

# Jack (Haoying) Zhou

Robotics Engineer | Systems, Simulation, Perception & Control | Applied ML/AI Researcher

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Robotics PhD candidate (Expected May 2026) with 5+ years building end-to-end robotics systems: **robot infrastructure development, system integration, real-time software, photorealistic simulation, multi-modal data pipelines, and AI-driven perception & automation**. Have driven cross-institution collaborations on shared dataset and system identification deliverables. Proven publication track record at top-tier venues (ICRA, IROS, NeurIPS). Deep expertise in the **da Vinci Research Kit (dVRK Classic/Si)**.

## Technical Skills

**Programming:** Python, C/C++, MATLAB, Bash/Shell

**Robotics:** ROS/ROS2, kinematics/dynamics/control, system identification, sensor fusion, teleoperation, calibration

**Simulation:** AMBF (Bullet Physics), NVIDIA Isaac Sim, Blender, Gazebo/RViz, CoppeliaSim, Simulink, Ansys FEA

**ML & Vision:** PyTorch, TensorFlow, OpenCV, deep learning, imitation learning, 6D pose estimation, 3D reconstruction

**Infrastructure:** Linux, Git, Docker, CMake/catkin/colcon, multi-threaded C++, image pipeline (v4l2, udev), PyQt

**Hardware:** dVRK Classic/Si (5+ YoE), rapid prototyping, SolidWorks, 3D printing, AutoCAD, machine shop

## Education

**Worcester Polytechnic Institute**

*Ph.D. in Robotics Engineering, GPA: 3.95/4.0*

Worcester, MA

*Sep 2020 – May 2026 (Expected)*

**Boston University**

*M.S. in Mechanical Engineering, GPA: 3.78/4.0*

Boston, MA

*Sep 2018 – May 2020*

**University of California, Berkeley**

*Visiting Undergraduate Student, Mechanical Engineering, GPA: 3.95/4.0*

Berkeley, CA

*Aug 2017 – May 2018*

**Beijing Institute of Technology**

*B.S. in Mechanical Engineering*

Beijing, China

*Sep 2014 – May 2018*

## Experience

**Visiting Graduate Scholar**

Jun 2023 – Present

*Johns Hopkins University – Laboratory for Computational Sensing and Robotics (LCSR)*

*Baltimore, MD*

- Led 8-person cross-institutional team building C++ multi-threaded data collection framework synchronizing 20+ ROS topics at millisecond precision; integrated chip-on-tip endoscope and custom Arduino capacitive sensor, delivering **2500+ surgical trajectories to NVIDIA Open-H-Embodiment**.
- Built end-to-end preprocessing pipeline with PyQt5 annotation tools, kinematic reprojection via hand-eye calibration, and AI-driven modules (FoundationStereo, RAFT, SAM2) for downstream perception and learning.
- Constructed photorealistic simulation environments in AMBF and Isaac Sim, converting MRI scans and CADs to sim-ready assets for NSF AccelNet Surgical Robotics Challenges, supporting **50+ international participants**.
- Designed simulation data collection pipeline using physical dVRK MTM teleoperation for imitation learning policy training, achieving **95% task completion with 20% faster execution** in simulation environments.
- Implemented gravity compensation and hybrid (model-based + learning-based) force estimation via convex optimization (CVXPY, pyOpt), **reducing static control errors by 73%** and force estimation errors by 30%.
- Investigated multi-modal contact detection using dual-branch (Mamba + ViT) fusion deep learning architecture.

**Image-Guided Therapy Robotics Intern**

May 2022 – Aug 2022

*Philips Research North America*

*Cambridge, MA*

- Developed robot motion simulator integrating DICOM imaging with PyQt5 GUI and Xbox controller teleoperation, **improving visualization refresh rate by 30x** for interventional therapy planning.

**Research Assistant**

Mar 2021 – Present

*Worcester Polytechnic Institute – Automation and Interventional Medicine (AIM) Lab*

*Worcester, MA*

- Restored non-functional full da Vinci Surgical System to operational state using dVRK controllers through systematic calibration, failure mode analysis, and custom maintenance protocols (surgical instrument lubrication, cable tension recovery).
- Integrated custom sensors (sEMG, haptic devices) and end-effectors (photoacoustic probe) with dVRK PSM via ROS and servo control, enabling smart teleoperation and probe autonomous scanning.
- Developed deep learning pipeline for markerless suturing needle 6D pose estimation, achieving **1.4 mm and 2.9°** errors in simulation.

## Selected Publications (15 of 18 Total)

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1. **Zhou, H.**, Liu, C., Wu, Y., ..., & Kazanzides, P. (2026). "SurgSync: Time-Synchronized Multi-modal Data Collection Framework and Dataset for Surgical Robotics." *IEEE Intl. Conf. on Robotics and Automation (ICRA)*.
2. **Zhou, H.**, Yang, H., Deguet, A., ..., & Kazanzides, P. (2025). "Gravity Compensation of the dVRK-Si Patient Side Manipulator based on Dynamic Model Identification." *Hamlyn Symp. on Medical Robotics (Oral)*.
3. Yang, H., **Zhou, H.**, Fischer, G. S., & Wu, J. Y. (2024). "A Hybrid Model and Learning-Based Force Estimation Framework for Surgical Robots." *IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*.
4. **Zhou, H.**, Jiang, Y., Gao, S., ..., & Fischer, G. S. (2024). "Suturing Tasks Automation Based on Skills Learned From Demonstrations: A Simulation Study." *Intl. Symp. on Medical Robotics (ISMR), IEEE*.
5. Wu, J., **Zhou, H.**, Kazanzides, P., Munawar, A., & Liu, A. (2024). "SurgicAI: A Hierarchical Platform for Fine-Grained Surgical Policy Learning and Benchmarking." *Conf. on Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track*.
6. Lin, F.\*, Liu, H.\*, **Zhou, H.\***, Hou, S.\*, Yamada, K. D., ... & Zhang, Z. (2024). "Loss Distillation via Gradient Matching for Point Cloud Completion with Weighted Chamfer Distance." *IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*.
7. Kim, T. W., **Zhou, H.**, Barragan, J. A., ..., & Munawar, A. (2025). "Surgical Robotics Environment in NVIDIA Isaac Sim for Robot-Assisted Suturing." *Intl. Symp. on Medical Robotics (ISMR), IEEE*.
8. Allison, C. J., **Zhou, H.**, Munawar, A., Kazanzides, P., & Barragan, J. A. (2024). "FIRE-3DV: Framework-Independent Rendering Engine for 3D Graphics Using Vulkan." *IEEE Intl. Conf. on Robotic Computing (IRC)*.
9. Barragan, J. A., Zhang, J., **Zhou, H.**, Munawar, A., & Kazanzides, P. (2024). "Realistic Data Generation for 6D Pose Estimation of Surgical Instruments." *IEEE Intl. Conf. on Robotics and Automation (ICRA)*.
10. Jiang, Y., **Zhou, H.**, & Fischer, G. S. (2023). "Development and Evaluation of a Markerless 6 DOF Pose Tracking Method for a Suture Needle from a Robotic Endoscope." *Journal of Medical Robotics Research*.
11. Wu, Z., Schmidt, A., Moore, R., **Zhou, H.**, ..., & Salcudean, S. E. (2025). "SurgPose: a Dataset for Articulated Robotic Surgical Tool Pose Estimation and Tracking." *IEEE Intl. Conf. on Robotics and Automation (ICRA)*.
12. Yang, K., Meier, T. B., **Zhou, H.**, Fischer, G. S., & Nycz, C. J. (2022). "A sEMG Proportional Control for the Gripper of Patient Side Manipulator in da Vinci Surgical System." *Intl. Conf. of the IEEE Engineering in Medicine & Biology Society (EMBC)*.
13. Gao, S., Wang, Y., Ma, X., **Zhou, H.**, Jiang, Y., Yang, K., ... & Zhang, H. K. (2023). "Intraoperative laparoscopic photoacoustic image guidance system in the da Vinci surgical system." *Biomedical Optics Express*.
14. Wang, S.\*, Wang, J.F.\*, Koh, Y.\*, **Zhou, H.**, ..., & Kazanzides, P. (2025). "An Augmented Reality Measurement Tool for the da Vinci Research Kit." *Intl. Symp. on Medical Robotics (ISMR), IEEE*.
15. Goldfarb, N., **Zhou, H.**, Bales, C., & Fischer, G. S. (2021). "Control of a lower limb exoskeleton using Learning from Demonstration and an iterative Linear Quadratic Regulator Controller: A simulation study." *Intl. Conf. of the IEEE Engineering in Medicine & Biology Society (EMBC)*.

## Awards & Certifications

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**Dr. Glenn Yee Graduate Student Tuition Award** – WPI, Fall 2024, Spring 2025, Spring 2026

**CITI Program Training** – Social & Behavioral Research (JHU); Human Subjects in Biomedical Research (WPI)

**Safety Certifications** – Radiation Safety (JHU, WPI); MRI Safety (WPI); Laboratory Animal Surgery, IRB (WPI)

## Availability

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Expected graduation: May 2026. Seeking full-time positions starting May/June 2026. Open to relocation within the U.S.

Eligible for 36-month STEM OPT; H-1B/O-1 or equivalent visa sponsorship required thereafter.