Xinchen Yao

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Education

Zhejiang University - University of Illinois Urbana-Champaign Institute   Sep 2022 – May 2026

Dual degree program:

- Zhejiang University, BS in Electrical and Computer Engineering, GPA: 3.83/4.3
- University of Illinois Urbana-Champaign, BS in Computer Engineering, GPA: 3.77/4.0

Technical Skills

Programming Languages: Python, C/C++, CUDA, Matlab, Rust, RISC-V Assembly
Learning Frameworks: PyTorch, RSL-RL, Jax, Brax
Simulators: Isaac Lab, Isaac Gym, Genesis, Mujoco MJX, MJ Lab
Control Algorithms: PID, LQR, MPC
Low-level Software: ROS/ROS2, Concurrency, STM32, Communication Protocols, SLAM, OpenCV

Experience

Physical Intelligence Lab, Zhejiang, China   Undergraduate Researcher
Zhejiang University - University of Illinois Urbana-Champaign Institute   July 2025 - Present
Advisor: **Hua Chen**

- Eliciting emergent behaviors in locomotion controllers for bipedal robots and humanoids, using Isaac Lab and Genesis simulation platforms with custom RSL-RL implementations.
- Developing sim-to-sim evaluation pipelines in Mujoco. Deploying trained policies onto various real robots.
- Research on minimizing sim-to-real gap with learned dynamics models and simulation alignment.
- Developing algorithms based on PPO and APG, which can achieve higher sample efficiency and stability.

Human Dynamics and Controls Lab, Illinois, US   Undergraduate Researcher
The Grainger College of Engineering, University of Illinois Urbana-Champaign   Sep 2024 - Jun 2025
Advisor: **Elizabeth Hsiao-Wecksler**

- Developed a dynamics model in Genesis simulator for ballbot PURE Gen3 platform, which aims to accurately simulate the omniwheels while preserving computational efficiency.
- Implemented a learning-based control policies in Genesis to optimize balancing and movement performance and robustness for the PURE Gen3.
- Integrated new force sensors into PURE Gen3 hardware, improving state estimation and control reliability of existing model-based controller.

RoboMaster Meta Team, Zhejiang, China   Control Group Leader
Zhejiang University - University of Illinois Urbana-Champaign Institute   Jun 2023 - Present
Advisor: **Jiahuang Cui**

- Won second prize in RoboMaster regional competitions, as the leader of the control group.
- Architected and implemented an ROS2-based distributed control system supporting multiple robots (sentry, hero, infantry, engineer robots) with modular asynchronous communication infrastructure.
- Developed software and hardware interfaces for real-time motor control and sensor data acquisition through their protocols, as well as high-level autonomous navigation and decision-making algorithms.
- Trained and mentored new team members on control theory fundamentals, ROS2 framework, robot hardware architecture, embedded systems programming, and algorithm design.
- Collaborated in mechanics-control co-design iterations to optimize robot kinematics, actuator selection, and sensor placement for improved controllability and performance.

Projects

Where to Learn: Analytical Policy Gradient Directed Exploration for On-Policy Robotic Reinforcement Learning   Second Author

- A novel reinforcement learning algorithm combining Proximal Policy Optimization (PPO) with Adaptive Policy Gradient (APG) mechanisms to realize guided exploration in PPO, enhancing sample efficiency and stability.
- Implemented the algorithm in Brax, conducted training experiments in Mujoco MJX environments, performed hyperparameter tuning in benchmarks, and conducted ablation studies.
- Developed a new Mujoco MJX environment for our Tron1A biped robot, trained a policy with our new method, and deploy in reality for experiments.
- Website: wheretolearn.github.io

Omni WBR: Learning Adaptive Hybrid Wheeled-Biped Robot Omnidirectional Locomotion via Position-Based Incentive   First Author

- An engineering method in reinforcement learning to generate emergent omnidirectional gaits for wheeled bipedal robots, enabling smooth adaption to uneven terrains without explicit gait planning.
- Designed the task setting to enable adaptive gaits, and implemented training environment in Isaac Lab for our Tron1A wheeled biped robot.
- Implement sim-to-real pipelines for the robot. Customized RSL-RL with concurrent teacher-student and applied Lipschitz constrain for better sim-to-real deployment.
- Demonstration available on my website: yao-xinchen.github.io/projects/omni-wbr

Meta-Team/Meta-ROS: Modular ROS2 Control Framework for multiple RoboMaster Competition Robots   Creator, Maintainer

- A comprehensive ROS2-based control system architecture encompassing sensor integration, actuator control, forward/inverse kinematics, and autonomous decision-making modules for multi-robot coordination.
- Supports heterogeneous robot platforms with dynamically configurable parameters, modular package structure for easy extension, and real-time performance optimization for competition scenarios.
- Includes high-level modules like visual recognition, trajectory prediction, lidar-based SLAM, and RL-based locomotion controllers.
- Code: github.com/Meta-Team/Meta-ROS

Custom Wheeled Biped Robot with RL-base Locomotion Controller   Participant

- Co-designed a custom wheeled biped robot with 4 degrees of freedom with a closed chain structure.
- Implemented a training environment in Isaac Gym and trained a policy with custom RSL-RL.
- Developed a low-level control system for the robot with ROS2 to deploy the trained policy.
- Demonstration available on my website: yao-xinchen.github.io/projects/wheeled-biped

Course Projects

Unix-Like RSIC-V Operating System, Including Kernel and Shell   ECE391 Computer Systems

- Implemented device drivers (UART, VirtIO block), filesystem I/O, virtual memory, process management, and preemptive multitasking with system calls for concurrent user program execution.
- Designed and Implemented a zsh-style shell that can spawn processes and restore interface upon completion.
- Composed a tutorial on my workflow setup for this coursework: github.com/Yao-Xinchen/ECE391-Workflow

Convolution Neural Network Implementation in CUDA   ECE408 Applied Parallel Programming

- Implemented and optimized CUDA-based CNN inference, achieving over 40% performance improvement.
- Applied advanced techniques including tensor cores, CUDA stream, Joint Register and Shared Memory Tiling, and cuBLAS for higher memory efficiency.

Autonomous Diagonal and Parallel Parking   ECE484 Safe Autonomy

- Implemented Simultaneous Localization and Mapping (SLAM) with Fast-LIO, and path recognition with ENet.
- Designed and implemented a autonomous parking system with predefined diagonal and parallel maneuvers.
- Demonstration available on my website: yao-xinchen.github.io/projects/auto-parking