Junzhe Wu

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Education

- **University of Michigan, Ann Arbor** — Ann Arbor, MI
  M.S. in Electrical and Computer Engineering (Robotics track); GPA: 4.0/4.0 — *Sep 2021 - Apr 2023 (expected)*
  Core Courses: Deep Learning for Computer Vision, Mobile Robotics, Motion Planning, Ubiquitous Computing.

- **University of Shanghai for Science and Technology (USST)** — Shanghai, China
  B.Eng. in Industrial Electronics and Control Engineering; GPA: 3.77/4 — *Sep 2017 - Jun 2021*

Research/Project Experience

- **CURLY SLAM – a new baseline for Visual SLAM** — Jan 2022 – present
  Research Assistant advised by Prof. Maani Ghaffari, CURLY Lab
  - Built a SLAM system from scratch using ROS, including an OpenCV frontend, and a GTSAM backend with loop-closing.
  - Improved feature matching to ~ 100 correct matches per frame in frontend with optical flow method and correspondence search.
  - Used factor graphs and GTSAM to optimize and fuse factors like SIFT/ORB features, IMU, and objects.

- **EVCS - An Enhanced Visual Checkout System for Cashierless Store** — Aug 2022 – present
  Project Leader advised by Prof. Pei Zhang
  - Built an Unreal Engine simulator of a real cashier-less store to generate datasets
  - Solved the problem of rare availability of public datasets and time-consuming real simulation.
  - Use background subtraction and feature tracking to get uncovered item image for classification.

- **Motion Planning Library** — Sep 2021 - Dec 2021
  Independent Developer
  - Used Pybullet to simulate manipulators and mobile robots.
  - Implemented algorithms including A*, ANA*, RRT, Kalman Filter (EKF, UKF, Invariant EKF) and Particle Filters.

- **GoldMiner – a Lab-Developed Mobile Robot with Manipulator** — Sep 2019 - Sep 2020
  Project Leader, RoboVigor Robotics Lab
  - Detected bounding boxes of objects with CenterNet, then obtained 3D positions with depth images.
  - Designed a Moveit controller with Gazebo simulation and a "pick and place" workflow.
  - Implemented 200Hz host-client communication between Nvidia Jetson TX2 and STM32.
  - Created an STM32 embedded system library "CornerStone" with RTOS to control the robot.

- **CornerStone – an STM32 Embedded System Library for Robotics** — Jun 2018 - Sep 2019
  Project Leader, RoboVigor Robotics Lab
  - Encapsulated STM32 functions such as BSP, PID control, actuating, host-client communication, etc.
  - Designed OOP interface with sensor pipeline architecture to seperate algorithms with robot workflow.
  - Distributed to 8 different robots in the lab with CI/CD tools and Git collaboration across 15 contributors.

Work Experience

- **Medtronic Inc.** — Shanghai, China
  Intern, Robotics Department — *Jul 2020 – Dec 2020*
  - **Gesture Control Manipulator for Robotic Spine Surgery**:
    - Modelled Universal Robot manipulator with forward and inverse kinematics, reachable and dexterous workplace.
    - Generated obstacle avoidance trajectories for the manipulator with MoveIt in ROS.
    - Implemented free-driving mode for the manipulator with millimeter-level accuracy using OnRobot force sensor.

Skills

- **Language**: C++, C, Python, JS/HTML/CSS, Node.js, MATLAB, English, Chinese.
- **Tool**: Linux, Docker, Unreal Engine.
- **Robotics**: ROS, OpenCV, Eigen, GTSAM, STM32, RTOS.
- **Machine Learning**: PyTorch, TensorFlow, FCOS, Yolo, Transformer.

Honors and Awards

- **First Prize**, Shanghai Data Mining Competition for College Students *2020*
- **Second Prize**, RoboMaster 2020 Online Assessment *2020*
- **Grand Prize (Regional), Second Prize (Global Finals)**, RoboMaster 2019 Robotics Competition (University Championship) *2019*
- **First Prize**, USST Social Practice Scholarship *2018*
- **Champions**, RoboMaster 2018 Robotics Competition (Technical Challenge) *2018*

Community

- **Team Leader**, RoboVigor Robotics Lab *2019-2021*
- **Volunteer**, Google Developer Group Shanghai *2019-2020*