Puen Xu

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Professional Summary

Robotics engineer with B.S. and M.S. degrees in Robotics and over 5 years of experience developing autonomous systems through research and hands-on projects. Interested in roles focused on advancing decision-making in robotics.

Education

University of Pennsylvania (Penn) — Philadelphia, PA
M.S.E. in Robotics, GRASP Lab, GPA: 3.95/4.0 — Aug 2024 - Present

Worcester Polytechnic Institute (WPI) — Worcester, MA
B.S. in Robotics Engineering, with High Distinction, GPA: 3.95/4.0 — Aug 2020 - May 2024

Work Experience

BESTMOW — Philadelphia, PA
Robotics Engineer Intern — Starting Jan 2026

- Upcoming intern at a startup developing autonomous robotic lawn mowers, focusing on perception, motion planning, and control algorithms.

Research

Resilient Market-Based Multi-Robot Exploration under Byzantine Threats — Philadelphia, PA
Master's Thesis | Advisor: Prof. Linh Thi Xuan Phan — May 2025 – Present

- Extending RoboRebound, a Byzantine fault-tolerance framework for multi-robot systems, to operate in real-world environments, enabling resilient multi-robot exploration beyond constrained simulations.
- Evaluating robustness in market-based exploration and RVO navigation, mitigating adversarial behaviors such as bid manipulation and map poisoning while ensuring safe distributed coordination.
- Designing and testing rendezvous strategies for intermittent communication to overcome proximity constraints in decentralized multi-robot deployments.
- Collaborating with electrical engineers to build Secbot, a custom mobile robot, and validating RoboRebound's performance on physical hardware.

Projects

Visual-Inertial Navigation and Path Planning for Autonomous UAV (Team of 1) — Philadelphia, PA
Full-Stack Engineer | Python, Controller Design, Motion Planning, Sensor Fusion — Jan 2025 – May 2025

- Implemented an onboard Visual-Inertial Odometry (VIO) system using an Error-State Kalman Filter (ESKF) to fuse stereo camera and IMU data, achieving accurate 6-DOF pose estimation for GPS-denied quadrotor flight in simulation and hardware tests.
- Integrated real-time trajectory planning and control, combining A* pathfinding with minimum-jerk polynomial smoothing and a geometric SE(3) controller for dynamically feasible, smooth trajectory tracking through cluttered 3D environments.
- Deployed and tuned the full autonomy stack on a quadrotor platform, performing system identification, controller gain tuning, and state estimator calibration to achieve stable flight and precise trajectory tracking under sensor noise and model uncertainty.

BiQu: Bimodal Quadruped Robot (Team of 6) — Worcester, MA
Mechanical Lead | Sponsor: Unitree Robotics | SolidWorks, Arduino, PCB Design, ROS — Aug 2023 – May 2024

- Designed and fabricated a 3-DOF robotic arm with a 2-DOF gripper using SolidWorks and 3D printing, performing torque and structural analysis to select motors and gearboxes for required payload handling.
- Developed and wired custom motor drives and PCB using EasyEDA, integrating power distribution, motor control, and battery housing into a compact, modular electronics enclosure.
- Integrated the arm with ROS and the Jetson Nano on the Unitree Go1, enabling real-time motion control and communication with the quadruped's onboard systems for precise loco-manipulation.

Robotic Bird Deterrent (Team of 2) — Worcester, MA
Embedded Software Lead | Sponsor: Eversouce | Computer Vision, Front-End Development — Aug 2023 – Dec 2023

- Designed, fabricated, and wired a mobile robot to patrol power transmission lines, deterring ravens using coordinated audio and visual stimuli.
- Developed a YOLOv5-based raven detection pipeline integrated with ROS, and implemented a high-level ROS state machine to monitor sensor messages and dynamically select controller actions.
- Built a mobile application interfaced with ROS, allowing remote robot operation via touchscreen controls to drive the robot and trigger deterrent actions.

Autonomous SLAM-Based Maze Navigation (Team of 2) Worcester, MA
Software Lead | Python, ROS, Gazebo, SLAM Mar 2023 – May 2023

- Implemented a full SLAM and navigation stack using ROS Gmapping to perform real-time 2D occupancy grid mapping and localization from LiDAR and odometry data in an unknown maze environment.
- Developed autonomous exploration and path-planning modules including frontier detection, configuration-space generation, and A*-based optimal path planning, enabling systematic map coverage and obstacle avoidance.
- Integrated probabilistic localization using particle filtering for pose estimation within the generated map, allowing the robot to re-localize after drift and navigate reliably to specified goals using ROS navigation stack components.

Autonomous Vision-Guided Pick and Place System (Team of 3) Worcester, MA
Software Lead | MATLAB, Computer Vision, Robot Manipulation Jan 2023 – Mar 2023

- Developed a fully autonomous robotic pick-and-place platform integrating a 3-DoF manipulator, camera, and gripper to detect, localize, and sort colored objects using computer vision and motion planning.
- Implemented closed-loop kinematic control and task-space motion planning to achieve precise end-effector positioning and smooth object manipulation in a dynamic environment.
- Integrated calibrated vision and robot control pipelines in MATLAB to perform object detection, localization, and robot–camera frame transformation for accurate autonomous operation.

Teaching Assistantship

GRASP Lab, Penn Philadelphia, PA
Course: Robotics Bootcamp for Incoming Master's Students Jul 2025 – Aug 2025

Robotics Engineering Department, WPI Worcester, MA
Courses: Unified Robotics III - Manipulation, Unified Robotics IV - Navigation Aug 2023 – May 2024

Mathematical Sciences Department, WPI Worcester, MA
Courses: Calculus III, Applied Statistics I, Ordinary Differential Equations Aug 2022 – May 2023

Skills

Robotics & Software: ROS, Linux, Robot Programming (C++, Python, MATLAB)
Mechanical & Embedded Systems: SolidWorks, Embedded Development, PCB Design, Controller Design
Analytical Tools: Convex Optimization, Optimal Control, Trajectory Optimization, Machine Learning
Languages: Fluent in English and Mandarin; Competent in Japanese, French, and Spanish

Honors & Awards

MQP (Senior Capstone) Award Honorable Mention, *WPI* May 2024
Tau Beta Pi (Engineering Honor Society) Apr 2023
Presidential Scholarship, *WPI* Aug 2020