

# Fan Zhang

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<b>Contact Information</b>	Personal Robotics Lab Department of Electrical and Electronic Engineering Imperial College of Science, Technology and Medicine Room 1006, Exhibition Road, SW7 2BT, London, UK.	Email: f.zhang16@imperial.ac.uk www: www.zhang-fan.com
<b>Research Interests</b>	Human-Robot Interaction, Assistive Robots, Surgical Robot, Perception and Manipulation, Sim2real Transfer Learning	
<b>Education</b>	Imperial College London Ph.D. in Electrical Engineering, Oct 2016 - present Thesis: Personalized Robotic-Assisted Dressing Supervisor: Prof. Yiannis Demiris (Royal Academy of Engineering Chair in Emerging Technologies)  Harbin Institute of Technology State Key Laboratory of Robotics and System M.Sc in Mechatronics, Sep 2014 - Jul 2016 Thesis: Preoperative Planning for Multi-Arm Surgical Robots Supervisor: Prof. Zhijiang Du  Harbin Institute of Technology B.Eng. in Mechanical Engineering, Sep 2010 - Jul 2014 Thesis: Mechanical Analysis of Scissor Lifts Considering Friction Supervisor: Prof. Yuan Xue	
<b>Awards</b>	Conference Awards <b>Best Student Paper Award</b> , IEEE International Conference on Mechatronics and Automation (ICMA), 2016  Harbin Institute of Technology <b>Best Msc Thesis Award</b> , 2016 (<10%) Outstanding Master's Graduates, 2016 (<10%) Vice President, Students' Union, Sep 2012 - Sep 2013  National Basic Foreign Language Teaching Research Centre National English Contest for College Students, First Prize, 2013 (0.6%)	
<b>Talks</b>	Intelligent Robot Seminar, Chinese Association for Artificial Intelligence (CAAI), Jun 2020 <b>Shenzhou Forum for International Young Scholars Plenary Talk</b> , HIT, Dec 2019 Human Motion Analysis for Healthcare Applications, IET, Jun 2019 (video) The Hamlyn Centre, Imperial College London, Nov 2017 The 2nd UK Robot Manipulation Workshop, Jul 2017	
<b>In the Press</b>	Posture Tracking for Robotic Dressing, Chinese Association Artificial Intelligence, May 2020 Baxter the nursebot to help care for ageing population, <b>The Times</b> , Aug 2019	

Robotic nurse that helps you dress could aid staff shortage, [Bloomberg](#), Aug 2019  
Others: Daily Mail, Telegraph, South China Morning Post, IndustryWeek.

**Technical Skills** MATLAB, Python, ROS, Linux, ADAMS, Autodesk Fusion 360, Maya, PyBullet, Blender  
3D Printing

**Reviewer** IEEE Robotics and Automation Magazine

**Activities** IEEE Access

International Conference on Robotics and Automation (ICRA 2020)

Winter Conference on Applications of Computer Vision (WACV 2020)

IEEE International Conference on Mechatronics and Automation (ICMA 2016)

**Teaching** Graduate Teaching Assistant, Human-Centered Robotics,

**Experience** Imperial College London, 2017 - 2020

### Journal Publications

- **Zhang F**, Cully A and Demiris Y (2019). Probabilistic Real-Time User Posture Tracking for Personalized Robot-Assisted Dressing, [IEEE Transactions on Robotics](#), 35.4 (2019): 873-888
- Yan Z, Du Z, **Zhang F**, Wang W (2018). Preoperative Optimization of the Surgical Robot considering Internal Diversity of Workspace, Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science, 232(6), pp: 1091-1107
- Chen J, Xue Y, **Zhang F** (2016). Mechanical Analysis and Finite Element Simulation of Scissor Transmission Mechanism under Partial Load, Key Engineering Materials, vol. 667, pp: 518-523.
- **Zhang F**, Chen J, Xue Y (2013). Mechanical Analysis of Scissor Transmission Mechanism Considering Friction, Applied Mechanics and Materials, vol. 419, pp: 74-80.

### Conference Publications

- **Zhang F**, Demiris Y (2020). Data-Efficient Garment Grasping and Manipulation for Robot-Assisted Dressing, IEEE International Conference on Robotics and Automation (ICRA 2020), France.
- **Zhang F**, Cully A, Demiris Y (2017). Personalized Robot-Assisted Dressing using User Modeling in Latent Spaces, IEEE International Conference on Intelligent Robots and Systems (IROS 2017), Canada, pp: 3603-3610.
- **Zhang F**, Yan Z, Du Z (2017). Preoperative Planning for the Multi-Arm Surgical Robot using PSO-GP-based Performance Optimization, IEEE International Conference on Robotics and Automation (ICRA 2017), Singapore, pp: 5629-5635.
- **Zhang F**, Yan Z, Du Z (2016). Preoperative Setup Planning for Robotic Surgery Based on a Simulation Platform and Gaussian Process, IEEE International Conference on Mechatronics and Automation (ICMA 2016), China, pp: 902-907. --- [Best Student Paper Award](#)
- **Zhang F**, Su Y, Zhang X, Dong W, Du Z (2015). An Under-Actuated Manipulation Controller Based on Workspace Analysis and Gaussian Processes, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2015), Germany, pp: 5629-5635.

### Workshop Publications

- **Zhang F**, Cully A and Demiris Y (2019), Probabilistic Real-Time User Posture Tracking using Visual and Haptic Information for Robot-Assisted Dressing, IET Human Motion Analysis for Healthcare Applications.
- **Zhang F**, Cully A and Demiris Y (2017), Personalized Robot-Assisted Dressing using Hierarchical Multi-Task Control and User Modeling, The 2nd UK Robot Manipulation Workshop.

## Research Projects:

### -- Robot-Assisted Dressing for Impaired Patients

- We present a data-efficient supervised deep neural network to learn garment grasping points. The proposed work enables the Baxter robot to autonomously grasp a hospital gown hung on a rail, bring it close to the user and successfully dress the upper-body.
- We introduce a precise, real-time, user posture tracking method based on a probabilistic filter using multi-modal (vision and haptic) information.
- We propose a low-dimensional user model that captures the specificities of upper-body impairments, which enables the Baxter humanoid robot to provide personalized dressing assistance for users with different upper-body movement impairments.
- The above works have been published in IEEE Transactions on Robotics ([top journal in robotics, impact factor: 6.483](#)), ICRA, IROS (top conferences in robotics).
- The above works have been covered by several news outlets, including [The Times](#), [Bloomberg](#), Daily Mail, Telegraph, South China Morning Post, IndustryWeek, etc.
- The above works are supported in part by EPSRC Grant EP/S032398/1 (Interactive Perception-Action-Learning for Modelling Objects), and a Royal Academy of Engineering Chair in Emerging Technologies.

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

- We address the problem of preoperative planning for the multi-arm surgical robot by designing a new PSO-GP-based optimization strategy, an integrated method of Particle Swarm Optimization (PSO) and Gaussian Process (GP), to optimize the preoperative port position and robot arm positioning.
- This method provides guidelines for surgeons to perform an efficient intervention with the use of the multi-arm surgical robot system.
- The above works have been accepted to several conferences and journals (ICRA, ICMA, Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science).
- The above works have received [Best Student Paper Award](#) at IEEE International Conference on Mechatronics and Automation (ICMA), 2016.
- The above works have received [Best Msc Thesis Award](#) at Harbin Institute of Technology, 2016.
- The above works are supported by the National Natural Science Foundation of China (Grant No.61403107).

### -- Under-Actuated In-Hand Manipulation

- We design a planar under-actuated gripper with two three-phalanx fingers.
- We use Gaussian Processes to compensate the kinematics error of the under-actuated planar gripper.
- The above works have been published in IROS (top conference in robotics).
- The gripper has been implemented on a mobile robot in extreme environments.