

## Education

- **The Chinese University of Hong Kong, Shenzhen, China** 2018 –  
*Ph.D. candidate in Computer and Information Engineering.*  
Thesis direction: Efficient Reinforcement Learning  
**Supervisor: Prof. Zhi-Quan (Tom) LUO**
- **Huazhong University of Science and Technology, China** 2017  
*B.Eng. in Computer Science (Honors Program). Outstanding Graduate*  
Thesis: Learning multi-channel influence in networks. Supervisor: Prof. Kun HE

## Research Interests

- Sequential decision-making & Reinforcement learning; Uncertainty quantification, Approx. Bayesian.
- Algorithms Design & Analysis; Applied probability, Random projection in Sequential processes.
- Applications in Artificial Intelligence (AI) & Operations Research (OR) that could **benefit Humanity**.

## Professional Experience

### Research Position

- **The Chinese University of Hong Kong, Shenzhen, China** 2018 –  
*Graduate Research Assistant with Presidential Fellowship* with Prof. Zhi-Quan (Tom) Luo
- **Tencent AI, Shenzhen, China** 2019  
*Research Intern in Agent Center* with Dr. Lei Han
- **Department of Computer Science, Cornell University, Ithaca, NY** 2017  
*Independent Research Assistant* with Prof. John Hopcroft
- **Microsoft Research Lab - Asia, Beijing, China** 2016  
*Research Intern in Theory Center.* with Dr. Wei Chen

### Selected Research Project

- **Efficient Reinforcement Learning: Algorithm Design and Analysis**
  - **Key problem:** Data and computation efficiency is a key obstacle of applying RL in **real-world**.
  - **Algorithm:** (1) We design **efficient and scalable** RL algorithms for complex environments with hypermodel and approximate Thompson sampling beyond conjugacy [5], [6], which **demonstrates significant efficiency gain** in deep RL benchmarks (e.g. **only 15% data consumption and 5% model parameters** compared to SOTAs in Atari suite). The approach is being applied to **real-world** communication environments. (2) We design distributed actor-critic RL agents, significantly stabilizing the optimization procedure when the off-policy data is reused, addressing the efficiency issue [7].
  - **Analysis:** We developed **new probability tools** [11], [2], [12] for the sequential random projection and sequential subspace embedding via novel constructions of stopped and self-normalized processes, which can be regard as a **non-trivial martingale extension to the Johnson–Lindenstrauss (JL)**. The tools are then applied to the regret analysis of hypermodel-based TS-type algorithms in bandit [12] and RL [5] environments, achieving **the same regret order** of TS and RLSVI with **cheap computation**.
- **Game-theoretic Decision-making under Uncertainty**
  - We design TS-type algorithms, leveraging the opponent's action information and the structure of utility, in a multi-agent scenario [8] with an unknown utility function. We develop a new **information-theoretic regret bound**. For some structured utility functions, the bound is only **logarithmic in the size of strategy space**. The method is applied to **real-world problems**, e.g., traffic routing and radar communication, **reducing the experimental budgets by more than an order of magnitude**.

## Research Publications

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### Journal Articles

- 1 K. He, Y. Li, S. Soundarajan, and J. E. Hopcroft, "Hidden community detection in social networks," *Information Sciences*, vol. 425, pp. 92–106, 2018.

### Conference Proceedings

- 2 Y. Li, "Simple, unified analysis of johnson-lindenstrauss with applications," in *The 37th Annual Conference on Learning Theory (COLT)*, under review, 2024. arXiv: [2402.10232 \[stat.ML\]](#).
- 3 Y. Li, L. Liu, W. Pu, and Z.-Q. Luo, "Optimistic thompson sampling for no-regret learning in unknown games," in *The 41st International Conference on Machine Learning (ICML)*, under review, 2024. arXiv: [2402.09456 \[cs.LG\]](#).
- 4 Y. Li and Z.-Q. Luo, "A value-targeted analysis of posterior sampling reinforcement learning with linear function approximation," in *The 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024.
- 5 Y. Li, J. Xu, L. Han, and Z. Luo, "Hyperagent: A simple, scalable, efficient and provable reinforcement learning framework for complex environments," in *The 41st International Conference on Machine Learning (ICML)*, under review, 2024. arXiv: [2402.10228 \[cs.LG\]](#).
- 6 Z. Li, Y. Li, Y. Zhang, T. Zhang, and Z.-Q. Luo, "Hyperdq: A randomized exploration method for deep reinforcement learning," in *International Conference on Learning Representations (ICLR)*, 2022.
- 7 Q. Wang, Y. Li, J. Xiong, and T. Zhang, "Divergence-augmented policy optimization," in *Advances in Neural Information Processing Systems (NeurIPS)*, vol. 32, 2019.

### Workshop Papers

- 8 Y. Li, L. Liu, W. Pu, and Z.-Q. Luo, *Optimistic thompson sampling for no-regret learning in unknown games*, ICML 2023 Workshop The Many Facets of Preference-Based Learning, 2023.
- 9 Y. Li, J. Xu, and Z. Luo, *Efficient and scalable reinforcement learning via hypermodel*, NeurIPS 2023 Workshop on Adaptive Experimental Design and Active Learning in the Real World, 2023.
- 10 Z. Li, Y. Li, Y. Zhang, T. Zhang, and Z.-Q. Luo, *Hyperdq: A randomized exploration method for deep reinforcement learning*, NeurIPS 2021 Workshop Ecological Theory of Reinforcement Learning, 2021.

### Articles in Preparation

- 11 Y. Li, "Probability tools for sequential random projection," To appear on arXiv preprint, 2024.
- 12 Y. Li, J. Xu, and Z.-Q. Luo, "Approximate thompson sampling via hypermodel and index sampling," To be submitted, 2024.

## Selected Scholastic Honors

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- **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 Ph.D. Fellowship**, Jointly by Tencent & 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. Report: [\[1\] Newspaper](#). [\[2\] HUST Online](#).
- **Outstanding Achievements in terms of Academic Performance (Top 1%)**, by Huazhong University of Science and Technology, 2015.
- **National Scholarship**, by Huazhong University of Science and Technology

## Selected Oral Presentations

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- **HyperAgent: A Simple, Efficient and Scalable RL Framework for Complex Environments**  
*Contributed Talk* in The third doctoral and postdoctoral Daoyuan academic forum, Jan. 13, 2024.  
**Best paper award.**

## Selected Oral Presentations (continued)

- **Towards AGI for Humanity through Efficient Reinforcement Learning**  
*Contributed Talk* in Graduate Research Forum, 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

## Miscellaneous Experience

### Teaching Assistant

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

### Academic Services

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| Reviewer  | ■ Conference on Neural Information Processing Systems (NeurIPS), International Conference on Learning Representations (ICLR).   |
| Organizer | ■ <b>RL Seminar</b> in The Chinese University of Hong Kong, Shenzhen. (Spring 2019, Summer 2020, Fall 2020, Spring 2021, Summer 2021, Fall 2021, Spring 2022, Fall 2022.) |

### Certifications

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| 2017 | ■ <b>Neural Networks and Deep Learning.</b> An online non-credit course authorized by DeepLearning.AI and offered through <b>Coursera</b> . |
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## References

### Professor Zhi-Quan (Tom) Luo


X.Q. Deng Presidential Chair Professor  
The Chinese University of Hong Kong, Shenzhen  
2001 Longxiang Boulevard, Longgang District, Shenzhen 518172, China  
✉ [luozq@cuhk.edu.cn](mailto:luozq@cuhk.edu.cn)

### Professor J. G. "Jim" Dai

Leon C. Welch Professor  
Cornell University  
235 Rhodes Hall, 136 Hoy Road Ithaca, NY 14853  
✉ [jim.dai@cornell.edu](mailto:jim.dai@cornell.edu)  
Dean, School of Data Science  
The Chinese University of Hong Kong, Shenzhen  
2001 Longxiang Boulevard, Longgang District, Shenzhen 518172, China  
✉ [jimdai@cuhk.edu.cn](mailto:jimdai@cuhk.edu.cn)

Thank you for reading!  
*Experience before Ph.D. study is listed in the next page.*




## Experience before Ph.D. Study

2007     **Special program for super-normal children**, Shenzhen middle school at BYD.

### Research Position

- 2018     **SenseTime Group Ltd.**, Beijing, China  
*Computer Vision Trainee Researcher* with Dr. *Jing Shao*  
Continual Learning for Image Classification with Deep Neural Networks: Algorithm design and implementation. Details in "Projects before Graduate Study".
- 2017     **Department of Computer Science, Cornell University**, Ithaca, NY  
*Independent Research Assistant* with Prof. *John Hopcroft*  
Algorithms for Community Detection in Graphs and Social Influence Analysis. Part of the outcome was published in Information Science [1] and included in the undergraduate thesis. See details in "Projects before Graduate Study".
- 2016     **Microsoft Research Lab - Asia**, Beijing, China  
*Research Intern* in Theory Center with Dr. *Wei Chen*  
Information and Influence in Social Networks: Learning and Optimization. Part of the outcome is in the undergraduate thesis. Details in "Projects before Graduate Study".
- 15-17     **Hopcroft Center on Computing Science**,  
Huazhong University of Science and Technology, China  
*Undergraduate Research Assistant* with Prof. *Kun He*

### Projects before Graduate Study

- 2018     **Multi-label Continual Learning.** [Github] [Report] Concerning the catastrophic forgetting phenomenon in deep learning, we developed a distributed computation framework for continual and incremental learning in multi-label image classification. This project was initiated while working as a trainee researcher at SenseTime Research. We further proposed a new method called "Projection as Pareto Improvement" (PPI) method by formulating continual learning as a multi-objective optimization problem.
- 16-17     **Hidden Community Detection.** [Github] [Journal] Propose a new concept of hidden community for network analysis. Provide a meta-approach called HICODE for finding hidden communities. Several weakening methods are proposed to reduce the impact of the detected structure. The framework works iteratively to enhance detection of both dominant and hidden communities. Extensive experiments demonstrate the effectiveness of the proposed method.
-  **Learning and Optimizing Social Influence.** [Thesis] A key task in social network analysis is learning, predicting, and optimizing social influence. Existing models with large numbers of parameters are hard to fit without massive data. We aim to reduce the effective parameters by modeling the multi-channel influence phenomenon. We primarily study the noisy-or-like nonlinear combination of multi-channel influence. Under this model, we derive the sample complexity lower bound and design an algorithm for learning the influence network.