

Zhonglin Liu

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 Liu-Zhonglin (Joe)






EDUCATION

- **The University of Hong Kong** Sept 2022 - Aug 2026 (Expected)
Bachelor of Science, major in Mathematics and Economics Hong Kong SAR, China
 - Young Scientist Scheme (YSS): An elite program offering early research training, mentorship, and international research opportunities for outstanding science students.
 - Cumulative GPA: 3.88 / 4.3
- **National University of Singapore** Jan 2025 - May 2025
HKU Worldwide Undergraduate Student Exchange Programme Singapore
 - Semester GPA: 4.9 / 5.0

RESEARCH INTERESTS

- Modelling of Complex Systems, Operations Research , Decision Making under Uncertainty, Applied Artificial Intelligence, Computational Biology.

RESEARCH EXPERIENCE

- **Analysis, Approximation, and Control of Probabilistic Boolean Networks (Ongoing)** 2025 - Present
Supervisor: Prof. Ching Wai Ki (HKU)
Systematically studied the analysis and control of PBNs for genetic systems, implementing matrix-based methods for both exact and approximate steady-state computation to ensure scalability. Formulated a finite-horizon optimal control problem with hard constraints to model realistic therapeutic interventions. 
- **Information Acquisition and Design (Ongoing)** 2025 - Present
Supervisors: Dr. Hong Ming Tan & Prof. Jussi Keppo (NUS)
Developed a two-period model to optimize a pharmaceutical firm's clinical trial data collection for regulatory approval. Additionally, contributed to designing an incentive mechanism for a Large Language Model (LLM) platform to acquire high-quality user information.
- **A PBN-RL-XAI Framework for Therapeutic Discovery in Melanoma** 2025
Independent Research
Developed an integrated PBN-RL-XAI framework to discover therapeutic strategies for immunotherapy-resistant melanoma, identifying a novel 'hit-and-run' inhibition therapy. 
- **Inferring Progressive Disconnection in Alzheimer's Disease with PBNs** 2025
Supervisor: Prof. Zhang Louxin (NUS)
Developed a novel Probabilistic Boolean Network (PBN) framework to model effective connectivity in fMRI data, identifying a progressive disconnection of DMN-to-MTL pathways in Alzheimer's disease. 
- **A Comparative Study of Algorithms for the Travelling Salesman Problem** 2024 - 2025
Supervisor: Prof. Zang Wenan (HKU)
Compared classical heuristics against hybrid reinforcement learning models for the Euclidean TSP, demonstrating that an Actor-Critic agent integrated with classical methods achieves competitive performance. 
- **Machine Learning Methods in Prediction of Online Portfolio Selection Problems** 2023 - 2024
Supervisor: Prof. Ching Wai Ki (HKU)
This project investigated the integration of machine learning models, specifically LSTM and XGBoost, to predict asset prices for Online Portfolio Selection strategies. 

PUBLICATIONS AND MANUSCRIPTS

- [1]] Liu, Z. (2025). **A PBN-RL-XAI Framework for Discovering a "Hit-and-Run" Therapeutic Strategy in Melanoma**. arXiv preprint arXiv:2507.10136. Under review at the IEEE International Conference on Bioinformatics and Biomedicine (BIBM).
- [2]] Liu, Z., & Zhang, L. (2025). **Inferring Progressive Disconnection in Alzheimer's Disease with Probabilistic Boolean Networks**. *bioRxiv*. <https://doi.org/10.1101/2025.07.10.664143>. Accepted for poster presentation at the Asia Pacific Bioinformatics Conference (APBC) 2025.
- [3]] Liu, Z., Zhao, Y., Lyu, B., & Ching, W.-K. (2025). **Integrating Machine Learning Methods for the Prediction in Online Portfolio Selection Problems**. In *Proceedings of the International Conference on Applied Research in Business, Management and Economics*, Vol. 2, pp. 17-28. Diamond Scientific Publishing. DOI: 10.33422/bmeconf.v2i1.1015.
- [4]] Liu, Z. (2024). **A Comparative Study of Classical and Reinforcement Learning Algorithms for the Travelling Salesman Problem**. Unpublished capstone project report.

WORK/PROJECT EXPERIENCE

- Enhancing Mathematical Understanding via Manim** [Globe] [Globe] 2022 - Present
Team Leader & Main Producer
Hong Kong
 - Utilized Manim to create animated educational videos illustrating mathematical concepts. In charge of managing workflows and distributing tasks.
 - Served as the main producer for videos that were broadcast across the HKU campus via U-Vision, enhancing mathematical understanding for the university community. Example of my work: [Maths in a minute – 2025 - A very mathematical year](#).
- Bank of China** August 2024
Credit Analyst Intern
China
 - Analyzed industry credit reports and prepared detailed financial summaries to support client credit evaluations.
- Department of Mathematics, The University of Hong Kong** Oct 2023 - Dec 2023; Feb 2024 - May 2024
Student Teaching Assistant
Hong Kong
 - Assisted in teaching fundamental concepts of mathematics and multivariable calculus, conducting revision classes to improve student performance.
 - Developed video tutorials using Manim to visually simplify and explain complex mathematical concepts.
- Essence Brilliant Limited** August 2023
Education Content Developer
Hong Kong
 - Created dynamic educational videos using Python and Manim to explain complex topics.
 - Managed team task distribution and facilitated communication between internal and external stakeholders.

HONORS AND AWARDS

- Undergraduate Research Fellowship Programme with Research Internship Awards** 2025 - 2026
The University of Hong Kong [Globe]
- Wong Yung Chow Prize in Mathematics** 2024 - 2025
The University of Hong Kong [Globe]
 - Awarded to the best 3rd year student in Mathematics, on the recommendation of the Head of Mathematics.
- Hong Kong Chiu Chow Chamber of Commerce Rayson Huang Memorial Student Enrichment Award** 2024 - 2025
The University of Hong Kong [Globe]
- HKU Recognition Award for Distinguished Service to the Community** 2024 - 2025
The University of Hong Kong [Globe]
 - Awarded for the “Enhancing Mathematical Understanding: A Students as Partners (SAP) Project in Animation and Engagement” group project, which enhanced mathematical understanding through animated videos made using Manim.
- C.V. Starr Scholarships** 2024 - 2025
The University of Hong Kong [Globe]
- Summer Research Fellowship** 2023 - 2024
The University of Hong Kong [Globe]
- Dean’s Honours List** 2022 - 2023, 2023 - 2024, 2024 - 2025
The University of Hong Kong

EXTRACURRICULAR

- Lead for Life Character Leadership Programme (Team Courage)** 2022 - 2025
The University of Hong Kong [Globe]
 - A multi-year programme focused on character leadership, mentorship, and service-learning. Participated in workshops on resilience and mindset, and completed a service project with the Mission for Migrant Workers.
- Volunteer** 2023 - Present
Mission for Migrant Workers (MFMW) [Globe]
 - Organized and supported community events, including charity raffles and the provision of free health services for migrant workers.

ADDITIONAL INFORMATION

Languages: Native Mandarin; Fluent English (TOEFL: 112/120)
Hobbies: Teaching, Photography