# Jiahe (Michael) Pan

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## Education

**ETH Zürich** *Zürich, Switzerland*
*MSc in Robotics, Systems and Control* *Sep 2024 – Present*

- **Focus:** Reinforcement learning, Robot dynamics, Applied deep learning, Probabilistic AI, Computer vision, Motion planning, Dynamic programming and optimal control
- **Tutor:** Prof. Robert Riener (Sensory-Motor Systems Lab)

**The University of Melbourne** *Melbourne, Australia*
*BSc in Mechatronics Engineering* *Mar 2021 - Nov 2023*

- **Grade**: 87.7/100 (First Class Honors)
- **Dean's Honors List 2023** (top 3% of all BSc students)
- **Focus:** System modeling, analysis and control; Mechanical and electronics; Machine learning and AI
- **Thesis supervisors:** Dr. Jonathan Eden, Dr. Wafa Johal, Prof. Denny Oetomo

## Research and Projects

**Thesis Student & Research Assistant** *Melbourne, Australia*
*Human-Robotics Lab, The University of Melbourne* *Jan 2024 - Jul 2024*

- **Modeling performance in shared control robot teleoperation using Fitts' Law**. Designed and implemented tracking and convex-blending controllers for shared control in a target-reaching task.
- Investigated the **effects of shared control on a human teleoperator's cognitive load and trust**. Designed and implemented a trajectory-tracking task with robot teleoperation using a haptic controller.
- Explored the use of a Robot's face (Furhat) for **affective visualization** of complex real-world data.
- Designed an **office assistant robot** (TIAGo), implementing autonomous navigation, person-tracking and following, natural language communication, object detection and manipulation with arm trajectory control.
- Investigated **motion-capture-based robot teleoperation using augmented-reality** to enhance performance and user perception. Implemented human arm motion mapping and robot arm trajectory generation.

**Summer Research Scholar & Research Assistant** *Melbourne, Australia*
*Monash Robotics Lab, Monash University* *Nov 2022 - Jun 2023*

- Designed and implemented a novel motion planning algorithm for **integrated grasp selection and trajectory optimization** for robotic arms in cluttered workspaces.
- Three key ideas of the algorithm: 1) parametric grasp selection using Bayesian optimization, 2) trajectory initialization using sampling-based planning (RRT-Connect), and 3) trust-region SQP trajectory optimization in a receding-horizon style with gradual constraint-tightening for enhanced computational efficiency.
- Performed extensive evaluation both in simulation (Gazebo) and on real hardware (Fetch robot).

**Autonomous Perception and Powertrain Engineer** *Melbourne, Australia*
*MUR (Melbourne University Racing), The University of Melbourne* *Apr 2022 – May 2023*

- Researched the design of the cone location algorithm in the race car's autonomous navigation pipeline.
- Performed optimal power calculations subject to vehicle constraints of the Formula Student competition.

## Awards and Honors

**1st-place** in the **Office Assistant Robot Competition** at HRI'24 (Boulder, Colorado, 2024)

**The University of Melbourne Dean's Honors List** (top 3% of all BSc students, 2023)

**Summer Research Scholarship** - Monash University (2022)

**U21 Global Citizens** - Common Purpose (2022)

## Publications

**Assisting MoCap-Based Teleoperation of Robot Arm using Augmented-Reality Visualisations**
Q. Zhou, DA. Chacon, **J. Pan**, W. Johal.
*IEEE/ACM International Conference on Human-Robot Interaction, 2025.*

**OfficeMate: Design and Evaluation of an Office Assistant Robot**
**J. Pan**, S. Schombs, Y. Zhang, R. Tabatabaei, M. Bilal, W. Johal
*IEEE/ACM International Conference on Human-Robot Interaction, 2025.*

**Using Fitts' Law to Benchmark Assisted Human-Robot Performance**
**J. Pan**, J. Eden, D. Oetomo, W. Johal.
*IEEE/ACM International Conference on Human-Robot Interaction, 2025.*

**Effects of Shared Control on Cognitive Load and Trust in Teleoperated Trajectory Tracking**
**J. Pan**, J. Eden, D. Oetomo, W. Johal.
*IEEE Robotics and Automation Letters (RA-L), 2024.*

**A Review of Differentiable Simulators**
R. Newbury, J. Collins, K. He, **J. Pan**, I. Posner, D. Howard, A. Cosgun.
*IEEE Access, 2024.*

**FaceVis: Exploring a Robot's Face for Affective Visualisation Design**
S. Schombs, **J. Pan**, Y. Zhang, J. Goncalves, W. Johal.
*ACM Extended Abstracts of the CHI Conference on Human Factors in Computing Systems, 2024.*

**Variable Grasp Pose and Commitment for Trajectory Optimization**
**J. Pan**, K. He, J.M. Ong, A. Cosgun.
*IEEE 5th International Congress on Human-Computer Interaction, Optimization and Robotic Applications, 2023.*

## Skills

**Research Skills**

- Experience working with real robotic platforms (Franka Panda, Fetch, TIAGo, Furhat, UR3).
- Knowledge of optimization and sampling-based planners for motion planning and trajectory optimization. Understandings of reinforcement learning, imitation learning, and learning from demonstration.
- Understanding of clearly defining research questions, developing methods for evaluation, and publishing as first author and co-author in both independent and collaborative research projects.
- Proficient in designing and conducting experimental validations and user studies, collecting data through physiological measures, questionnaires, and interviews, and performing statistical analysis using hypothesis tests and mixed models.
- Providing detailed peer-reviews for paper submissions.

**Software Skills**

- Proficient in Python, C++, C, R, MATLAB.
- Familiar with Linux (Ubuntu), PyTorch, Git, Docker, Conda.
- Proficient in ROS, ROS2, RViz, Gazebo; Theoretical understanding of differentiable physics simulators.
- Familiar with motion planning libraries (MoveIt!, ROS Navigation, Tesseract ROS TrajOpt).

**Hardware Skills**

- g.tec EEG recording with 32-channel setup using dry electrodes on an EEG cap.
- Basic understanding of Unity, Hololens 2, Meta Quest 2, OptiTrack motion-capture system.