

# George Jiayuan Gao

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| CONTACT INFORMATION        | 3025 John F. Kennedy Blvd,<br>Philadelphia, PA 19104                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <a href="mailto:gegao@seas.upenn.edu">gegao@seas.upenn.edu</a> - Email<br><a href="tel:+13145360564">+1 314-536-0564</a> - Phone<br><a href="https://ggao22.github.io">ggao22.github.io</a> - Personal Website |
| EDUCATION                  | <b>University of Pennsylvania</b><br>M.S. in Robotics, <b>GPA: 3.9/4.0</b> <ul style="list-style-type: none"><li>Thesis Research Advisors: Dr. Nadia Figueroa, Dr. Dinesh Jayaraman</li></ul> <b>Washington University in St. Louis</b><br>B.S. in Computer Science and Mathematics, <b>GPA: 3.9/4.0</b> <ul style="list-style-type: none"><li>Graduated Magna Cum Laude in Three Years.</li><li>Undergrad Research Advisor: Dr. Yevgeniy Vorobeychik</li><li>Research Area: <i>Real-time lane-following for autonomous vehicles.</i></li></ul>                                                                                                                                                                                                                                                                                                                                                                                | Philadelphia, PA<br>August 2023 - Present<br><br>St. Louis, MO<br>August 2020 - May 2023                                                                                                                       |
| PEER-REVIEWED PUBLICATIONS | <b>VLMgineer: Vision Language Models as Robotic Toolsmiths</b><br><b>George Jiayuan Gao*</b> , Tianyu Li*, Junyao Shi, Yihan Li <sup>†</sup> , Zizhe Zhang <sup>†</sup> , Nadia Figueroa, Dinesh Jayaraman <ul style="list-style-type: none"><li><i>Robotics: Science and Systems (RSS) Workshop on Robot Hardware-Aware Intelligence, 2025.</i></li><li><i>Under review at ML conference.</i></li></ul> <b>Out-of-Distribution Recovery with Object-Centric Keypoint Inverse Policy For Visuomotor Imitation Learning.</b><br><b>George Jiayuan Gao</b> , Tianyu Li, Nadia Figueroa <ul style="list-style-type: none"><li><i>International Conference on Intelligent Robots and Systems (IROS), 2025.</i></li><li><i>Spotlight at CoRL 2024 Workshop on Lifelong Learning for Home Robots.</i></li></ul>                                                                                                                      | [Web] [PDF]<br><br>[Web] [PDF] [Code]                                                                                                                                                                          |
| AWARDS                     | <b>Outstanding Research Award</b> <ul style="list-style-type: none"><li><i>Sole recipient among the Robotics Master's Class of 2025.</i></li><li>Awarded by Penn Engineering for exceptional research contributions.</li></ul> <b>Antoinette Frances Dames Award</b> , administered by WashU, for 4.0 GPA sophomores.<br><b>Dean's List</b> , administered by WashU, all semesters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2025<br><br>2022<br>2020-2023                                                                                                                                                                                  |
| ONGOING RESEARCH           | <b>Eureka for Manipulation: Real-World Dexterous Agent via Large-Scale Reinforcement Learning</b><br><i>Research Assistant under Prof. Dinesh Jayaraman</i> <ul style="list-style-type: none"><li>Training a skilled manipulation agent with RL in simulation that can zero-shot transfer to the real world is hard. The question is: does this get any easier when we add LLM in the loop and utilize ginormous levels of computing power, such as hundreds of Nvidia's latest generation of data-center GPUs?</li></ul> <b>Stable Visuomotor Policy from a Single Demo: Elastic Action Synthesis Data Augmentation</b><br><i>Research Assistant under Prof. Nadia Figueroa</i> <ul style="list-style-type: none"><li>We propose a methodology that uses our in-house <b>Elastic-Motion-Policy</b>, enabling the training of visuomotor policies with full spatial generalization from only a single demonstration.</li></ul> | March 2025 - Present<br><br>December 2024 - Present                                                                                                                                                            |
| PAST PROJECT               | <b>Environmental Transfer of Visuomotor Policy via Object-Centric Domain Randomization</b><br>[PDF] <ul style="list-style-type: none"><li>Proposed GDN-ACT, a novel and scalable approach enabling <b>zero-shot generalization</b> of visuomotor policies across unseen environments using a pre-trained state-space mapping for object localization. Achieved a <b>61.6% success rate</b> on complex bimanual grasping tasks across five unseen simulated environments.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                             | January 2024 - May 2024                                                                                                                                                                                        |

**Modular Gait Optimization: From Unit Moves to Multi-Step Trajectory in Bipedal Systems**  
 [PDF] [Code] August 2023 - December 2023

- Developed the Gait Modularization and Optimization Technique (GMOT), leveraging modular unit gaits as initialization for Hybrid Direct Collocation (HDC), reducing constraint sensitivity, enhancing computational stability across various gaits (walking, running, hopping), and achieving **time-efficiency gains of up to 80%**.

**Miniature City Lane-Following Autonomous Driving Platform Development** [Code]  
*Research Assistant* under Prof. Yevgeniy Vorobeychik October 2021 – May 2023

- Developed the driving stack for Washington University’s inaugural miniature city autonomous driving platform by creating a vision-based lane-following pipeline.
- Resolved key reliability issues arising from CPU hardware limitations by implementing an innovative DBSCAN–K-Means cycle, resulting in a **21% reduction** in total pipeline latency and significantly improving system responsiveness.

**Computational Fluid Dynamics (CFD) Simulation Project**  
*Research Assistant* under Prof. Agarwal Ramesh May 2021 – October 2021

- Implemented turbulence simulations using Prof. Ramesh Agarwal’s Wray–Agarwal turbulence model with OpenFOAM and C++, recorded results and developed optimization plans for run-time improvements and garbage collection, which were subsequently executed.

**Motion Capture-Based Real-Time Teleoperation Pipeline for Visuomotor Policy Learning**  
 [Code] August 2024 – November 2024

- Developed a real-time (~100Hz) visuomotor-learning teleoperation pipeline to control robotic manipulators using motion capture and to record high-quality frame-to-action datasets.

TEACHING  
EXPERIENCE

**Head Teaching Assistant** August 2021 - May 2023  
*McKelvey School of Engineering*, Washington University in St. Louis, St. Louis, MO, USA  
*CSE-247 Data Structures & Algorithms*: Managed 350 students, and 90 teaching assistants; Held weekly review lectures, office hours, and bi-semester exam review sessions.

**Graduate Teaching Assistant** January 2024 - May 2024  
**Penn Engineering**, University of Pennsylvania, Philadelphia, PA, USA  
*MEAM-5200 Introduction to Robotics*, 200 students: Held weekly office hours and real-robot studios.

INDUSTRY  
EXPERIENCE

**Megvii Technology Limited**, Beijing, China  
*Full-Stack Software Development Intern* May 2021 - August 2021

- Designed and deployed an interactive web module to visualize work-hour data with dynamic histograms, pie charts, and trend graphs, facilitating effective analysis and discussion in departmental meetings.

SERVICES

**Reviewer** for CoRL Workshop on Lifelong Learning for Home Robots 2024  
**Volunteer Science Instructor** for a Rural High School, Tongzhou, China 2020

ACTIVITIES

Member of the **Penn Robotics Entrepreneurship Club** 2023 - Present  
 Member of the **WashU Sensasians Acapella Club** 2021 - 2023

COMPUTER SKILLS

**Languages:** Python, C++, Java, Javascript, HTML/CSS,  $\text{\LaTeX}$   
**Technologies/Frameworks:** Linux, ROS1 & 2, PyTorch, AutoCAD, Solidworks  
**Developer Tools:** GitHub, Docker, IDEs, Miniconda