Yuzhou(Joe) Chen

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Interests: Foundation Models (VLAs, VLMs, LLMs), Generative Models, Diffusion Models

Work Experience

- **Magna International Inc.** *10.2025 – Present*| **Troy, MI**
  *Robotics & AI Software Intern – **Diffusion Policy Development** | Consistency Models, Imitation Learning*
  - **Large Behavior Model**: Integrated CLIP and SigLIP2 for multimodal encoding and adopted DiT as a Flow Matching decoder, achieving **100%** task success in specific manipulation tasks.
  - **DiT Optimization**: Enhanced DiT with RMSNorm, RoPE, and SwiGLU for stable training and improved generalization; incorporated EMA-based self-distillation using Consistency Models.
  - **Motion Optimization**: Implemented intra- and inter-chunk linear interpolation and blending to enhance motion smoothness in dexterous manipulation.
  - **Token Quantization**: Applying Token Merging (ToMe) and KV-cache for efficient inference; distilling the model into a Diffusion CNN (DiC) to achieve a **50%** reduction in model size.
  - **Architecture Benchmarking**: Benchmarking DiT based architecture with different conditioning stategies, including PixelArt-α, MMDiT, and DiT-Air, to evaluate performance and scalability across tasks.

- **Magna International Inc.** *08.2025 – Present*| **Troy, MI**
  *Robotics & AI Software Intern - **VLA** Development | ROS2, VLA, Imitation Learning*
  - **DROID-like Setup**: Configured a ROS environment for 3 cameras and Franka Panda for VLA fine-tune purpose; implemented Cartesian and joint state controllers for precise manipulation.
  - **VLA Deployment**: Fine-tuned π_0-Base, π_0-FAST, π_0-DROID, $\pi_{0.5}$ and SmolVLA-Base; deployed OpenPi on Franka Panda(DROID and DROID-like setup) and ALOHA1.
  - **DAgger Optimized VLA**: Fine-tuned and deployed SmolVLA on ALOHA1; integrated DAgger and state machine for failure correction, reached **94%** success rate in Sim.
  - **VLA Inference Acceleration**: Implemented temporal action-chunk interpolation and blending to mitigate inference latency, achieving smoother action execution.

- **Magna International Inc.** *05.2025 – Present*| **Troy, MI**
  *Robotics AI Software Intern - **ACT-ALOHA** Development | Sim2Real, RLHF, CLIP, Imitation Learning, MuJoCo*
  - **Multi-task Learning**: Added a CLIP encoder for text understanding and applied FiLM for condition injection, enabling multi-task learning while preserve single task success rate.
  - **Sim2Real Transfer**: Improved sim-to-real performance by freezing early layers of the vision backbone.
  - **Multi-backbone Feature Fusion**: Benchmarked vision backbones among ResNet, SigLIPv2, DINOv3, and SAMv2; concatenated features with aligned patch sizes to enrich visual representation and feature diversity.
  - **Vision Augmentation**: Applied separate vision backbones, data augmentation and cosine learning rate with warmup, improving success rate by **32%** on ALOHA1.
  - **Training Optimization**: Applied weight decay and ramped up KL weight to capture more latent information, achieved **100%** success rate in Sim.
  - **Reinforcement Learning with Human Feedback**: Designed a weighted training loss based on human feedback to produce smoother motions, improving task success rate by **12%** on ALOHA1.

- **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.

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*

Skills

- **Programming Languages**: Python, C++, HTML/CSS, C, SQL, MATLAB, JavaScript, Arduino
- **MLOps & Software Tools**: Deep Learning Frameworks (PyTorch, JAX, GPyTorch, TensorFlow), Data Science Libraries (NumPy, Pandas, matplotlib, scikit-learn), Cloud & DevOps (Docker, AWS EC2/S3, Git)
- **Engineering Tools**: ANSYS, Abaqus, SolidWorks, UG NX, CATIA, AutoCAD, Mathematica, 3D Printing

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 the 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**: 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.

- **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.