Yuzhou(Joe) Chen

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Interests: Robotic Foundation Models (VLA, VLM), End-to-End Planning, Deep reinforcement learning

Work Experience

- **Magna International Inc.** *06.2025 – Present*| **Troy, MI**
  Robotics AI Software Intern | Franka Panda, ROS, ACT, VLA
  - **DROID-like Setup**: Configured a ROS environment for 3 cameras and Franka Panda; implemented Cartesian and joint state controllers for precise manipulation.
  - **Torque Awearness Imitation Learning**: Deployed ACT on Franka Panda using torque as inputs, inceasing task success rate by **18%**.
  - **VLA Model Fine-tuning and Deployment**: Fine-tuned OpenPi using human demonstration data collected in the DROID-like environment.

- **Magna International Inc.** *05.2025 – Present*| **Troy, MI**
  Robotics AI Software Intern | ALOHA Setup, Sim2Real, RLHF, VLA, ACT, CLIP
  - **Multi-task Learning**: Enhanced the ACT model by integrating a CLIP encoder, enabling ALOHA to perform **3** distinct tasks.
  - **Sim2Real Transfer**: Improved sim-to-real generalization by freezing early layers of the vision backbone.
  - **Data Augmentation**: Applied data augmentation in sim and real, boosting success rate by **12%**; applied domain randomization in sim for better generalization.
  - **Reinforcement Learning with Human Feedback (RLHF)**: Designed a weighted training loss based on human feedback to produce smoother motions, improving task success rate by **6%**.
  - **VLA Model Deployment**: Fine-tuned and deployed OpenPi and SmolVLA on the ALOHA1 setup.

- **University of Michigan Robotics Department** *11.2024 – 04.2025* | **Ann Arbor, MI**
  Research Assistant | Tactile fusion, 3D Reconstruction, Segmentation, Physics learning, Grasp planning
  - **Tactile-Enhanced Perception**: Fused tactile signals with point clouds reconstructed from multi-view images, integrating semantic segmentation for grasp planning.
  - **Multimodal Deformable Physics Learning**: Developed a transformer to learn deformable physics from point cloud shape changes under external forces.
  - **Grasp Pose Evaluator**: Evaluated grasping candidates by simulating post-contact deformations using learned physics models. Selected the most stable grasp.

- **Dalian Yaming Auto Parts Co., Ltd.** *06.2021 – 09.2021* | **Dalian, China**
  Computer Vision Intern | YOLO
  - **Defect Detection**: Developed a crack detection system for automotive fuel pipelines, leveraging YOLO to improve accuracy and reduce false positives.
  - **YOLO Development**: Enhanced YOLO architecture for better feature extraction; applied data augmentation techniques, increasing detection rate by **8%**
  - **Image Processing**: Enhanced defect identification with image processing, including noise reduction, edge detection, and morphological transformations.
  - **Industrial IoT & Automation**: Integrated a 5G-enabled industrial vision system for real-time defect analysis, enabling automated quality control **by 21%.**

Skills

- **Programming Languages**: Python, C++, HTML/CSS, C, SQL, MATLAB, JavaScript, Arduino
- **MLOps and Software Tools**: Deep Learning Frameworks (PyTorch, GPyTorch, TensorFlow, JAX), Data Science Libraries (NumPy, Pandas, OpenCV, matplotlib, scikit-learn), Robotics (ROS, IsaacLab, MuJoCo), Cloud & DevOps (Docker, AWS EC2/S3, Git)

Education

- **University of Michigan-Ann Arbor** **Ann Arbor, MI**
  M.S. in Electrical and Computer Engineering(Machine Learning), GPA: 3.76/4.0 *08.2022 – 05.2025*
  M.S.E. in Mechanical Engineering(Robotics and Mechatronics), GPA: 3.76/4.0
  - **Courses**: Robot Learning, Robotic Manipulation, Data Structure and Algorithms, Machine Learning

- **Jilin University** **Changchun, China**
  B.E. in Mechanical Engineering, GPA: 87.1/100 *08.2018 – 06.2022*

Selected Project Experience

- **Learning Multi-Body Pushing with Bayesian Optimization for MPPI Control** *07.2024 — 10.2024*
  Python, PyTorch, GPyTorch, PyBullet, NumPy, Gym, Stable-Baselines3 | GP, MPPI, Bayesian Optimization, RL
  - **Multi-Body Dynamics Learning**: Trained a ResNet on 1000 simulated trajectories, enabling indirectly pushing .
  - **Bayesian Optimization for MPPI**: Applied Gaussian Process (GP)-based Bayesian Optimization (BO-EI, BO-UCB) to tune MPPI hyperparameters, improving success rate by **60%**, while reducing average steps by **30%**.
  - **Obstacle Awearness Motion Planning**: Integrated the learned dynamics into an MPPI controller, outperforming CMA-ES baselines.
  - **Reinforcement Learning Baselines**: Trained PPO and diffusion policies in Stable-Baselines3 as learning-based baselines for comparison with MPPI.

- **Perception and Motion Planning in Simulated Airplane Cabins** *03.2024 – 06.2024*
  Python, PyTorch, IsaacLab | 3D Reconstruction, Point Cloud Segmentation
  - **Environment Setup**: Configured an airplane cabin simulation in IsaacLab and deployed dual-camera perception.
  - **Multi-View Segmentation and Reconstruction**: Applied EdgeSAM for instance segmentation from multi-view images and reconstructed segmented objects using Mast3R.
  - **Full-Scene Reconstruction and Segmentation Benchmarking**: Reconstructed the environment using Mast3R and compared point cloud segmentation performance across PointNet++, OneFormer3D, and Mask3D.

- **Perception, Reasoning, and Control for Autonomous Robot** *11.2023 – 02.2024*
  C, C++, Python, ROS | PID, SLAM, A Search*
  - **Control**: Designed high level PID controllers with low-pass filtering for smooth and safe autonomous navigation.
  - **Perception and Mapping**: Implemented particle filter SLAM with occupancy grids and Bresenham's algorithm, localizing robot pose using odometry, LiDAR, and Monte Carlo localization.
  - **Planning and Pathfinding**: Developed Brushfire algorithm for exploration and A* search for path planning, constructing efficient navigation paths in unknown environments.

- **Autonomy Development for 5-DOF Robotic Arm** *08.2022 – 10.2023*
  Python, NumPy, OpenCV, ROS | Object Detection, Forward Kinematics, Inverse Kinematics
  - **Sensing and Perception**: Calibrated Realsense L515 3D camera and implemented AprilTag and block detection in OpenCV for autonomous block classification and stacking.
  - **Reasoning and Acting**: Applied inverse kinematics to compute block stacking poses; implemented interpolation with path smoothing.
  - **System Integration**: Programmed a 5-DOF RX200 arm for autonomous stacking tasks via ROS-based message passing between camera, state, and control stations.

- **Vehicle Trajectory Prediction using Graph Convolutional Networks** *01.2021 – 04.2021*
  Python, PyTorch, NumPy, Pandas | GCN
  - **Graph Neural Networks**: Developed Graph Convolutional Network (GCN)-based model for vehicle trajectory prediction, integrating spatial dependencies of traffic agents.
  - **Dataset Processing**: Trained and tested the model on the Apollo Scape dataset, constructing a graph-based traffic representation where nodes represent vehicles/pedestrians, and edges encode their interactions.

- **Improved Multi-Elevator System for Invalid Waiting Time Reduction** *08.2019 – 01.2020*
  Python, OpenCV | Computer Vision
  - **Human-Computer Interface Optimization**: Redesigned the elevator interaction flow, reducing invalid passenger waiting time by **13%**.
  - **Computer Vision and Machine Learning**: Processed camera images with OpenCV and applied machine learning to accurately count passengers via color-threshold extraction.
  - **Passenger Flow Optimization**: Integrated real-time passenger detection to improve elevator scheduling efficiency.

- **Self-Adjusting Device for Underwater Robot Diving Depth Control** *04.2019 – 08.2019*
  Arduino, CAD, CATIA | Control System
  - **Closed-Loop Depth Control**: Designed a self-adjusting negative-feedback control system for stable underwater diving depth.
  - **Mechanical and Circuit Optimization**: Simplified the electronic circuit to extend service life and optimized screw motion stability via a tunable limit spring.
  - **Microcontroller Programming**: Programmed the AUV microcontroller to enable 6-DoF motion control.