

Zimin Liang 梁子民

Search and Optimisation · Combinatorial Problems

Multi-Agent Systems · Intelligent Decision Making

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🔗 <https://scholar.google.com/citations?user=8N0DMEYAAAAJ>

🌐 <https://Zim-L.github.io/about>

🐙 <https://github.com/Zim-L>

SUMMARY

PhD in Computer Science from the University of Birmingham. Research mainly focuses on multi-objective combinatorial optimisation, including local search, evolutionary algorithms, problem landscape and algorithm analysis. Work has examined why simple search strategies can sometimes outperform more sophisticated methods, using both theoretical analysis and empirical experiments across different combinatorial problems, with publications at AAAI, IJCAI, FOGA, PPSN and GECCO. More recently, I am interested in developing several LLM-agent systems for coding, personal task management and simulated-world content generation.

RESEARCH PROJECTS

Multi-objective Combinatorial Optimisation

Local search · evolutionary search · algorithm comparison

- Studied a wide range of combinatorial problems: Knapsack, TSP, NK-landscape and QAP
- Compared multi-objective local search with evolutionary algorithms (GECCO 2024), and later neural methods
- Empirically and theoretically study why simple randomised local search methods can outperform more complex systematic local search (AAAI 2026a)
- Investigated how computational budget and different algorithmic components change search behaviour.
- Co-supervised a project for medical resource allocation and scheduling in disaster response (CAIE 2025)
- Co-supervised a project about scalability of the algorithms for larger size problems

Evolutionary Multi-Objective Optimisation

Non-elitist search · algorithm analysis · exploration v.s. exploitation

- Propose a simple non-elitist evolutionary algorithm for extremely rugged landscape (GECCO 2023)
- Study stochastic population update and how it uses inferior solutions to escape local optima (IJCAI 2025)
- Investigated archive-update frequency and why one-by-one updates can outperform larger batch updates.
- Cooperate with LAMDA Lab from Nanjing University on the studies of stochastic population update (IJCAI 2025), reusing archive (AAAI 2026b), dual population for exploration and exploitation (IJCAI 2026), etc

Problem Characteristics & Search Landscapes

Problem landscape · visualisation · benchmark design

- Develop Pareto landscape, a method for visualising the landscape of multi-objective problems (PPSN 2024)
- Constructed and analysed seven additional benchmark for theoretical analysis, exhibiting properties such as local optima, non-linear Pareto fronts, asymmetry and disconnected Pareto sets (FOGA 2025)

EXPERIENCE

2026 – **Liga Technologies Ltd** **Founder / Developer**

Personal AI Management & Coding System

- Built a main-agent / sub-agent architecture for research, coding and task management, with specialised coder, researcher and verifier agents (with coder – verifier workflow in isolated Git work trees and gated merging)
- Added tool permissions, model routing, recursion limits, concurrency checks, destructive -operation safeguards.
- The system allows scheduled autonomous tasks that observe my working pattern and collect news with brave search, and remind users through WeChat iLinkBot
- Developed long-term context management with project context history, compressed decisions/constraints, and a lightweight concept graph (general abstraction of LSP in coding IDE)

MAWriter – Multi-agent simulated-world novel writing system

- Built a structured fictional-world model containing plot plans, events, characters, items, clues, abilities, etc
- Designed a multi-agent workflow combining planning, writing, character simulation and consistency verifier
- It can generate medium size consistent novels (1M+ words) with local LLM or API (Different sub-agents can use different ones).

Home Steward – LLM-based household coordination system

- Built a home steward system with similar architecture to the Personal AI Management system, but focus on home scenarios (tasks, inventory, IoT device, long-term optimisation of device settings, for IoT platforms like Xiaomi, Midea, Aqara, Google, Huawei and Baidu) to provide an easy-life, and better long-term decision making.
- The task and IoT systems support multi-objective planning and optimisation.
- Developed an LLM-based household simulation to test the Home Steward system

2022 -	Doctorate Associate	Director of Academic Department
- Organised more than 20 Online academic salons - Organised two onsite events: London MSCA Workshop, and AI safety seminar - Birmingham Early-Career Researchers Forum AI Sub-Forum 2024, 2025 and 2026. Participated in Organising Shenzhen Bao'an Innovation and Entrepreneurship Competition for Overseas Doctorate Entrepreneurs.		
2022 – 2024	University of Birmingham	Teaching Assistant
Teaching Modules: Computer Aided Verification (design all labs sessions and relevant assignments), Evolutionary Computation, Artificial Intelligence 2 (Machine Learning), MSc Final Year Project, Algorithms for Data Science.		
2021 – 2024	University of Jinan	External Teaching Assistant
2018 – 2018	Ark St Alban's	Teaching Assistant, Coding Club Runner
2016 – 2018	UoB Chinese Society	Entertainment Director, Web Director

EDUCATION

2021.9 – 2026.7	University of Birmingham	PhD Computer Science
<i>Thesis: Multi-Objective Combinatorial Optimisation: When Simple Strategies Meet Complex Problems</i>		
2019.9 – 2021.7	University of Birmingham	MRes Natural Computation
<i>Thesis: Use Agent-Based Simulation to Investigate the Impact of Social Learning Between (Chimpanzee) Communities</i>		
2015.9 – 2019.7	University of Birmingham	MSci Computer Science (MSci: Integrated Bachelor with Master)
<i>Final Project: Improve Agent-Based Model of Financial Market with Chaotic Theory</i>		

PUBLICATION

- Z. Liang**, M. Li. *Random is Faster than Systematic in Multi-objective Local Search*. AAAI Conference on Artificial Intelligence (AAAI), 2026a.
- S. Ren, **Z. Liang**, M. Li, C. Qian. *Not Just for Archiving: Provable Benefits of Reusing the Archive in Evolutionary Multi-objective Optimization*. AAAI Conference on Artificial Intelligence (AAAI), 2026b.
- M. Tang, **Z. Liang**, M. Li. *On Scalability of Multi-Objective Evolutionary Algorithms on Combinatorial Optimisation Problems*. Genetic and Evolutionary Computation Conference (GECCO), 2026.
- Y. Sun, S. Ren, Z. Lv, **Z. Liang**, M. Li, C. Qian. *Towards Practical Problems: Running Time Analysis of MOEAs on Integer Spaces with Local Optima*. International Joint Conference on Artificial Intelligence (IJCAI), 2026.
- C. Jiang, S. Ren, **Z. Liang**, M. Li, C. Qian. *One for Exploration and Another for Exploitation: A Dual-Population MOEA Framework with Provable Benefits*. International Joint Conference on Artificial Intelligence (IJCAI), 2026.
- Z. Cui, **Z. Liang**, M. Li. *A Problem Landscape Visualisation Method for Multi-Objective Optimisation*. Mathematical and Computational Applications, 2026.
- S. Ren, **Z. Liang**, M. Li, C. Qian. *A Theoretical Perspective on Why Stochastic Population Update Needs an Archive in Evolutionary Multi-objective Optimization*. International Joint Conference on Artificial Intelligence (IJCAI), 2025.
- Z. Cui, **Z. Liang**, L. M. Pang, H. Ishibuchi, M. Li. *When to Truncate the Archive? On the Effect of the Truncation Frequency in Multi-Objective Optimisation*. Genetic and Evolutionary Computation Conference (GECCO), 2025.
- Z. Liang**, M. Li. *On the Problem Characteristics of Multi-objective Pseudo-Boolean Functions in Runtime Analysis*. Foundations of Genetic Algorithms (FOGA), 2025.
- Q. Liu, J. Dong, N. Cui, **Z. Liang**, J. Luo. *Strategic Allocation of Medical Resources in Disaster Response: A Multi-objective Nonlinear Dynamic Model with Risk and Cost Considerations*. Computers & Industrial Engineering, 2025.
- M. Li, X. Han, X. Chu, **Z. Liang**. *Empirical Comparison Between MOEAs and Local Search on Multi-objective Combinatorial Optimisation Problems*. Genetic and Evolutionary Computation Conference (GECCO), 2024.
- Z. Liang**, Z. Cui, M. Li. *Pareto Landscape: Visualising the Landscape of Multi-objective Optimisation Problems*. Parallel Problem Solving from Nature (PPSN), 2024.
- Z. Liang**, M. Li, P. K. Lehre. *Non-elitist Evolutionary Multi-objective Optimisation: Proof-of-principle Results*. Genetic and Evolutionary Computation Conference Companion (GECCO Companion), 2023.

SKILLS

- Optimisation:** Combinatorial Optimisation, Multi-objective Optimisation, Local Search, Evolutionary Algorithms, Black-box Optimisation, Heuristic Search, Problem Landscapes
- AI / Modelling:** LLM Agents, Agent-Based Simulation, PyTorch, BoTorch, OpenAI API
- Programming / Tools:** Python, C/C++, Java, NumPy, pymoo, jMetal, OpenCV, SLURM
- Video Game Making:** Multi-objective PCG. Experience on RPG Maker series, Game Studio, Inky.