Haodi (Woody) Hu

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Personal Website LinkedIn

EDUCATION

University of Southern California (USC) Aug 2021 – May 2026
Ph.D. student in Electrical Engineering Los Angeles, CA

University of Southern California (USC) Aug 2019 – May 2021
M.S. in Electrical Engineering Los Angeles, CA

Northeast Forest University (NEFU) Sep 2015 – Jun 2019
B.S. in Electrical Engineering, Excellent Graduate Reward Harbin, China

TECHNICAL SKILLS

Programming Languages: Python, C++, Java, MATLAB, SQL, HTML
Technical Skills: ROS2, Isaac Sim, RGB-D Imaging, CUDA, PyTorch, Motion Capture, Linux OS, Fine-tunning
Areas of Expertise: Deep Learning, LLM, Reinforcement Learning, Robot Locomotion, Robot Manipulation, Diffusion Models, Multi-robot Path Planning.

WORK EXPERIENCE

Machine Learning Engineer Intern June 2025 – Sep 2025
SanDisk San Jose, CA

- Built and deployed RL algorithms (Q-learning, DDPG, PPO) to optimize supply chain tasks, improving performance by **35.7%** over state-of-the-art baselines.
- Fine-tuned large language models (LLMs) for domain-specific tasks by integrating retrieval-augmented generation (RAG) and domain-adaptive pretraining. Optimized transformer architecture and inference pipelines, reducing latency by **41.1%** and improving factual grounding by **13.2%**.
- The Proposed RL-based inventory control system resulted in an estimated **$28.7M** saved for SanDisk.

Software Engineer Intern Jan 2019 – Jun 2019
Harbin Railway Construction Co., Ltd., Internship Harbin, China

- Designed a railway limit detection device by using a 16-channel Lidar imaging and designed a software to visualize the 3D environment with real-time 3D point cloud map reconstruction method.
- Tested the device on railway and it shows an average 2**5.8%** measurement error rate.

PUBLICATIONS

- **Haodi Hu**, Yue Wu, Daniel Seita, Feifei Qian*, "*Granular Loco-manipulation: Repositioning rocks through strategic sand avalanche*". Conference on Robot Learning (CoRL), 2025.
- **Haodi Hu**, Feifei Qian*, Daniel Seita*, "*Learning Granular Media Avalanche Behavior for Indirectly Manipulating Obstacles on a Granular Slope*". 8th Annual Conference on Robot Learning (CoRL), 2024.
- **Haodi Hu**, and Feifei Qian*. "*Obstacle-Aided Trajectory Control of a Quadrupedal Robot Through Sequential Gait Composition*". IEEE Transactions on Robotics (T-RO), vol. 40, pp. 3481-3495, 2024.
- **Haodi Hu**, Xingjue Liao, Wuhao Du, and Feifei Qian. "*Multi-robot connection towards collective obstacle field traversal"*. International Conference on Robotics and Automation (ICRA), 2024.
- Kaustav Chakraborty, **Haodi Hu**, Matthew Kvalheim, Feifei Qian*. "*Planning of Obstacle-aided Navigation for Multi-legged Robots using a Sampling-based Method over Directed Graphs*". IEEE Robotics and Automation Letters (RA-L), vol. 7, no. 4, pp. 8861-8868, Oct. 2022
- **Haodi Hu**, Guanting Dong, Peng Bo, Xing Jian*, Wenlong Song. "*Method for detecting micron cracks on a magnetic rotor surface based on a support vector machine*". IEEE Access, 6, 53141-53152, Oct 2018.
- **Haodi Hu**, Matthew Kvalheim, Michelle Joyce, Simon Wilshin, Andrew Spence, Feifei Qian. "*A Mode Map Representation to Predict Steady States and Attraction Basins for Legged Locomotion on Obstacle Terrains*". workshop in International Conference on Intelligent Robots and Systems (IROS), 2020.
- **Haodi Hu**, Matthew Kvalheim, and Feifei Qian. "*A mode map model to predict state transitions of multi-legged robots within obstacle fields*". Bulletin of the American Physical Society (2022).

RESEARCH EXPERIENCE

Learning Granular Media Avalanche Behavior for Indirectly Manipulating Objects on a Granular Slope — Aug 2023 – Present, USC

- Trained a Vision Transformer based model to predict granular media responses to legged robot excavation actions.
- Proposed a novel representation of objects movement on granular slope by using RGB-D images.
- Design a gantry robot to help automatic collecting experiment data for training.
- Trained a control policy that enabled quadrupedal robots to explore excavation strategies to manipulate obstacles to assist its locomotion on a granular slope.
- Deployed the trained policy on a Quadrupedal robot in the experiment, the robot shows an ability to intelligently manipulate objects on the slope to assist its locomotion.
- Our methods showed a consistent outperformance in many criteria compared to other state-in-art methods.
- Investigated multiply manipulators effector on manipulating objects on granular slope and integrated physics observation into our proposed network framework and result shows the networks required less data to achieve a similar performance as before.

Multi-robot Collaboration for Objects Manipulation and Path Planning — May 2024 – Present, USC

- Collected robot leg-granular-media interaction data with RGBD camera used a gantry robot system for training purpose.
- Trained a diffusion model to predict granular dynamics responses to legged robot manipulation actions.
- Proposed a Model Predictive Control (MPC) method combined with the diffusion model to predict multiple future actions for multi-robot action planning.
- Initially implemented our proposed method on a robot system has multiply legged robots and robots shows a good performance with single leg manipulation.

Multi-robot Connection towards Collective Obstacle Field Traversal — Jun 2022 – Aug 2024, USC

- Proposed a multi-agent robot system that can reconfigure to develop strategies for multiple robots cooperating to overcome locomotion challenges on different challenging terrains.
- Investigated how different robot leg-obstacle interaction patterns lead the robot to a moving state or stagnation state and applied it to an obstacle-dense terrain to help the open-loop robot generate desired movement without avoiding the interaction with obstacles.
- Build a model to predict multi-robot movement on rough terrains and integrated the model with our proposed control policy.
- Deployed our proposed method with a multi-robot system and our method successfully made the robot traversal through rough terrains.

Obstacle-Aided Trajectory Control of a Quadrupedal Robot Through Sequential Gait Composition — Sep 2021 – May 2023, USC

- Built a simplified mathematical model based on discrete dynamics to describe quadruped robot interaction with obstacles.
- Investigated passive steady mechanism under quadrupedal robot legs repeatedly interact with obstacles and proposed a sequential gaits method to guide an open-loop control robot to achieve desired locomotion trajectories on an obstacle-dense terrain.
- Engineered an efficient computational model predicting quadruped leg-obstacle behavior, validated through experiments, enabling sensor-free robot navigation across structural obstacles using sequential gaits.
- Extended the proposed model to more randomized and natural obstacle terrains and developed a gait sequential optimizing criteria to help optimize the robot path on obstacle-dense terrains.

Canine Locomotion Strategy Adaptation on Rocky Terrains — Oct 2020 – May 2023, USC

- Extracted canine foot contact information for modelling analysis by using an OpenCV based method.
- Created a mathematical model to investigate canine gaits shifting patterns on obstacle-dense terrains.
- Generated simulation results based on MATLAB Simulink concerning canine experiment parameters and compared the simulation results with the experiment results to help uncover how canine gait negotiates with obstacles.