YIJUN(ESTHER) GU

Robotics, Imperial College, London, UK

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RESEARCH OVERVIEW

My research lies at the intersection of human-robot interaction, machine learning, multi-modal perception, tactile sensing, physics simulation, and ergonomics. I develop interfaces and algorithms that enable robots to interact with human safely and efficiently, while adapting to individual preferences. Beyond physical interaction, I also interested in understanding human cognition, ensuring that the developed technologies aligned with users' mental models and well-being. My work is particularly focused on advancing assistive technologies in personal and healthcare applications.

EDUCATION

Ph.D., Electrical and Electronic Engineering — Feb 2022 – present
Imperial College London, UK
Advisor: Yiannis Demiris
*Funded by EEE PhD Scholarship

M.S., Computer Science — May 2021
Specialization in Computational Perception and Robotics
Georgia Institute of Technology, USA
Thesis: Virtual Reality as a Stepping Stone to Real-World Robotic Caregiving
Advisor: Charles C Kemp & Zackory Erickson

B.S.E., Computer Science, Data Science (double major) — May 2019
University of Michigan, USA

PAPERS IN SUBMISSION

Reducing caregiver burden with robotics: Limb manipulation assistance for caregivers in bed bathing
Yijun Gu*, Ertug Ovur*, Yiannis Demiris (* Equal contribution.)
ACM Transactions on Human-Robot Interaction (THRI), 2025

Title omitted for blind review
Yijun Gu*, Ertug Ovur*, Yiannis Demiris (* Equal contribution.)
IEEE Transactions on Robotics (T-RO), 2025

JOURNAL ARTICLES

VTTB: A Visuo-Tactile Learning Approach for Robot-Assisted Bed Bathing
Yijun Gu, Yiannis Demiris
IEEE Robotics and Automation Letters (RAL), 2024

Revolutionizing clean energy labs: Robotic imitation learning for efficient fabrication AI-powered electrical units assembly platform
Yijun Gu*, Xi Xu*, Tianyi Zhang, Jiwen Yu, Stephen Skinner (* Equal contribution.)
Energy and AI, 2025

CONFERENCE PROCEEDINGS

Learning Bimanual Manipulation Policies for Bathing Bed-bound People
Yijun Gu, Yiannis Demiris
IEEE International Conference on Intelligent Robots and Systems (IROS), 2024, **Oral Presentation**

Assistive VR Gym: Interactions with Real People to Improve Virtual Assistive Robots
Yijun Gu*, Zackory Erickson*, Charles C Kemp (* Equal contribution.)
IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), 2020

RESEARCH EXPERIENCE

Personal Robotics Lab, Imperial College London   Feb 2022 - Jan 2026 (exp.)
PhD Student, Principal Investigator: Prof. Yiannis Demiris

- Developed a Transformer-based imitation learning framework that fuses visual and tactile sensing to perceive human body accurately and generate safe, adaptive manipulation behaviors for assistive bed-bathing in contact-rich environment.

- Proposed the first bimanual robot-assisted bed bathing framework that autonomously lifts the limb and performs safe bathing actions around the body using MAPPO-based long-horizon planning and variable-impedance control.

- Investigated algorithmic advancements in multi-modal comfort learning, establishing the ergonomic foundations for predicting and adapting to human physical states under uncertainty.

- Collaborated on the development of an ergonomic, robot-assisted limb-repositioning system that integrates multimodal pose tracking, comfort modeling, control, and navigation to reduce caregiver physical load during bathing scenarios.

- Collaborated on the development of an ergonomics-optimized bimanual handover system that integrates comfort prediction, dual-arm trajectory coordination, proximity-based safety evaluation mechanisms to enable safe and efficient human–robot co-manipulation.

Healthcare Robotics Lab, Georgia Institute of Technology   Aug 2020 – May 2022
Graduate Research Assistant, Principal Investigator: Prof. Charles C. Kemp, Prof. Greg Turk, Prof. Karen Liu, and Dr. Zackory Erickson

- Developed algorithmic advancements to safely transfer robot controllers from physics simulation to real robots for robotic assistance.

- Benchmarked how much observation noise standard robot control policies can handle when transferred to real robots.

- Investigated algorithmic advancements to improve robot control policy robustness to noise.

- Presented a framework that integrates human biomechanical models and utilizes virtual reality to evaluate and improve simulation-trained assistive robots with real users.

CROMA Lab, University of Michigan   July 2018 – Apr 2019
Undergraduate Research Assistant, Principal Investigator: Dr. Sai R. Gouravajhala

- Developed a mix-initiative system that leverages real-time crowd workers to annotate subcomponents of objects and generate point cloud objects with new configurations.

Laboratory for Progress, University of Michigan   Sep 2017 – Apr 2018
Undergraduate Research Assistant, Principal Investigator: Prof. Chad Jenkins and Dr. Zhiqiang Sui

- Worked as part of the "Never Mind the Bounding Boxes, Here's the SAND Filters" project.
- Explored Point Pair Features (PPF), an occlusion-robust 6D pose estimation algorithm that couples oriented point pair features with a Hough-like voting scheme to match models to scenes.

TEACHING EXPERIENCE

ELEC70015 Human Centered Robotics, Imperial College London   Spring 2022 - present
Graduate Teaching Assistant, Prof. Yiannis Demiris

ELEC60009/70061 Deep Learning, Imperial College London   Spring 2025
Graduate Teaching Assistant, Prof. Krystian Mikolajczyk

ELEC60019/70059 Applied Machine Learning, Imperial College London   Fall 2024
Graduate Teaching Assistant, Prof. Abd Al Rahman Abu Ebayyeh

ELEC60019/70059 Applied Machine Learning, Imperial College London   Fall 2023
Graduate Teaching Assistant, Prof. Abd Al Rahman Abu Ebayyeh

ELEC60019/70059 Applied Machine Learning, Imperial College London   Fall 2022
Graduate Teaching Assistant, Prof. Krystian Mikolajczyk

CS6476 Computer Vision, Georgia Institute of Technology   Spring 2021
Graduate Teaching Assistant, Prof. Frank Dallert

CS6601 Artificial Intelligence, Georgia Institute of Technology   Fall 2020
Graduate Teaching Assistant, Prof. Thomas Ploetz

EECS280 Programming and Intro Data Structures, University of Michigan   Spring 2017 – Fall 2018
Teaching Assistant, Prof. James Juett

RESEARCH MENTORSHIP

Anqi Qiu, M.S., IC, EEE → University College London PhD	2022 - 2023
Xinyun Chi, M.S., IC, EEE → University of Manchester PhD	2024
Rapin Adchariyaporn, M.S., IC, EEE	2025

ACADEMIC SERVICE

Journal Reviewer	IEEE Transactions on Human-Machine Systems(THMS), IEEE Robotics and Automation Letter(RA-L), IEEE Internet of Things Journal(IoT), Scifiniti Publishing
Conference Reviewer	IEEE ICRA, IEEE IROS, IEEE RO-MAN

SKILLS

Programming	Python, C++, ROS, Matlab, Latex, Git, HTML, Docker, IOS (Swift)
Libraries and Tools	Scikit-learn, Pytorch, Tensorflow, Numpy, pandas, matplotlib, OPENCV, OpenNI, Bullet, MUJOCO, IssacGym, PCL, Virtual Reality, BLENDER
Robots	Franka, Kinova, Spot, Baxter, AgileX, Allergo Hand
Sensors	Kinect, RealSense, Zed, RGBD cameras, Gelsight, Digit, tactile sensors, Delsys EMG system, LiDAR, HTC VIVE, Vision Pro, OptiTrack
Operating Systems	Linux, IOS, Raspberry Pi
Languages	Chinese (Native), English (Proficient), Japanese (Conversational)