Haoran He

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Education

Hong Kong University of Science and Technology, Hong Kong 2024.2 – Present

Ph.D. student in Electronic and Computer Engineering

Shanghai Jiao Tong University (SJTU), Shanghai, China 2019.9 – 2023.6

Undergraduate student in Computer Science (CS)

Interests

I am a first-year Ph.D. student at Hong Kong University of Science and Technology, advised by Prof. Ling Pan. I received my bachelor Degree at Shanghai Jiao Tong University in June 2023, advised by Prof. Weinan Zhang and Prof. Yong Yu.

My goal is to develop an intelligent decision-making system that possesses optimality, generalizability, interpretability and robustness. To achieve this, I primarily focus on:

- Generalist Reinforcement Learning and its application in the real world.
- Generative models (e.g., flow and diffusion models) and their applications.
- Large foundation models for reasoning and decision-making.

Publications

- Large-Scale Actionless Video Pre-Training via Discrete Diffusion for Efficient Policy Learning
  Haoran He, Chenjia Bai, Ling Pan, Weinan Zhang, Bin Zhao, Xuelong Li.
  preprint (under review in NeurIPS 2024)

- Looking Backward: Retrospective Backward Synthesis for Goal-Conditioned GFlowNets
  Haoran He, Can Chang, Huazhe Xu, Ling Pan
  preprint (under review in NeurIPS 2024)

- Rectifying Reinforcement Learning for Reward Matching
  Haoran He, Emmanuel Bengio, Qingpeng Cai, Ling Pan.
  preprint (under review in NeurIPS 2024)

- On the Value of Myopic Behavior in Policy Reuse
  Kang Xu, Chenjia Bai, Shuang Qiu, **Haoran He**, Bin Zhao, Zhen Wang, Wei Li, Xuelong Li.
  preprint (TPAMI 2024, Major Revision)

- SAM-E: Leveraging Visual Foundation Model with Sequence Imitation for Embodied Manipulation
  Junjie Zhang, Chenjia Bai, **Haoran He**, Wenke Xia, Zhigang Wang, Bin Zhao, Xiu Li, Xuelong Li.
  ICML 2024

- Robust Quadrupedal Locomotion via Risk-Averse Policy Learning
  Jiyuan Shi, Chenjia Bai, **Haoran He**, Lei Han, Dong Wang, Bin Zhao, Xiu Li, Xuelong Li.
  ICRA 2024

- Diffusion Model is an Effective Planner and Data Synthesizer for Multi-Task Reinforcement Learning
  Haoran He, Chenjia Bai, Kang Xu, Zhuoran Yang, Weinan Zhang, Dong Wang, Bin Zhao, Xuelong Li.
  NeurIPS 2023

- Regularized Conditional Diffusion Model for Multi-Task Preference Alignment
  Xudong Yu, Chenjia Bai, **Haoran He**, Changhong Wang, Xuelong Li.
  preprint, 2024

- Diffusion Models for Reinforcement Learning: A Survey
  Zhengbang Zhu, Hanye Zhao, **Haoran He**, Yichao Zhong, Shenyu Zhang, Haoquan Guo, Tingting Chen, Weinan Zhang.
  preprint, 2024)

- Privileged Knowledge Distillation for Sim-to-Real Policy Generalization
  Haoran He, Chenjia Bai, Hang Lai, LingXiao Wang, Weinan Zhang.
  preprint, 2023

EXPERIENCE

Intern at Shanghai AI Lab — Oct. 2022 – Feb. 2024

Role: Member of the RL group

Brief introduction: Research on generalist reinforcement learning and robotics. Advised by Dr. Chenjia Bai

- Aims to master quadruped locomotion task via a novel RL method. Adversarial methods for domain adaptation(e.g. sim2real) and skill discovery for performance boosting are proven to be effective.
- Learn a single policy that can tackle multiple tasks from the collected offline data.
- Proposed a new model named MTDIFF, which is trained on large-scale datasets for multi-task decision-making.
- Proposed a new model named VPDD, which is a generalist video-based multi-task agent pre-trained on large-scale human videos.

Sim2Real Project — Feb. 2022 – Feb. 2023

Role: Member of the group

Brief introduction: Close the sim-to-real gap and accomplish more efficient policy transfer. Advised by Prof. Weinan Zhang.

- Investigated popular methods and theories in the sim2real field
- Found an efficient way to exploit simulation-based training in real-world settings.
- Proposed a new method named **HIB** which can distill privileged knowledge and boost agent's generalization ability effectively. Accomplished a paper which is under-review now.

Anti-poaching Project — Sep. 2021 – Mar. 2022

Role: Individual Projects, Project Principal

Brief introduction: Take advantage of limited data to predict areas with a high risk of poaching. Collaborated with WWF and National Nature Reserves, and advised by prof. Fei Fang from CMU.

- Investigated popular methods and theories in this field
- Designed a new network inspired by meta-learning and GNN
- Exploring some exciting features of the results produced by transfer learning

ML in real-time rendering Project — Oct. 2021 – Jan. 2022

Role: Project Principal

Brief introduction: Design a new light-weighted network to predict illumination in less time and with guaranteed accuracy. Advised by prof. Bin Sheng and prof. Ran Yi from SJTU.

- Investigated popular networks in this field
- Designed a new network named bi-cgan, which combines cGAN and BCNN networks.
- Proved **bi-cgan** can get better performance in robustness and efficiency.

Linux System Project — Mar. 2021 – Jun. 2021

Brief introduction: Optimize process management in Linux system. Advised by prof. Fan Wu from SJTU.

- Learned shell scripts and Linux kernel
- Designed a new Weighted Round Robin scheduling methods and it performs better than traditional methods

PRP(Participation in Research Program) Project — Sep. 2020 – Mar. 2021

Role: Header of the whole team

Brief introduction: Explore the interpretability of machine learning and the relationship between information theory and machine learning. Advised by Prof. Fan Cheng from SJTU.

- Learned basis of information theory and popular methods of ML

- Implemented a large number of CV experiments to explore the influence of information entropy, mutual information and so on.

Intern in robocup team of SJTU Sep. 2019 – Feb. 2020

Brief introduction: Study Machine Debugging and Software Simulation and prepare for the contest.

- Learned basis of Signals and Control Systems
- Wrote quantity of scripts
- Deployed new aggressive and defensive algorithms on robots, and then recorded effects.

Skills

- Programming Languages: C == C++ == Python > Rust
- Platform: Linux or Windows
- Tools: git for code management and ArcGis for geographic information system; Pytorch and Tensorflow for conducting machine learning experiments and designing neural networks
- Development: Machine learning, Reinforcement Learning, Data Analysis

Honors and Awards

1st Prize in school robocup competition	2019
Merit Student in SJTU	2020
Cosco shipping scholarship	2020
Honorable Mention in Mathematical Contest In Modeling	2020
C-class Excellent Scholarship	2021
Merit Student in SJTU	2022
B-class Excellent Scholarship	2022
PostGraduate Scholarship	2024

Miscellaneous

- GitHub: `https://github.com/tinnerhrhe`
- personal page: `https://tinnerhrhe.github.io`
- Languages: English - Fluent, Mandarin - Native speaker
- Hobbies: Running, playing ping pong, and reading.