Liwei Yang

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EDUCATION

Carnegie Mellon University - School of Computer Science (CMU SCS) — *Pittsburgh, PA*
Master of Science in Robotic Systems Development — *(expected) 05/2025*

Relevant Coursework: Planning in Robotics, Optimal Control, Talking to Robots, Robot Autonomy, Computer Vision, Manipulation & Estimation & Control, Robot Mobility, Robot Learning (in progress), Learning for 3D Vision (in progress)

National Taiwan University (NTU) — *Taipei, Taiwan*
Bachelor of Science in Biomechatronics Engineering — *06/2022*

Relevant Coursework: Robotics, Machine Learning, Medical Mechatronics, Data Structures and Algorithms, Image Processing

SKILLS

Programming: C/C++, Python (PyTorch, OpenCV), Java, MATLAB, Julia
Robotics: Motion Planning, Optimal Control, Manipulation, Computer Vision
Software/Tools: ROS2/ROS, MoveIt2, Gazebo, Qt, Git, Docker, Google Test, 3D Slicer, SolidWorks, Jira

EXPERIENCE

Smith+Nephew — *Pittsburgh, PA*
R&D Intern (Robotics System Verification Engineering Intern) — *05/2024 - 08/2024*

- Analyzed and visualized registration algorithm results for total hip arthroplasty, boosting registration efficiency by 75%.
- Crafted and automated 20 C++ tests using **GoogleTest**, enhancing code reliability and reducing testing time by 50%.
- Executed 15 manual test cases, identifying multiple bugs for the development team and accelerating product launch.

Center for Artificial Intelligence and Advanced Robotics — *Taipei, Taiwan*
Research Assistant, topic: Companion Healthcare Aid Robot Manager — *02/2022 - 10/2022*

- Developed a voice-interactive module, enhancing facial recognition capabilities and user engagement.
- Leveraged **SQLite** to centralize physiological data from multiple users, improving system scalability and user management.
- Integrated a smartwatch with the robot using Bluetooth Low Energy protocol, optimizing data synchronization capabilities.

Robots and Medical Mechatronics Lab — *Taipei, Taiwan*
Undergraduate Researcher, topic: Remote Swabbing Robot — *09/2020 - 03/2022*

- Constructed a statistical morphing oral model using CT images in **3D Slicer**, achieving landmarks' accuracy of 2 mm.
- Won sponsorship worth $1600 USD from Taiwan's Ministry of Science and Technology.
- Won the best student paper award at the Conference on Advanced Robotics and Intelligent Systems.

SELECTED PROJECTS

MRSD Capstone (Sponsored by Smith+Nephew) — *Pittsburgh, PA*
Project Manager, topic: Tekkneeca – Assistive Surgical Robot for Orthopedics — *11/2023 - 11/2024*

- Integrated registration algorithm to replace invasive IR trackers for surgical robots, achieving drilling accuracy of 2 mm.
- Adapted **MoveIt2** hybrid-planning with KUKA LBR Med 7 to account for bone motion and define recovery behavior.
- Designed **MPC** controllers to compensate for bone motion during the surgery, achieving a compensation speed of 6 mm/sec.

I Can't Do It – Bimanual Robotic Arm Collaboration — *Pittsburgh, PA*
10/2024 - 12/2024

- Harnessed the reasoning capabilities of OpenAI **GPT-4o** to foster collaboration between two robotic arms.
- Enabled talking to robots by integrating OpenAI Whisper speech-to-text model to ROS2.
- Developed generalized **Pilz** industrial motion planning stack using MoveItCpp and ROS2 parameters.

Blind Swarm – Formation Planning for Swarm Robots — *Pittsburgh, PA*
10/2024 - 12/2024

- Simulated drone formation changes while avoiding collisions with static obstacles and other drones.
- Designed and implemented **conflict-based search planning** and imposing constraints on motion primitives based RRT.

ARoboT – Autonomous Pixel Art Builder — *Pittsburgh, PA*
03/2024 - 05/2024

- Integrated symbolic task planner to stack 3D-printed blocks to form a pixel art.
- Utilized MoveIt with the **RRTConnect** planner to plan Franka Emika Panda trajectory to pick-and-place building blocks.
- Conducted eye-in-hand **extrinsic camera calibration** to enhance the accuracy of object detection and pose estimation.

MLF6110 – Mobile Lost and Found Robot — *Taipei, Taiwan*
11/2021 - 01/2022

- Led a team of 4 to integrate an object-searching mobile robot using depth camera and lidar.
- Utilized **DWA** navigation and **AMCL** localization methods using ROS.
- Applied BRISK and RANSAC algorithms in object searching and found all lost items.

PUBLICATIONS

Peer-reviewed Journal Articles

A Morphology Model for the Cyber-physical Operation of a Remote Swabbing Robot.

- **Yang, L. W.** & Yen, P. L., International Journal of iRobotics.