Wenyu Han (he/him, Ph.D.)

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Education

New York University New York, USA

Ph.D. Candidate in AI4CE Lab, Mechanical Engineering, Advisor: Chen Feng *Sept 2019 - Present*

Thesis: Towards automation design and construction using representation learning on structured data

Specialization: Robotics, Embodied AI, Reinforcement Learning, and Generative AI

Northwestern University Evanston, USA

M.S. in Integrated Design Automation Lab, Mechanical Engineering, Advisor: Wei Chen *Sept 2017 - June 2019*

Dalian University of Technology Dalian, China

B.S. in Engineering Mechanics Deparment *Sept 2012 - June 2016*

Project Experience

Mobile Object Rearrangement with Learned Localization Uncertainty *Sep 2022 - Sep 2023*

New York University, AI4CE lab

- Proposed a recurrent localization neural network to enable explicit agent's and objects' poses estimation with uncertainties in a dynamic environment.
- Designed a hierarchical reinforcement learning method for learning a long-term policy for rearrangement tasks, achieving surpassing performance than monolithic reinforcement learning baselines.
- Developed a 3D indoor environment simulator for mobile rearrangement tasks using Pybullet.

Generative Transformer for City Layout of Arbitrary Building Shape *March 2023 - Sep 2023*

New York University, AI4CE lab

- Proposed a generative pre-trained transformer (CityGPT) for large-scale city layouts generation, enabling various applications: conditional layout generation, city completion, and infinite city generation.
- Designed a two-stage training strategy using the masked autoencoder (MAE) for training the CityGPT.

Learning Simultaneous Navigation and Construction in Grid Worlds *June 2020 - Sep 2022*

New York University, AI4CE lab

- Designed and implemented a Deep Recurrent Q-Network (DRQN) with explicit LSTM-based position estimation module for solving the proposed mobile construction task.
- Adpated a family of model-free and model-based reinforcement learning baselines: DQN, DQN+MCTS, DRQN, DRQN+Hindsight, SAC, Rainbow, and PPO.
- Developed a grid-world simulation environment based on OpenAI.Gym framework, which supports multi-processing for high-efficiency training.

AutoEncoding Tree for City Generation and Applications *May 2020 - Sep 2023*

New York University, AI4CE lab

- Designed and implemented a tree-structured autoencoder (AETree) to learn the hidden representation of the real-world city geometric data, showing usefulness for urban planning applications.
- Applied learned decoder to generate novel city layouts by randomly sampling from the Gaussian Mixture Model.
- Adapted SketchRNN and PointNet as baselines for evaluating AETree's performance on city layouts generation.

SPARE3D: A Dataset for spatial reasoning on three-view line drawings *Sep 2019 - Apr 2020*

New York University, AI4CE lab

- Designed three types of tasks for evaluating the spatial reasoning skills of intelligent systems.
- Adapted CycleGAN and PointNet baselines for evaluating the 2D and 3D generative capabilities of AI systems.
- Adapted three baselines: ResNet, VGG, and BagNet for testing the AI system's spatial reasoning skills on 2D line drawings.
- Implemented multi-processing data generation scripts for each spatial reasoning task based on the ABC dataset.

Publication

[**Under review for ICLR 2024**] **Wenyu Han***, Rongjing Xie*, Ashiq Rahman Anwar Batcha, Chen Feng, *Mobile Object Rearrangement with Learned Localization Uncertainty.* (∗ = equal contribution)

[**Under review for ICLR 2024**] Rongjing Xie*, **Wenyu Han***, Shuhang Ge, Congcong Wen, Chen Feng, *CityGPT: Generative Transformer for City Layout of Arbitrary Building Shape.* (∗ = equal contribution)

[**ICLR 2023**] **Wenyu Han**, Haoran Wu, Eisuke Hirota, Alexander Gao, Lerrel Pinto, Ludovic Righetti, Chen Feng, *Learning Simultaneous Navigation and Construction in Grid Worlds.* [OpenReview, Project]

[**IEEE/CVF CVPR 2020**] **Wenyu Han***, Siyuan Xiang*, Chenhui Liu, Ruoyu Wang, Chen Feng, *SPARE3D: A Dataset for SPAtial REasoning on Three-View Line Drawings.* (∗ = equal contribution) [PDF, Project]

[**Under review for ISPRS**] **Wenyu Han**, Congcong Wen, Lazarus Chok, Yan Liang Tan, Sheung Lung Chan, Hang Zhao, Chen Feng, *AutoEncoding Tree for City Generation and Applications.* [PDF, Project]

[**IEEE ITSC 2023**] Ruixuan Zhang, **Wenyu Han**, Zilin Bian, Kaan Ozbay, Chen Feng, *Learning When to See for Long-Term Traffic Data Collection on Power-Constrained Devices.*

Working Experience

Bosch USA Sunnyvale, CA

Research scientist intern: 3D perception and LLM for the embodied AI task *Jun 2023 - Aug 2023*

- Designed a 3D semantic mapping and exploration method, integrated with scene reasoning via LLM, for the visual room rearrangement task.
- Experienced in Grounding DINO and SAM for object detection and segmentation in the AI2Thor simulator.

Technical Skills

Languages: Python, C, and Matlab
Libraries: PyTorch, OpenCV, OpenAI.Gym, Stable-baselines, Pybullet, OpenGL, PyTorch3D, Open3D
Soft skills: Scientific writing (with Latex); academic presentation; research project management
Software: ANSYS, AutoCAD, FreeCAD

Awards and Honors

Dean's PhD Fellowship in the Department of MAE at the NYU Tandon School of Engineering, 2019

Outstanding Graduate Student of DUT (Rank 9/71), 2016

2nd Class Academic Excellence Scholarship of DUT, 2013 – 2014

"Liheng" Scholarship for Engineering Mechanics Major Students of DUT, 2013 – 2014

Service Experience

Review experience: *conference:* ECCV 2020, NeurIPS 2021, CVPR 2022, CVPR 2023, ICRA 2024; *journal:* Journal of Construction Engineering and Management

Graduate Teaching Assistant for ECE-GY 6143, Machine Learning, New York University

Graduate Teaching Assistant for ROB-GY 6203, Robot Perception, New York University