Yingru Li

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TL;DR: Sequential Decision-making, Optimization, Probability with applications in AI & Operations.
Interests: I focus on algorithms and theory for *interactive agents* that operate in complex and uncertain environments. This work necessitates advancements in methods for knowledge and uncertainty representation, exploration, adaptation, and decision-making. To achieve these goals, I use and develop *fundamental tools* in probability, optimization, game theory, and information theory. The methods developed have been *applied* to gaming, human-AI alignment, and reliable & safe operations.

Education

- **The Chinese University of Hong Kong, Shenzhen**, China
  Ph.D. candidate *in Computer and Information Engineering.*
  Supervisor: *Zhi-Quan (Tom) Luo*
  Committee: *Jim Dai*, *Xinyun Chen*, *Baoxiang Wang*, *Benjamin Van Roy* (Stanford & Google DeepMind)
- **Huazhong University of Science and Technology**, China
  B.Eng. *in Computer Science (Honors Program). Outstanding Graduate.*

Professional Experience

Research Positions

- **The Chinese University of Hong Kong, Shenzhen**, China — 2018–
  Graduate Research Assistant with Presidential Fellowship — *Zhi-Quan (Tom) Luo*
- **Tencent AI & Robotics X**, Shenzhen, China — 2020
  Research Intern in Agent Center — *Lei Han*
- **SenseTime Research**, Peking, China — 2018
  Computer Vision Trainee Researcher — *Jing Shao*
- **Department of Computer Science, Cornell University**, Ithaca, NY — 2017
  Undergraduate Research Assistant — *John E. Hopcroft*
- **Microsoft Research Lab**, Asia — 2016
  Research Intern in Theory Center — *Wei Chen*
- **Hopcroft Center on Computing Science**, China — 2015-2017
  Undergraduate Research Assistant — *Kun He*

Academic Service

- **Reviewer** for Conference on Neural Information Processing Systems (NeurIPS), International Conference on Learning Representations (ICLR), ICLR 2024 Workshop on Bridging the Gap Between Practice and Theory in Deep Learning (BGPT), ICML 2024 Workshop on Aligning Reinforcement Learning Experimentalists and Theorists (ARLET)
- **Organizer** 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 two sessions in INFORMS Annual Meeting 2024 on "Integrating Generative AI with Sequential Decision-making".

Teaching

- **Stochastic Processes** (STA/DDA4001) — by *Jim Dai*, Fall 2018
- **Optimization II** (MAT3220) — by *Shuzhong Zhang*, Spr. 2019
- **Distributed and Parallel Computing** (CSC4005) — by *Yeh-Ching Chung*, Fall 2019
- **Reinforcement Learning** (DDA6105/CIE6023) — by *Xinyun Chen* and *Jim Dai*, Fall 2020
- **Matrix Analysis** (CIE6002) — by *Tsung-Hui Chang*, Spr. 2021
- **Deep Learning and Their Applications** (MDS6224) — by *Chen Chen*, Spr. 2022

Awards

- **Best Paper Award**, in the third doctoral and postdoctoral Daoyuan academic forum, 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 AI& The Chinese University of Hong Kong, Shenzhen, 2018.
- **Award of Excellence** in Internship, by Microsoft Research Lab, 2016.
- **Qiming Star Award** (top 5 overall undergraduates), by Huazhong University of Science and Technology, 2016. **Reports**: [1] Newspaper. [2] HUST Online.
- **National Scholarship** (Academic Excellence), by Huazhong University of Science and Technology.
- **First Prize**, in Parallel computation and Application Contest (PAC) held by Intel and CCF, 2015.

Selected Oral Presentations

- **GPT-HyperAgent: Adaptive Foundation Models for Online Decisions**
  Invited talk in 2024 INFORMS Annual Meeting, Seattle, Oct., 2024.
- **HyperAgent: Advancing Scalable Exploration through Fast Uncertainty Estimation in RL**
  Invited talk in International Symposium on Mathematical Programming (ISMP), Montréal, Jul., 2024.
- **Q* meets Thompson Sampling: Scaling up Exploration via HyperAgent**
  Invited talk at RLChina.org, Jun., 2024.
- **HyperAgent: A Simple, Efficient and Scalable RL Framework for Complex Environments**
  Virtual talk at Princeton University, May, 2024.
  Invited talk in Informs Optimization Society (IOS) Conference, Rice University, Mar., 2024.
  Contributed talk, in the third doctoral and postdoctoral Daoyuan academic forum, Jan. 13, 2024.
- **Towards AGI for Humanity through Efficient Reinforcement Learning**
  Contributed Talk in Graduate Research Forum, CUHK, Shenzhen Oct. 21, 2023.
- **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*. presented at ICML 2024 Workshop on 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*. presented at ICML 2023 Workshop on The Many Facets of Preference-Based Learning. arXiv: 2402.09456 [cs.LG].

3. **Yingru Li**, Jiawei Xu, and Zhi-Quan Luo. *Scaling Exploration with HyperAgent: Fast Incremental Uncertainty Estimation*. presented at ICML 2024 Workshops: (1) Aligning Reinforcement Learning Experimentalists and Theorists; (2) Automated Reinforcement Learning: Exploring Meta-Learning, AutoML, and LLMs.

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

Conference Proceedings

5. **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].

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

7. 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].

8. 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-.

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

Under Preparation

10. **Yingru Li**, Xiangbo Wu, Yanchuan Tang, Xiang Wan, Benyou Wang, and Zhi-Quan Luo. "Uncertainty-aware Vision-Language Agents for Multi-turn Medical Decision-making". under preparation. 2024.

11. **Yingru Li**, Jiawei Xu, Xiangbo Wu, Anningzhe Gao, Baoxiang Wang, Benyou Wang, and Zhi-Quan Luo. "Controlled Decoding via Q-Star on Outcome Feedback for Language Models". under preparation. 2024.

Journal Articles

12. 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.