Min Liu

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RESEARCH INTEREST

My research objective is to develop *generalist robots* that can reason, plan, and act in open-world environments, much like humans. Motivated by this vision, I explore how to scale robot learning on heterogeneous data sources, refine sensorimotor policies through online self-practice, and integrate reactive control with semantic reasoning to solve complex, long-horizon tasks in the physical world.

EDUCATION

Carnegie Mellon University 8/2023 – 12/2024
M.S. in Machine Learning, Machine Learning Department *Pittsburgh, PA*
- Advised by Prof. Ruslan Salakhutdinov

Nanjing University 9/2019 – 6/2023
B.S. in Computer Science and Technology, Kuang Yaming Honors School *Nanjing, China*
- GPA: 4.56/5.00 (91.2/100); Ranking: 1st/15

PUBLICATIONS

* denotes equal contribution

1. **Local Policies Enable Zero-shot Long-horizon Manipulation**
   Murtaza Dalal*, **Min Liu***, Walter Talbott, Chen Chen, Deepak Pathak, Jian Zhang, Ruslan Salakhutdinov
   International Conference on Robotics and Automation (ICRA), 2025 (Under Review)
   CoRL 2024 Workshop on Learning Effective Abstractions for Planning *Oral Presentation*

2. **SoftMAC: Differentiable Soft Body Simulation with Forecast-based Contact Model and Two-way Coupling with Articulated Rigid Bodies and Clothes**
   Min Liu, Gang Yang, Siyuan Luo, Lin Shao
   International Conference on Intelligent Robots and Systems (IROS), 2024 *Oral Pitch Presentation*

3. **Beating Backdoor Attack at Its Own Game**
   Min Liu, Alberto Sangiovanni-Vincentelli, Xiangyu Yue
   International Conference on Computer Vision (ICCV), 2023

4. **Selective Knowledge Distillation for Non-Autoregressive Neural Machine Translation**
   Min Liu, Yu Bao, Chengqi Zhao, Shujian Huang
   AAAI Conference on Artificial Intelligence (AAAI), 2023

RESEARCH EXPERIENCES

Video-to-Sim-to-Real: Autonomous Scene Creation and Policy Learning 10/2024 – present
Advisor: Prof. Deepak Pathak *Carnegie Mellon University*
- Developed an autonomous pipeline to generate realistic, interactive robot training environments from scene videos, minimizing manual setup and enhancing environment fidelity.
- Conducting research on a video-to-sim-to-real framework that leverages reconstructed environments to enable efficient policy learning or refining in complex, specialized scenes.

Generalist Agent for Long-Horizon Manipulation via Sim-to-Real 9/2023 – 9/2024
Advisor: Prof. Ruslan Salakhutdinov *Carnegie Mellon University*
- Proposed local policy, a novel policy class that focuses on the local interaction regions to achieve invariance to absolute robot and object poses, skills ordering, and global scene configuration.
- Trained generalist visuomotor policies through sim2real on over 6,000 objects, which together with existing foundation models can form a hierarchical system capable of operating in a wide range of scenarios.

- Developed ManipGen, a broadly capable manipulation system that can solve diverse long-horizon tasks *zero-shot* from text instructions, showcasing state-of-the-art generalization and task-chaining ability.

Differentiable Soft Body Simulation for Robotic Manipulation   3/2023 – 9/2023
Advisor: Prof. Lin Shao   *National University of Singapore*

- Proposed SoftMAC, an MPM-based differentiable soft body simulator that enables two-way coupling with articulated rigid bodies and cloth, thus supporting a broader spectrum of robotics tasks involving various materials.
- Introduced a forecast-based contact model to reduce artifacts and a penetration tracing algorithm to reconstruct SDF within local areas for non-volumetric cloth meshes.
- Verified the effectiveness of the system in various robotic manipulation tasks (*e.g.*, make taco and pour wine) by optimizing action sequences using gradient information calculated by SoftMAC.

Quality Assurance for Neural Networks under Backdoor Attack   8/2022 – 2/2023
Advisor: Prof. Alberto Sangiovanni-Vincentelli and Prof. Xiangyu Yue   *University of California, Berkeley*

- Proposed the idea of emulating attacker strategies in backdoor defense by injecting a non-adversarial backdoor.
- Developed a defense framework to inject a non-adversarial backdoor that, once triggered, effectively suppresses the adversarial backdoor.
- Introduced an efficient test-time poisoned data filtering technique that leverages the non-adversarial backdoor's ability to control the representation of poisoned samples.
- Achieved state-of-the-art defense effectiveness with minimal performance degradation on clean samples

Non-Autoregressive Transformer for Neural Machine Translation   11/2021 – 6/2022
Advisor: Prof. Shujian Huang   *Nanjing University*

- Proposed a selective knowledge distillation approach, incorporating an evaluator to identify NAT-friendly targets that balance high quality with low complexity.
- Developed a simple yet effective progressive distillation method to enhance NAT performance.
- Demonstrated that distilling only 5% of raw translations with selection significantly improves NAT performance, surpassing models trained on raw translation pairs.

PROFESSIONAL EXPERIENCE

ByteDance Research   3/2022 – 9/2022
Machine Learning (NLP) Intern   *Shanghai, China*

- Built a cross-modal pre-training pipeline for end-to-end speech translation.
- Developed techniques for enhancing linguistic and acoustic representation learning.

HONORS AND AWARDS

Outstanding Graduate at Kuang Yaming Honors School, Nanjing University   2023
Chenxue Scholarship (*5 students in Nanjing University*)   2023
SenseTime Scholarship (*awarded to 30 undergraduates in fields related to AI across China*)   2022
National Elite Program in Fundamental Science (*first prize scholarship, top 5%*)   2020-2022
Yongman Yang Scholarship (*1% in Kuang Yaming Honors School*)   2021

VOLUNTEERING AND SERVICE

Conference Reviewer	CVPR (2024, 2025), ICRA (2025)
Community Service	Volunteer docent in Nanjing Yunjin Brocade Museum (2019)
	Instructor in Nanfeng online volunteer teaching program during epidemic (2020)
Campus Service	Mentor for new students at Youxun Academy, Nanjing University (2021-2022)

SKILLS

Languages	Mandarin Chinese (native), English (TOEFL: 113)
Programming	Python, PyTorch, C/C++, MATLAB, Taichi
Tools & Software	IsaacGym, PyBullet, Mujoco, Fairseq