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

Interests: Data-Centric/Trustworthy AI & Decisions, Reinforcement Learning, Probability, Optimization

Education

- **The Chinese University of Hong Kong, Shenzhen**, China 2025 (expected)
  Ph.D. *in Computer Science and Information Engineering.*
  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**, Wuhan, China 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.*

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. (ICML; **Best Paper** in 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 hidden community detection research with John E. Hopcroft, advancing graph theory.
- **Microsoft Research Lab**, Asia 2016
  Research Intern in Theory Center
  Influence maximization and learning in social networks. (**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

- **Exploartion at Scale: Theory, Algorithms & Applications**
  a.k.a. "GPT-HyperAgent: Adaptive Foundation Models for Online Decisions"
  a.k.a. "HyperAgent: Advancing Scalable Exploration through Fast Uncertainty Estimation in RL"
  a.k.a. "Q* meets Thompson Sampling: Scaling up Exploration via HyperAgent"
  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

Selected Research Publications

Preprints

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

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

3. **Yingru Li**, Jiawei Xu, and Zhi-Quan Luo. *Adaptive Foundation Models for Online Decisions: HyperAgent with Fast Incremental Uncertainty Estimation*. Preprint. Presentation 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].

4. **Yingru Li**, Jiawei Xu, Baoxiang Wang, and Zhi-Quan Luo. *Scalable Exploration via Ensemble++*. Preprint. arXiv: 2407.13195 [cs.LG].

5. **Yingru Li**. *Probability Tools for Sequential Random Projection*. Preprint. Presentation at ICML 2024 Workshop "High-dimensional Learning Dynamics 2024: The Emergence of Structure and Reasoning". 2024. arXiv: 2402.14026 [math.ST].

Conference Proceedings

6. **Yingru Li** and Zhi-Quan Luo. "Prior-dependent analysis of posterior sampling reinforcement learning with function approximation". In: *The 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*. 2024. arXiv: 2403.11175 [stat.ML].

7. **Yingru Li**, Jiawei Xu, Lei Han, and Zhi-Quan Luo. "Q-Star Meets Scalable Posterior Sampling: Bridging Theory and Practice via HyperAgent". In: *The 41st International Conference on Machine Learning (ICML)*. Proceedings of Machine Learning Research. 2024. arXiv: 2402.10228 [cs.LG].

8. Liangqi Liu, Wenqiang Pu, **Yingru Li**, Bo Jiu, and Zhi-Quan Luo. "Radar Anti-jamming Strategy Learning via Domain-knowledge Enhanced Online Convex Optimization". In: *2024 IEEE 13th Sensor Array and Multichannel Signal Processing Workshop (SAM)*. IEEE. 2024. arXiv: 2402.16274 [eess.SP].

9. Ziniu Li, **Yingru Li**, Yushun Zhang, Tong Zhang, and Zhi-Quan Luo. "HyperDQN: A Randomized Exploration Method for Deep Reinforcement Learning". In: *International Conference on Learning Representations (ICLR)*. 2022. URL: https://openreview.net/pdf?id=X0nrKAXu7g-.

10. Qing Wang, **Yingru Li**, Jiechao Xiong, and Tong Zhang. "Divergence-Augmented Policy Optimization". In: *Advances in Neural Information Processing Systems (NeurIPS)*. Vol. 32. Curran Associates, Inc., 2019. URL: https://openreview.net/pdf?id=rylacVSeIS.

Journal Articles

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

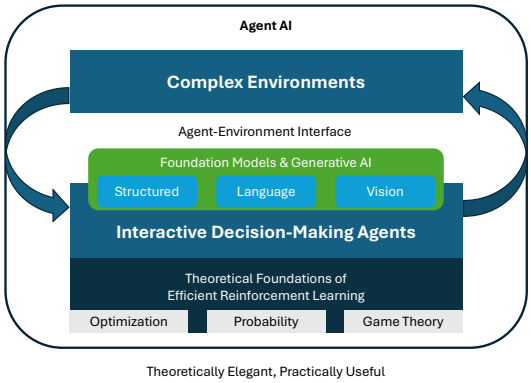
Under Preparation

12. **Yingru Li**, Xiaoxiao Liu, Benyou Wang, and Zhi-Quan Luo. "Multi-turn Actor-critic Language Agents for Hospital Outpatient Referral". 2024.

13. Liangqi Liu, Wenqiang Pu, **Yingru Li**, Bo Jiu, and Zhi-Quan Luo. "Learning an Opponent-aware Anti-jamming Strategy via Online Convex Optimization". 2024.

14. Fei Yu, **Yingru Li**, Benyou Wang, and Zhi-Quan Luo. "Uncertainty-guided Multi-step Reasoning in LLMs". 2024.

Research Statement



My research vision is to develop interactive AI agents that operate reliably in complex, uncertain, dynamic and human-in-the-loop environments. This work necessitates advancements in knowledge and uncertainty representation, exploration, continual adaptation, reasoning and decision-making. To achieve these goals, I use and develop **fundamental tools** in probability, game theory, and information theory. Meanwhile, I design **scalable architecture & algorithms**, exploiting modern large-scale computation tools. My methods have been applied to llm math reasoning, strategic games in sensing & transportation, human-AI interplay for content moderation, and reliable medical decision-making. The significance of my work has been recognized through presentations at top-tier conferences (ICML, NeurIPS, ICLR, AISTATS, ISMP, INFORMS), as well as through awards (Best Paper Award at the 2024 Daoyuan Forum, Best Student Paper Award at the 2024 IEEE SAM). For more information, visit https://richardli.xyz/#research.

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.