Siyi Hu *Ph.D. Candidate*

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Education

Ph.D. in Machine Learning (transferred from Monash University)	University of Technology Sydney Advisor: Prof. Xiaojun Chang	2021 - Present
M.Sc. in Electronic Engineering	Fudan University	2017 - 2020
B.Sc. in Communication Engineering	Fudan University	2013 - 2017

Publications

My research has significantly advanced the domain of Multi-agent Systems, with a focused effort on enhancing scalability, efficiency, and the implementation of cooperative artificial intelligence solutions. Through the development of innovative algorithms and libraries, I have addressed critical challenges in agent learning and decision-making processes. Below is a highlighted representative publication where I served as the first/leading author, followed by the publications in top-tier conferences and journals where I collaborated with other AI researchers and machine learning engineers:

Leading Author

[1] **Title:** *ProAgent: Building Proactive Cooperative AI with Large Language Models.*

Ceyao Zhang*, Kaijie Yang*, **Siyi Hu***, et al. [.* for equal contribution.]

Publication: AAAI, 2024

Award: Oral Presentation, Top 5%

Rank: Top Conferences in AI, A* in CORE Computer Science Rankings

[2] **Title:** *MARLlib: A Scalable and Efficient Multi-agent Reinforcement Learning Library.*

Siyi Hu, Yifan Zhong, Minquan Gao, Weixun Wang, Hao Dong, Xiaodan Liang, Zhihui Li, Xiaojun Chang, Yaodong Yang

Publication: JMLR, 2023

Rank: Top Journals in ML, A in CORE Computer Science Rankings

[3] **Title:** *Policy Diagnosis via Measuring Role Diversity in Cooperative Multi-agent RL.*

Siyi Hu, Chuanlong Xie, Xiaodan Liang, Xiaojun Chang

Publication: ICML, 2022

Rank: Top Conferences in ML, A* in CORE Computer Science Rankings

[4] **Title:** *UPDeT: Universal Multi-agent RL via Policy Decoupling with Transformers.*

Siyi Hu, Fengda Zhu, Xiaojun Chang, Xiaodan Liang

Publication: ICLR, 2021

Award: Spotlight Paper, Top 10%

Rank: Top Conferences in AI, A* in CORE Computer Science Rankings

Contributing Author

[1] **Title:** *Maximum Entropy Heterogeneous-Agent Mirror Learning.*

Jiarong Liu, Yifan Zhong, **Siyi Hu**, Haobo Fu, Qiang Fu, Xiaojun Chang, Yaodong Yang,

Publication: ICLR, 2024

Award: Spotlight Paper, Top 10%

Rank: Top Conferences in AI, A* in CORE Computer Science Rankings

[2] **Title:** *Heterogeneous-Agent Reinforcement Learning.*

Yifan Zhong, Jakub Grudzien Kuba, **Siyi Hu**, Jiaming Ji, Yaodong Yang

Publication: JMLR, 2023

Rank: Top Journals in ML, A in CORE Computer Science Rankings

Projects

- **A Library for Multi-Agent Learning** **2022-present**

  Role: Project Leader

  Keywords: Industry-Oriented, User-Friendly, Multi-Agent System, Reinforcement Learning

  Overview: Developed a library unifying multi-agent systems and algorithms, offering support for diverse tasks and training pipelines in one place.

  Challenges: 1) Unifying various algorithms with an agent-level distributed dataflow. 2) Supporting diverse tasks, including cooperative, collaborative, competitive, and mixed tasks. 3) Designing a new interface aligned with the Gym structure.

  Achievement: Created a library featuring 18 pre-built algorithms, an intuitive API, support for 10+ multi-agent environments, customizable model architectures, and policy sharing. It has become a pivotal resource, evidenced by over a thousand released experiments and comprehensive documentation.

  Community Impact: The library's community has quickly grown, with over 100 researchers actively sharing experiences, raising questions, and contributing since its inception. More details.

  Project: Replicable-MARL/MARLlib (700 + ⋆) Paper

- **Build LLM-based Cooperative Agents** **2023-present**

  Role: Collaborator

  Keywords: NLP, AI Agent, Human-AI Cooperation, Zero-shot Coordination

  Overview: Developed a framework using large language models (LLMs) for AI agents capable of dynamic behavioral adaptation for enhanced cooperation.

  Challenges: 1) Leveraging ChatGPT(gpt-3.5-turbo-0301) for enhanced reasoning and planning on zero-shot cooperative task. 2) Aligning language models with atomic actions to bridge the agent with its tasks. 3) Modeling teammates through the construction of beliefs.

  Achievement: Pioneered a shift in cooperative multi-agent systems with LLMs, leading to a notable improvement in performance in the *Overcooked-AI* environment.

  Project: Website Paper

- **Automatic Data Integration Platform**

  Role: Data Engineer

  Keywords: Web Data Extraction, ETL, Geospatial Engineering, OCR

Overview: Developed an advanced technological platform designed to automate the extraction and integration of data from multiple sources, thereby enhancing the efficiency of Extract, Transform, Load (ETL) processes and data analysis capabilities.

Challenges: 1) Dynamic data extraction from web pages characterized by intricate structures and mechanisms for human-bot verification and protection. 2) A multi-processing architecture employing IP proxy strategies to augment extraction efficiency. 3) Error tolerance and recovery to ensure process resilience.

Achievement: Successfully engineered a platform that significantly enhances the speed of data extraction and reduces data storage requirements, underscored by a comprehensive emphasis on robust error management and recovery functionalities.

Skills

- **Specialisation**: Machine Learning, Data Science, covering areas such as supervised, unsupervised learning, reinforcement learning, NLP, statistical analysis, and predictive modeling.
- **Skills**: Proficient in Python, Java, and Scala, with expertise in data science and machine learning libraries including but not limited to Scikit-learn, Pandas, NumPy, Ray/RLlib, PyTorch, TensorFlow.
- **Model Evaluation**: Skilled in cross-validation, grid search, and performance metrics evaluation.
- **Teamwork & Communication**: Proven leadership in monumental projects like MARLlib, demonstrating excellent collaboration and communication skills while working with people across the world.

Presentations

1. "UPDeT: Universal Multi-agent RL via Policy Decoupling with Transformers," *ICLR Spotlight*, 2021.
2. "Policy Diagnosis via Measuring Role Diversity in Cooperative Multi-agent RL," *ICML talk*, 2022.
3. "MARLlib: A Scalable and Efficient Multi-agent Reinforcement Learning Library," *Jiang Men Talk*, 2023.

Awards and Honors

Graduated with Honors Fudan University, 2017
First-class Scholarship for Outstanding Student Fudan University, 2015