

JOSEPH JIA RONG CHEN

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RESEARCH AND WORK EXPERIENCE

Research Assistant, Johns Hopkins University | Adviser: Axel Krieger | Baltimore, Maryland

May 2024 - Present

- Developed autonomous tumor incision path planning algorithm in **ROS 2** and **C++**, resulting in **JMRR journal publication**
- Integrated, calibrated and troubleshoot industrial-grade 3D and near-infrared vision systems into robotic platform; enabled real-time autonomous guidance via sensor fusion and segmentation
- Applied Meta's SAM2 foundation model with dual-camera input for point cloud segmentation of tumor regions
- Designed test protocol using Python and OpenCV alongside imaging test stands to compare surgical output to CT ground truth, enabling objective validation of system precision and performance
- Kilmer, E.*, Chen, J.*, et al. (2025). *Towards fluorescence-guided autonomous robotic partial nephrectomy on novel tissue-mimicking hydrogel phantoms*. *Journal of Medical Robotics and Research* (in press). *Equal contribution.

Medical Device R&D Intern, Merge Medical Device Studio | Houston, Texas

May 2025 - Aug 2025

- Drove development of a lung ablation system, including mechanical components and FPCBs, by leading project planning, ODM and OEM coordination, and material logistics across 10+ suppliers—resulting in timely and cost-effective prototype
- Collaborated with industrial designers, clinical advisors, and engineers to iterate on device form factors and usability features, aligning cross-disciplinary input into cohesive product decisions during early-stage development
- Rapidly prototyped and iterated electromechanical systems—including vibrating needle catheters and thermal surgical tools—using 3D printing, PCB prototyping, machining and microcontroller to enable feasibility and early-stage validation

Mechanical Design Engineer, Foxconn | Hsinchu, Taiwan

Oct 2022 - Oct 2023

- Led full mechanical development of a high-volume IP camera casing, taking the product from industrial design form factor to mass production in just 3 months by coordinating across global teams in the U.S., China, Vietnam, and Taiwan
- Applied sound engineering principles to develop robust, manufacturable mechanical designs—producing detailed 2D drawings with GD&T (ASME Y14.5), performing FEA to validate structural requirements, and conducting tolerance analysis and review DFM/DFA with vendors to ensure production readiness and design integrity
- Designed test fixtures for mechanical validation and reliability testing, and provided ongoing support to resolve integration and quality issues throughout pre-production and ramp-up phases

EDUCATION

JOHNS HOPKINS UNIVERSITY | Baltimore, Maryland (GPA 3.71/4.0)

Jan 2024 – Dec 2025

• Master of Science in Engineering in Robotics

Relevant Coursework: Robot Devices Kinematics Dynamics and Control, Linear Control, Deep learning, Computer Vision

PURDUE UNIVERSITY | West Lafayette, Indiana (GPA: 3.93/4.0)

Aug 2017 – May 2022

• Bachelor of Science in Mechanical Engineering, graduated with distinction

Relevant Coursework: Linear Circuits, System Modeling & Measurement, Control Systems

COURSE PROJECTS

Mechatronics

Spring 2025

- Designed a differential drive robot for maze traversal using color-coded markers, including full 3D system modeling in SolidWorks and integration of vision, distance sensors, and actuators via GPIO, I²C, and UART protocols
- Developed low-level PID velocity control for servo motors with encoder feedback, and implemented high-level motion control using differential drive model with IMU data and camera for stable and responsive navigation
- Implemented search and shooting strategies with Arduino-based state machine logic for an air hockey robot, coordinating real-time sensor data and control actions to maximize scoring in the JHockey tournament

Deep Learning: Classification and Localization of Surgical Tools for Hospital Sterilization

Fall 2024

- Trained a Faster R-CNN model using Pytorch to classify surgical tools and generate bounding box
- Designed a custom CNN-based multitask architecture to perform simultaneous object classification and segmentation
- Segmented Da Vinci surgical manipulator using UNET with data augmentation for robustness against non-adversarial corruption

Robot Operating System

Spring 2025

- Implemented a resolved rate controller for a UR5 robotic arm using the ROS 2 control architecture; validated motion in RVIZ simulation and successfully executed real-world robot control
- Built a digital twin for Virtuoso robot using ROS 2 control architecture, starting with custom URDF modeling, Hardware interface, to custom controllers supporting both surgeon controller (SID) input and digital commands
- Integrated Gazebo simulation for real-time visualization of tool tip behavior, supporting validation of control strategies and enhancing user interaction with the digital twin in RVIZ

Algorithm for Sensor Based Robotics, Johns Hopkins University | Baltimore, Maryland

Spring 2024

- Developed motion planning and control for UR5 robotic arm using custom **Resolved Rate Controller** and **RRT algorithms** for obstacle avoidance; validated motion in RViz and deployed on physical hardware
- Implemented custom **C++ controller in ROS 2** leveraging the manipulator **Jacobian** for smooth Cartesian-space motion of a 6-DOF arm
- Executed **hand-eye calibration** using AR tags to compute camera-to-robot transformation, enabling accurate sensor-guided manipulation

SKILLS

- **Programming and Robotics:** Python, C++, C, MATLAB, Arduino, ROS 2, Gazebo, RViz, OpenCV, PyTorch, LabView
- **Mechatronics:** SolidWorks, Creo, ANSYS, Abaqus, PCB & FPCB, KiCAD
- **Tools & Communication:** Mandarin (Native), English (Fluent)