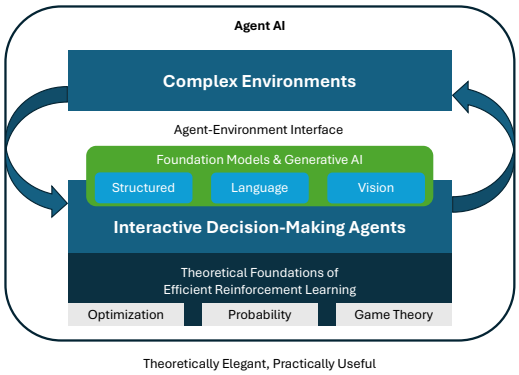
Yingru Li (086) 13006106862 szrlee@gmail.com https://richardli.xyz/

Interests: Decision Making Under Uncertainty, Reinforcement & Active Learning, LLM Reasoning & Agent

Education

- **The Chinese University of Hong Kong (CUHK)**, Shenzhen
  Ph.D. *in Computer Science and Information Engineering.* March 2025 (expected)
  Supervisor: *Zhi-Quan (Tom) Luo* https://en.wikipedia.org/wiki/Zhi-Quan_Tom_Luo
  Committee: *Hongyuan Zha*, *Xinyun Chen*, *Baoxiang Wang*, *John C.S. Lui*, *Benjamin Van Roy (Stanford & Google DeepMind)*
- **Huazhong University of Science and Technology (HUST)**, Wuhan 2020
  M.S. *in Computer Science.* 1st/134 overall, 1st/26 in Computer Theory and Software specialization.
  B.E. *in Computer Science with Honor. Outstanding Graduate.*

Research Vision



Theoretically Elegant, Practically Useful

My research focuses on developing **trustworthy AI agents** for reliable and strategic operation in complex, uncertain environments with human interaction. By advancing methods in **uncertainty quantification**, **reinforcement learning** (RL), and **large language model** (LLM) reasoning, I bridge foundational theory with scalable algorithms and modern computational tools. This approach enables **robust and sample-efficient decision-making** in real-world scenarios, particularly under data-scarce conditions. For further details, see my research highlights on my webpage.

Representative Publications

1. Fei Yu, **Yingru Li**, Benyou Wang, and Zhi-Quan Luo. "Uncertainty-guided Search for Multi-step Reasoning in LLMs". Co-first author. To be released soon. 2024.
2. **Yingru Li**, Xiaoxiao Liu, Benyou Wang, and Zhi-Quan Luo. "Multi-turn Actor-critic Language Agents for Hospital Outpatient Referral". To be released soon. 2024.
3. **Yingru Li**. *Probability Tools for Sequential Random Projection*. Preprint. Presented at ICML 2024 Workshop "High-dimensional Learning Dynamics 2024: The Emergence of Structure and Reasoning". 2024. arXiv: 2402.14026 [math.ST].
4. **Yingru Li**, Jiawei Xu, Baoxiang Wang, and Zhi-Quan Luo. *Scalable Exploration via Ensemble++*. Preprint. An early version presented at ICML 2024 Workshops: (1) "Aligning Reinforcement Learning Experimentalists and Theorists"; (2) "Automated Reinforcement Learning: Exploring Meta-Learning, AutoML, and LLMs". arXiv: 2407.13195 [cs.LG].
5. **Yingru Li**, Jiawei Xu, Lei Han, and Zhi-Quan Luo. "Q-Star Meets Scalable Posterior Sampling: Bridging Theory and Practice via HyperAgent". In: *ICML*. 2024.
6. **Yingru Li** and Zhi-Quan Luo. "Prior-dependent analysis of posterior sampling reinforcement learning with function approximation". In: *AISTATS*. 2024.
7. Ziniu Li, **Yingru Li**, Yushun Zhang, Tong Zhang, and Zhi-Quan Luo. "HyperDQN: A Randomized Exploration Method for Deep Reinforcement Learning". In: *ICLR*. Correponding author. 2022.
8. Qing Wang, **Yingru Li**, Jiechao Xiong, and Tong Zhang. "Divergence-Augmented Policy Optimization". In: *NeurIPS*. Vol. 32. Co-first author. 2019.

9. **Yingru Li**, Liangqi Liu, Hao Liang, Wenqiang Pu, and Zhi-Quan Luo. *Optimistic Thompson Sampling for No-Regret Learning in Unknown Games*. Preprint. Presented at ICML 2023 Workshop "The Many Facets of Preference-Based Learning". arXiv: 2402.09456 [cs.LG].

10. **Yingru Li**. *Simple, Unified Analysis of Johnson-Lindenstrauss with Applications*. Preprint. Presented at ICML 2024 Workshop "High-dimensional Learning Dynamics 2024: The Emergence of Structure and Reasoning". arXiv: 2402.10232 [stat.ML].

11. Kun He, **Yingru Li**, Sucheta Soundarajan, and John E. Hopcroft. "Hidden community detection in social networks". In: *Information Sciences* 425 (2018). Correponding author, pp. 92–106. ISSN: 0020-0255. DOI: https://doi.org/10.1016/j.ins.2017.10.019.

Professional Experience

- **Shenzhen Research Institute of Big Data**, Shenzhen, China 2023 - present
  Research Assistant
  - Innovated game-theoretic algorithms for signal sensing, earning **Best Student Paper Award**.
  - Contributed to HuatuoGPT agent for multi-turn outpatient referral, now operational in 16 hospitals.
- **Tencent AI & Robotics X**, Shenzhen, China 2019 - 2022
  Research Intern, Agent Center. Topic: Data-efficient Reinforcement Learning (RL)
  - High-throughput distributed actor-learner system. Stable off-policy policy optimization (NeurIPS).
  - Develop HyperAgent on scalable exploration & uncertainty estimation for Deep RL, achieving 7x data efficiency and 20x computation reduction. (Published in ICML; **Best Paper** in 2024 Daoyuan forum).
- **SenseTime Research**, Peking, China 2018
  Computer Vision Trainee Researcher
  Continual learning system for multi-label image classification adapting to new labels in data streams.
- **Department of Computer Science, Cornell University**, Ithaca, NY 2017
  Undergraduate Research Assistant
  Spearheaded research in hidden community detection, a novel graph-theoretic concept, with Turing award winner John E. Hopcroft. (Published in Information Sciences)
- **Microsoft Research Lab**, Asia 2016
  Research Intern in Theory Center
  Influence maximization and learning in social networks. Received Award of Excellence in Internship.

Awards

- **Best Paper Award**, in the 3rd doctoral and postdoctoral Daoyuan academic forum, 2024.
- **Best Student Paper**, in IEEE Sensor Array and Multichannel Signal Processing Workshop, 2024.
- **SRIBD Ph.D. Fellowship** (Gold Class), by Shenzhen Research Institute of Big Data (SRIBD), 2023.
- **Presidential Ph.D. Fellowship**, by The Chinese University of Hong Kong, Shenzhen, 2019–2023.
- **Tencent AI Ph.D. Fellowship**, by Tencent & The Chinese University of Hong Kong, Shenzhen, 2018.
- **National Scholarship**, by Huazhong University of Science and Technology, 2018.
- **Qiming Star Award (Selected as one of 5 recipients out of 7,112 undergraduates.)**, by Huazhong University of Science and Technology, 2016. **Reports**: [1] Newspaper. [2] HUST Online.
- **First Prize**, in Parallel computation and Application Contest (PAC) held by Intel and CCF, 2015.
- **First Prize**, in China National Mathematics Olympiad (Province-level Math League), 2012.

Selected Oral Presentations

- **Tackling Data Scarcity for Trustworthy Agent**
  Invited talk at ETH, Zurich, Nov. 1, 2024.
- **Exploartion at Scale: Theory, Algorithms & Applications**
  a.k.a. "Scalable Uncertainty Quantification for Exploration and LLM Reasoning"
  Invited talk in 2024 INFORMS Annual Meeting, Seattle, Oct. 20, 2024.
  Invited talk at MIT, Jul. 30, 2024.
  Invited talk in International Symposium on Mathematical Programming (ISMP), Montréal, Jul. 25, 2024.
  Invited talk at RLChina.org, Jun. 25, 2024.
  Invited talk at Princeton University, May 2, 2024.
  Invited talk in INFORMS Optimization Society (IOS) Conference, Rice University, Mar. 23, 2024.
  Contributed talk, in the third doctoral and postdoctoral Daoyuan academic forum, Jan. 13, 2024.
- **No-Regret Learning in Unknown Game with Applications**
  Invited talk in RL Theory Student Workshop at Nanjing University, Aug. 23, 2022.
  Contributed Talk in the second doctoral and postdoctoral Daoyuan academic forum, Aug. 20, 2022.
- **HyperDQN: A Randomized Exploration Method for Deep Reinforcement Learning**
  Contributed Talk in NeurIPS Workshop Ecological Theory of Reinforcement Learning, Dec. 14, 2021

Academic Service

- **Reviewer** for Conference on Neural Information Processing Systems (NeurIPS) [12 papers], International Conference on Learning Representations (ICLR) [5 papers]; ICLR Workshop "Bridging the Gap Between Practice and Theory in Deep Learning" [2 papers], ICML Workshop "Aligning Reinforcement Learning Experimentalists and Theorists" [2 papers]. NeurIPS Workshop BDU Reviewers [2 papers]. AISTATS 2025 Conference Reviewers
- **Chair** for RL Seminar in The Chinese University of Hong Kong, Shenzhen, China (Spring 2019, Summer 2020, Fall 2020, Spring 2021, Summer 2021, Fall 2021, Spring 2022, Fall 2022.); for 2 sessions in INFORMS Annual Meeting 2024 on "Integrating Generative AI with Sequential Decision-making".

Teaching

- **Stochastic Processes** (STA/DDA4001) Fall 2018
- **Optimization II** (MAT3220) Spring 2019
- **Distributed and Parallel Computing** (CSC4005) Fall 2019
- **Reinforcement Learning** (DDA6105/CIE6023) Fall 2020
- **Matrix Analysis** (CIE6002) Spring 2021
- **Deep Learning and Their Applications** (MDS6224) Spring 2022

My teaching duties include delivering weekly tutorials, correcting assignments, and running laboratory sessions when required, **all in English**.

Beyond Academia

I enjoy photography. I often play tennis and swim, and occasionally play golf. These activities allow me to live in the moment and help me find physical and spiritual freedom.