Jack (Haoying) Zhou

Robotics Engineer (Systems, Software, Simulation, Control) | Applied/Research Scientist

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Robotics PhD candidate (Expected May 2026) with 5+ years of surgical robotics (**da Vinci Research Kit, dVRK Classic/Si**) experience in infrastructure development, multi-modal data collection, photorealistic simulation, and AI-driven perception and automation. Proven publication track record in top-tier robotics venues (ICRA, IROS, NeurIPS).

Technical Skills

Programming: Python, MATLAB, C/C++, Bash/Shell
Simulation: AMBF (Bullet Physics), Blender, Gazebo/RViz, NVIDIA Isaac Sim, Simulink, Ansys FEA
Robotics: ROS/ROS2, robot kinematics/dynamics/control, system identification, teleoperation, calibration
Platform: dVRK Classic/Si (5+ YoE), Linux, Git, Image pipeline (v4l2, udev), PyQt, CMake/catkin/colcon, Docker
ML & AI: PyTorch, OpenCV, Computer Vision, Deep Learning, Imitation Learning
Design: Rapid Prototyping, SolidWorks, 3D Printing, Machine Shop, AutoCAD

Education

Worcester Polytechnic Institute — Worcester, MA
Ph.D. in Robotics Engineering, GPA: 3.95/4.0 — *Sep 2020 – May 2026 (Expected)*

Boston University — Boston, MA
M.S. in Mechanical Engineering, GPA: 3.78/4.0 — *Sep 2018 – May 2020*

University of California, Berkeley — Berkeley, CA
Visiting Undergraduate Student, Mechanical Engineering, GPA: 3.95/4.0 — *Aug 2017 – May 2018*

Beijing Institute of Technology — Beijing, China
B.S. in Mechanical Engineering — *Sep 2014 – May 2018*

Experience

Visiting Graduate Scholar — Jun 2023 – Present
Johns Hopkins University — *Baltimore, MD*

- Preliminary investigation on multi-modal contact detection using dual-branch(Mamba+ViT) fusion architecture.
- Integrated chip-on-tip endoscope and custom Arduino capacitive contact sensor, led 8-person team building C++ multi-threaded recorders for real-world data collection to synchronize 20+ ROS topics at millisecond precision, delivering 2500+ surgical trajectories to NVIDIA Open-H-Embodiment.
- Developed preprocessing framework with PyQt5 annotation tools, kinematic reprojection using robot hand-eye calibration, and AI-driven preprocessing (FoundationStereo, RAFT, SAM2) for downstream AI applications.
- Built photorealistic simulation environments in AMBF and Isaac Sim by converting real-world MRI scans and CADs to sim-ready models for NSF AccelNet Surgical Robotics Challenges, supporting 50+ international participants.
- Developed simulation data collection pipeline using physical dVRK MTM as teleoperation interface for policy training data collection and benchmarking, enabling imitation learning achieving 95% task completion with 20% faster execution.
- Implemented gravity compensation and hybrid force estimation using convex optimization (CVXPY, pyOpt), reducing static control errors by 73% and force estimation errors by 30%.

Image-Guided Therapy Robotics Intern — May 2022 – Aug 2022
Philips Research North America — *Cambridge, MA*

- Built robot motion simulator using DICOM imaging and PyQt5 interface with Xbox controller teleoperation, improving visualization refresh frequency by 30x for image-guided therapy planning.

Research Assistant — Mar 2021 – Present
Worcester Polytechnic Institute — *Worcester, MA*

- Brought non-functional full da Vinci Surgical System to operational state using dVRK controllers through systematic calibration and failure mode analysis; developed instrument lubrication protocol and cable tension recovery maintenance approach to restore degraded instruments and extend operational lifespan.
- Integrated custom sensors (sEMG, haptic devices) and end-effectors (photoacoustic probe) with dVRK PSM using ROS and servo control, enabling AR measurement systems and autonomous scanning.
- Developed deep learning approach for markerless suturing needle 6D pose estimation achieving 1.4 mm and 2.9 degree errors in simulation environments.

Selected Publications (15 of 18 Total)

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

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

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.