YIFEI YUAN

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EDUCATION

Rutgers University & New Jersey Institute of Technology | Newark, NJ Sept 2024 – Present
Joint Ph.D. in Biomedical Engineering (Medical Devices Track)

- Research focus: bipedal locomotion control, exoskeleton assistance, and sim-to-real policy transfer.
- Applying deep reinforcement learning (PPO, multi-agent RL), imitation learning (AMP/DeepMimic-style motion priors), and adversarial training to achieve robust locomotion and co-adaptive human-robot control.

Washington University in St. Louis (WashU) | St. Louis, MO Sept 2022 – May 2024
M.Sc. in Information Systems GPA: 3.93/4 | M.Eng. in Engineering Management

Southwest Petroleum University (SWPU) | Chengdu, China Sept 2018 – Jun 2022
B.Eng. in Telecommunications Engineering GPA: 3.58/4

TECHNICAL SKILLS

Programming Languages: Python, C++, MATLAB, Shell Scripting
RL / ML Frameworks: PyTorch, Isaac Gym, Isaac Lab, Genesis, MuJoCo — PPO, SAC, AMP, multi-agent RL
Robotics & Simulation: ROS2, Gazebo, MuJoCo XML (musculoskeletal & exoskeleton modeling), sim-to-real deployment
Hardware: IMU (LPMS), CAN bus, force/torque sensors, Raspberry Pi embedded control, motion capture

RESEARCH EXPERIENCE

Research Assistant, Kessler Foundation | West Orange, NJ Mar 2025 – Present

- Training locomotion policies on a 12-DoF exoskeleton (hip, knee, ankle) using multi-agent PPO in MuJoCo; deploying policies to physical hardware via Raspberry Pi + dual CAN bus control stack.
- Built a sensor fusion pipeline combining IMU and motion capture data for real-time human-exoskeleton interaction monitoring, enabling adaptive torque assistance during walking.
- Designed sim-to-real compatible observation spaces (IMU-only, 12D) to remove motion capture dependency at deployment.

Research Assistant, New Jersey Institute of Technology | Newark, NJ Aug 2024 – Present

- Designed and trained a multi-agent RL system (human actor + exo actor + shared critic) for co-adaptive exoskeleton control using a 26-muscle 3D bipedal musculoskeletal model in MuJoCo.
- Implemented a 4-stage curriculum training protocol (PPO) achieving stable bipedal gait with gait symmetry rewards; resolved training instabilities including bang-bang behavior and policy collapse.
- Collected motion capture data from human subjects for inverse kinematics, used as reference trajectories for AMP-style imitation learning to produce naturalistic walking gaits.
- Validated trained policies on a lab-designed physical exoskeleton; diagnosed and resolved a 160 ms IMU-encoder time synchronization error critical for safe real-world deployment.

Research Assistant, Washington University Medical School | St. Louis, MO Oct 2023 – Aug 2024

- Collected multi-channel neural electrophysiology data from non-human primates using multi-electrode probes.
- Performed spike sorting, clustering, and data quality control pipelines in Python/MATLAB.

Electrical Engineer & Technical Advisor Intern, Erebus Technologies | St. Louis, MO May 2023 – Sept 2023

- Processed mobile device displacement data using clustering algorithms and time series analysis to reconstruct movement paths and generate activity heatmaps.
- Designed hardware circuitry and authored technical sections of a product patent application.

PROJECT EXPERIENCE

SMAT: Staged Multi-Agent Training for Co-Adaptive Exoskeleton Control 2024 – Present
Designed and implemented a 4-stage curriculum learning pipeline for simultaneous human-exoskeleton policy co-training in MuJoCo, with sim-to-real transfer to a physical hip-knee exoskeleton. Includes multi-agent PPO, AMP-style motion priors, and hardware-compatible policy design. Submitted to IROS 2026.

ROS2-Based AI Agent for Robotic Control Jan 2025 – May 2025
Built an LLM-driven (Llama/Gemini) autonomous navigation agent integrated with ROS2 and Gazebo. Agent interprets natural language commands, reasons over robot state, and plans navigation trajectories in simulation.

Human Motion Prediction Using IMU Sensor Data Dec 2020 – Apr 2022
Collected and processed data from 17 IMU sensors on human subjects. Trained and benchmarked RNN, LSTM, 1D-CNN, and MLP models; LSTM achieved highest accuracy for sequential motion forecasting.

PUBLICATIONS

- Yuan, Y., et al. “SMAT: Staged Multi-Agent Training for Co-Adaptive Exoskeleton Control.” *IEEE IROS 2026*. (Under Review)
- Yuan, Y., et al. “Gait Asymmetry from Unilateral Weakness and Improvement With Ankle Assistance: a Reinforcement Learning based Simulation Study.” *IEEE BioRob 2026*. (Accepted)
- Yuan, Y., et al. "Sim-to-Real Deployment of a Deep Reinforcement Learning Controller for a Lower-Limb Rehabilitation Exoskeleton." ICNR 2026. (Under Review)
- Yuan, Y., et al. “Unilateral Muscle Weakness Induces Progressive Gait Asymmetry: A Reinforcement Learning–Based Simulation Study.” *NEBEC 2026*. (Accepted)
- You, Z., Yuan, Y., et al. "Fast Personalization of Real-Time Human Activity Recognition via Transfer Learning." IEEE BioRob 2026. (Accepted)