haptic information with a probabilistic particle filter.
- Building controllers for hierarchical multi-task human-robot interaction.
- The above works have been published in top journals and conferences: Science Robotics, IEEE Transactions on Robotics, RA-L, ICRA, IROS, ICASSP, ICMA (Best Student Paper). Live demos for National Health Service, Apple, etc.
- Media covered by Bloomberg, The Times, Daily Mail, Telegraph , NewScientist, TechXplore.
- The Science Robotics paper has been selected as the Best Research Paper, Early Career Researcher, 2025 AI & Robotics Research Awards, held by TAS Hub, Responsible Ai UK, and the Royal Society.
- Based on above works, I have been awarded the UK Best PhD in Robotics Award 2020 1st place.
- The above works are supported by MURI UKRI Closed-Loop Multisensory Brain-Computer Interface for Enhanced Decision, TAS Trust Node UKRI Trustworthy Autonomous Systems Node in Trust, Innovate UK D-RISK Learning Edge Cases for Autonomous Vehicles.

Other Publications

1) **Composition of Conditional Diffusion Policies with Guided Sampling**
   Amirreza Razmjoo, Sylvain Calinon, Michael Gienger, Fan Zhang
   IROS 2025. (paper, website)

2) **Generation of Real-time Robotic Emotional Expressions Learning from Human Demonstration in Mixed Reality**
   Chao Wang, Michael Gienger, Fan Zhang
   IROS 2025, Foundation Models for Robotic Design workshop. (paper, website)

3) **Robot manipulation with flow matching**
   Fan Zhang, Michael Gienger
   CoRL 2024 Workshop on Mastering Robot Manipulation in a World of Abundant Data. 2024

4) **Contrastive Self-Supervised Learning for Automated Multi-Modal Dance Performance Assessment**
   Yun Zhong, Fan Zhang, Yiannis Demiris
   ICASSP, 2023. (paper, video, code)

5) **Visual-Tactile Learning of Garment Unfolding for Robot-Assisted Dressing**
   Fan Zhang, Yiannis Demiris
   RA-L, 2023. (paper, video)

6) **Learning Grasping Points for Garment Manipulation in Robot-Assisted Dressing**
   Fan Zhang, Yiannis Demiris
   ICRA, 2020. (paper, video)

7) **Personalized Robot-Assisted Dressing using User Modeling in Latent Spaces**
   Fan Zhang, Antone Cully, Yiannis Demiris
   IROS, 2017. (paper, video)

8) **Preoperative Planning for the Multi-Arm Surgical Robot using PSO-GP-based Performance Optimization**
   Fan Zhang, Zhiyan Yuan, Zhijiang Du
   ICRA, 2017. (paper, video)

9) **An under-actuated manipulation controller based on Workspace Analysis and Gaussian Processes**
Fan Zhang, Yanyu Su, Xiang Zhang, Wie Dong, Zhijiang Du
IROS, 2015. (paper, video)

10) **Preoperative Setup Planning for Robotic Surgery Based on a Simulation Platform and Gaussian Process**
Fan Zhang, Zhiyan Yuan, Zhijiang Du.
IEEE International Conference on Mechatronics and Automation (ICMA), 2016. (paper)

11) **CARMA: Context-Aware Situational Grounding of Human-Robot Group Interactions by Combining Vision-Language Models with Object and Action Recognition**
Joerg Deigmoeller, Stephan Hasler, Nakul Agarwal, Daniel Tanneberg, Anna Belardinelli, Reza Ghoddoosian, Chao Wang, Felix Ocker, Fan Zhang, Behzad Dariush, Michael Gienger
arXiv:2506.20373 (2025)

12) **Grasp-oriented fine-grained cloth segmentation without real supervision**
Ruijie Ren, Mohit Gurnani Rajesh, Jordi Sanchez-Riera, Adrian Lopez-Rodriguez, Fan Zhang, Yurun Tian, Guillem Alenyà, Antonio Agudo, Yiannis Demiris, Krystian Mikolajczyk, Francesc Moreno Noguer
6th International Conference on Machine Vision and Applications 2023

13) **Preoperative optimization of the surgical robot considering internal diversity of workspace**
Fan Zhang, Zhiyan Yuan, Zhijiang Du. Yan, Zhiyuan, Zhijiang Du, Fan Zhang, and Weidong Wang
Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science

14) **Mechanical analysis of scissor transmission mechanism considering friction**
Zhang, Fan, Xue Yuan, and Jin Chen
Applied Mechanics and Materials (2013)

15) **Mechanical analysis and finite element simulation of scissor transmission mechanism under partial load.**
Fan Zhang, Zhiyan Yuan, Zhijiang Du. Chen, Jin, Xue Yuan, and Fan Zhang
Key Engineering Materials 667 (2016)

16) **N170 component analysis of single-trial EEG based on electrophysiological source imaging**
Pengchao Wang, Wei Mu, Gege Zhan, Zuoting Song, Tao Fang, Xueze Zhang, Junkongshuai Wang, Lan Niu, Jianxiong Bin, Fan Zhang, Lihua Zhang, Jie Jia, Xiaoyang Kang
44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) 2022

17) **Comparison of MI-EEG Decoding in Source to Sensor Domain**
Tao Fang, Zuoting Song, Wei Mu, Song Le, Yuan Zhang, Xueze Zhang, Gege Zhan, Pengchao Wang, Junkongshuai Wang, Jianxiong Bin, Fan Zhang, Lihua Zhang, Xiaoyang Kang
44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) 2022