

JINTAN ZHANG

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📍 Baltimore, Maryland 📞 (530)-760-9657

EDUCATION

Ph.D. in Computer Science

Johns Hopkins University, Baltimore, MD

Aug 2022 - Present

- Advisor: Dr. Peter Kazanzides and Dr. Emad Bector

M.S.E. in Robotics

Johns Hopkins University, Baltimore, MD

Aug 2021 - May 2022

- Advisor: Dr. Peter Kazanzides

B.S. in Electrical Engineering & Computer Science

Johns Hopkins University, Baltimore, MD

Aug 2019 - May 2021

- GPA: 3.71

Mechanical Engineering

University of California, Davis, Davis, CA

Sep 2017 - June 2019

- GPA: 3.934

RESEARCH EXPERIENCE

Volumetric Tool Tip Tracking and Tissue Characterization System for Vascular Access

Johns Hopkins University

Sep 2022 - Present

- Designed multi-physics simulation framework integrating optical (fiber-optic needle) and acoustic (multi-sensor triangulation) modeling for prototyping tracking systems
- Researched and implemented real-time algorithms and software pipeline for simultaneous tool tip tracking ($\leq 1\text{mm}$ accuracy) and tissue characterization (sensitivity & specificity $\geq 90\%$), processing photoacoustic signals at 20Hz with custom acoustic sensors
- Architected multi-process data pipeline using ZMQ-based IPC to connect real-time data acquisition, signal processing engine, and Qt-based clinical GUI

Learning-based Robot Dynamics Identification and Force Estimation on daVinci Research Kit

Johns Hopkins University

Sep 2021 - Present

- Developed neural networks for 7-DOF surgical robot dynamics identification and contact force estimation. Achieved 1.4N force and 0.04Nm torque estimation accuracy, enabling safer tissue manipulation during surgery
- Pioneered transfer learning framework enabling cross-robot dynamics adaptation with only 15s of intraoperative data collection and 30s training time, validated across 8 surgical instruments and 5+ international dVRK sites

Robotic Simulation Infrastructure

Johns Hopkins University

Sep 2022 - Present

- Architected robotic ultrasound simulation pipeline integrating Isaac Sim (FEM soft body dynamics) with k-Wave acoustic simulator, enabling realistic B-mode imaging of deformable tissue
- Built photorealistic rendering extension for AMBF simulator using Blender API, generating synthetic training data for 6D pose estimation with domain randomization

Low-Level Control and Firmware Development for da Vinci Research Kit

Johns Hopkins University

Aug 2019 - Present

- Designed novel firmware-based velocity controller, achieving $\geq 50\%$ reduction in steady-state tracking error compared to PC-based controllers while maintaining 10MHz control loop rate
- Implemented essential firmware: digital FIR filters, high-speed data collection module, LED feedback interface for the watchdog safety system
- Developed GUI for real-time PID tuning and performance monitoring, enabling rapid controller optimization

Causality-Driven Robot Tool Segmentation

Johns Hopkins University

Aug 2021 - Apr 2022

- Proposed novel causal model for surgical tool segmentation that iteratively optimizes robot kinematics through differentiable rendering and feature matching, achieving 91.8 Dice score under extreme conditions (smoke, blood, low light) vs 86.7 for SOTA image-only methods
- Developed end-to-end pipeline integrating PyTorch3D differentiable rendering with attentional cosine similarity loss, enabling simultaneous segmentation and kinematic parameter estimation from vision data
- Demonstrated superior domain generalization through counterfactual testing on synthetic (AMBF) and real dVRK data with controlled environment variations

WORK EXPERIENCE

Video Software Engineering Intern

Intuitive Surgical, Inc., Sunnyvale, CA

May 2022 - Aug 2022

- Developed embedded Linux C++ APIs enabling Manufacturing/NPI teams to configure video processing FPGA boards, streamlining hardware validation and production workflows
- Built parameter management system for surgical display calibration (gamma curves, resolution, aspect ratio, etc.) with hot-reload capability for field engineer updates

Computer Science Tutor

University of California, Davis, Davis, CA

Jan 2019 - Aug 2019

- ECS36A: Programming & Problem Solving, ECS36B: Object-Oriented Programming

Robotics Intern

ZhuFei Robotics Lover Club, Shanghai, China

July 2017 - Aug 2017

- Taught high school students basic WER Brick Robot design, programming, and video editing skills

Journal Articles

Wu, Yixuan, Mahban Gholijafari, **Zhang, Jintan**, et al. “M-PANDA: Male Pelvic Anatomical Numerical Dataset for Acoustic Imaging”. In: *Photoacoustics* (2025). (*Under Review*).

Yilmaz, Nural, **Zhang, Jintan**, Peter Kazanzides, and Ugur Tumerdem. “Transfer of learned dynamics between different surgical robots and operative configurations”. In: *International Journal of Computer Assisted Radiology and Surgery* 17.5 (2022). (*NDI Best Paper Award: Runner-Up*), pp. 903–910. DOI: 10.1007/s11548-022-02601-7.

Conference Proceedings

Zhang, Jintan, Keshuai Xu, Yixuan Wu, et al. “Volumetric vascular access guidance system with sub-millimeter accuracy in variable ultrasound orientations”. In: *2025 IEEE International Ultrasonics Symposium (IUS)*. 2025.

Barragan, Juan Antonio, **Zhang, Jintan**, Haoying Zhou, Adnan Munawar, and Peter Kazanzides. “Realistic Data Generation for 6D Pose Estimation of Surgical Instruments”. In: *2024 IEEE International Conference on Robotics and Automation (ICRA)*. 2024, pp. 13347–13353. DOI: 10.1109/ICRA57147.2024.10611638.

Xu, Keshuai, **Zhang, Jintan**, Laeben Lester, Jeeun Kang, and Emad Bector. “Vendor-independent Non-intrusive Synchronization Signals Capture from Clinical Ultrasound Machines”. In: *2024 IEEE Ultrasonics, Ferroelectrics, and Frequency Control Joint Symposium (UFFC-JS)*. 2024, pp. 1–3. DOI: 10.1109/UFFC-JS60046.2024.10793930.

Zhang, Jintan and Peter Kazanzides. “Velocity Control for the da Vinci Research Kit”. In: *2023 International Symposium on Medical Robotics (ISMR)*. 2023, pp. 1–7. DOI: 10.1109/ISMR57123.2023.10130265.

Ding, Hao, **Zhang, Jintan**, Peter Kazanzides, Jie Ying Wu, and Mathias Unberath. “CaRTS: Causality-Driven Robot Tool Segmentation from Vision and Kinematics Data”. In: *Medical Image Computing and Computer Assisted Intervention – MICCAI 2022*. Vol. 13431. Lecture Notes in Computer Science. Springer, 2022, pp. 387–398. DOI: 10.1007/978-3-031-16449-1_37.

Zhang, Jintan, Nural Yilmaz, Ugur Tumerdem, and Peter Kazanzides. “Learning Based Estimation of 7 DOF Instrument and Grasping Forces on the da Vinci Research Kit”. In: *2022 International Symposium on Medical Robotics (ISMR)*. (*Best Paper Award*). 2022, pp. 1–7. DOI: 10.1109/ISMR48347.2022.9807525.

Presentations

Zhang, Jintan, Keshuai Xu, Laeben Lester, Emad Bector, and Jeeun Kang. *Volumetric Tool Tip Tracking and Tissue Characterization for Surgical and Interventional Guidance*. Ultrasonic Imaging and Tissue Characterization (UITC). 2025.

Zhang, Jintan, Laeben Lester, Emad Bector, and Jeeun Kang. *Sub-millimeter, Volumetric Tracking of Beacon Signal During Vascular Access*. IEEE International Ultrasonics Symposium (IUS). 2023.

Zhang, Jintan, Laeben Lester, Keshuai Xu, Emad Bector, and Jeeun Kang. *Volumetric Tracking of Beacon Signal During Vascular Access: System Design and Optimization*. Ultrasonic Imaging and Tissue Characterization (UITC). 2023.

SKILLS

Programming:	Python, C/C++, Verilog, MATLAB, CUDA
Deep Learning Framework:	PyTorch
Simulation:	COMSOL, Isaac Sim, K-Wave, ValoMC, MCmatlab, Simulink
Embedded System:	Linux, Vivado, Vitis
Robot System Design:	ROS
Visualization:	Blender, Unity
Version Control:	Git

HONORS AND AWARDS

- **Dean's List** *Fall 2019 - Spring 2021*
Johns Hopkins University
- **Robert A. and Denzil M. Kepner Awards** *Sep 2018*
University of California, Davis
- **Dean's Honor List** *Fall 2017 - Spring 2019*
University of California, Davis

PROFESSIONAL REFERENCES

- **Dr. Peter Kazantzides**
Department of Computer Science, Johns Hopkins University
Research Professor
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- **Dr. Emad Boctor**
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- **Dr. Adnan Munawar**
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- **Dr. Jie Ying Wu**
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