RUI DU

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Education

Wuchang Shouyi University **2009 – 2013**
Bachelor of Science in Computer Science and Technology Wuhan, China

Publications

Y. Chen, J. Suarez, J. Zhang, C. Yu, B. Wu, H. Chen, H. Zhu, **Rui Du**, S. Qian, S. Liu, W. Hong, J. He, Y. Zhang, L. Zhao, C. Zhu, J. Togelius, S. Mohanty, J. Chen, X. Li, X. Zhu, and P. Isola. **Benchmarking Robustness and Generalization in Multi-Agent Systems: A Case Study on Neural MMO**, 2023. URL https://arxiv.org/abs/2308.15802.

E. Liu, J. Suarez, C. You, B. Wu, B. Chen, J. Hu, J. Chen, X. Zhu, C. Zhu, J. Togelius, S. Mohanty, W. Hong, **Rui Du**, Y. Zhang, Q. Wang, X. Li, Z. Yuan, X. Li, Y. Huang, K. Zhang, H. Yang, S. Tang, and P. Isola. **The NeurIPS 2022 Neural MMO Challenge: A Massively Multiagent Competition with Specialization and Trade**, 2023. URL https://arxiv.org/abs/2311.03707.

Professional Experience

Shanghai Bilibili Technology Co., Ltd. **2016.9 – Present**
Senior Machine Learning Researcher, Artificial Intelligence Technology Department

- Took the lead in reinforcement learning research and guided the team to develop a distributed training system; integrated it with the innovative business of the gaming department within the company and applied it to large language models; led the team to win multiple top awards in international competitions.
- Deployed an experimental platform for recommendation service and achieved second-level real-time monitoring of multiple groups of experimental data online using Kafka.
- Implemented distributed offline data processing through big data platforms such as Hadoop and other supporting facilities to ensure the smooth execution of upstream and downstream tasks, as well as the output of reports.

Shanghai Fuxisi Technology Co. Ltd. **2014.7 – 2016.9**
Software Development Engineer

- Responsible for the backend development of the online mall system and supporting management system.
- Developed mobile API used for background communication and interaction with mobile APP.

Augmentum, Inc. **2013.7 – 2014.6**
Software Development Engineer

- Developed the internal management system, including the maintenance and handling of the work order system.
- Executed the internal internet travel project, developed and launched a social platform to share travel information based on PHP.

Fastlink **2011.9 – 2012.6**
Intern

- Managed virtual hosts on the cloud service platform, handled customer work orders, and performed daily maintenance of Linux physical servers.
- Responsible for the development and maintenance of the backend administration interface.

Research Experience

Using MARL to Investigate Automated Vehicle Safety vs. Effectiveness Trade-Off **2024.1 – present**
↪ Advisor: Prof. Peter Zhang *CMU*

- Independently conducted research on multi-agent reinforcement learning (MARL) for automated vehicle safety and effectiveness.
- Developed and trained several reinforcement learning algorithms (PPO, SAC, DDPG) to evaluate performance on the MetaDrive simulator.
- Refined and transformed the work into a research paper under the guidance of the advisor

RL from Human Feedback on a 32x NVIDIA A800 GPU Cluster *Core Member* **2023.7 – 2023.12**

- Co-developed a 70B-parameter reward model for reinforcement learning from human feedback, based on the Llama2 large language model and using a cluster of 16 NVIDIA A800 GPUs.
- Collaborated to build and organize the training data pipeline, achieving an improvement of approximately 14% to 27% over the 13B-parameter reward model on various internal evaluation metrics; provided safety metrics based on the reward model, aiding other safety-related projects.

- Led the development of 16B-parameter and 1.9B-parameter critic and actor models for RLHF algorithms, implementing PPO to reinforce the actor fine-tuning model. Coordinated with the colleague who focused on multi-GPU communication to implement multi-model inference across the distributed system.
- Open Source Model: github.com/bilibili/Index-1.9B

Neural MMO Multi-Agent Competitions *Leader* **2022.4 – 2022.10**

- Led the team in using TensorFlow to implement the Multi-Agent PPO algorithm, enabling it to be trained centrally and distributed on 8 machines, each with 8 GPU cores, and on 32 machines, each with 64 CPU cores.
- Analyzed the opponent's strategy and adjust the weight of the reward function parameters appropriately.
- Achieved 1st place in IJCAI and 2nd place in NeurIPS competitions, published two summary papers as co-author, and shared strategies with other top competitors in collaborative sessions.
- Presented and shared competitive strategies with top participants at NeurIPS, enhancing collaborative knowledge exchange. The presentation link: https://www.youtube.com/watch?v=nJqbIP_g4uM

Google Football Multi-Agents Project *Leader* **2020.6 – 2021.4**

- Grasped a multi-agent system to increase the complexity of reinforcement learning tasks and gained in-depth insights into agent interactions. Conducted research on weight sharing and attention mechanisms to enhance cooperation among agents in a multi-agent system.
- Conducted research on weight sharing and attention mechanisms to enhance cooperation among agents in a multi-agent system.
- Achieved significant success in two 5v5 Competitions, demonstrating the effectiveness of the developed strategies and algorithms.

Research on the RL algorithms within the Dota2 environment *Core Member* **April 2019 – Aug 2021**

- Studied RL algorithms (A2C, DQN, and PPO) in the Dota 2 environment as a beginner to reinforcement learning, utilizing distributed computing across 192 NVIDIA GTX 1080 Ti GPUs and 1000 CPUs.
- Conducted evaluations, human vs. AI matches, and set up distributed training using Docker deployment.
- Completed feature extraction tasks for Dota 2, overcoming challenges due to lack of documentation and public APIs, as assigned by Sijia Xu.
- Open Source Code: github.com/bilibili/LastOrder-Dota2

Projects

Reinforcement Learning Distributed Framework *Leader* **2020 – 2023**

- Led to create a distributed RL framework with templates for rapid project code generation and Docker-based deployment, significantly reducing setup time.
- Incorporated common RL tools and decoupled inference, training, evaluation, monitoring, and model pooling to enhance efficiency and flexibility.

Big Data Processing and Real-time Monitoring Framework **2016 – 2018**

- Developed a comprehensive data management framework for real-time and offline processing using Kafka, Grafana and Hadoop.
- Designed and implemented experimental platforms and data governance systems to support efficient data management and analysis.

Independent Development of Ruby-based Systems **2014 – 2016**

- Created a smart home automation system with IFTTT integration, featuring mobile APP APIs for home control.
- Built a comprehensive e-commerce platform, including functions of order processing, payment handling, product display, and backend management.

Internal Ticket Management System Development **2013 – 2014**

- Designed and implemented an internal ticket management system to streamline operations and support internal workflows.

Awards & Honors

3rd place, IEEE CoG IEEE CoG 2023 Google Football AI Challenge 1 Final Result **2023**

2nd place, IEEE CoG IEEE CoG 2022 Google Football AI Challenge 1 Final Result. **2022**

2nd place, NeurIPS Conf NeurIPS 2022 the Neural MMO Challenge Final Result. **2022**

1st place, IJCAI Conf IJCAI 2022 the Neural MMO Challenge Final Result. **2022**

Skills

Language proficiency	Mandarin (Native), English (Fluent)-TOEFL: 72
Programming Languages	Python, Ruby, Go, HTML, C++, LaTeX
Tools & Technologies	TensorFlow, PyTorch, Docker, Hadoop, Kafka, Unity

Hobbies

Hobbies	Dota2 (MMR 4000), Gacha Game, Video Games, Basketball