Shizhe Zhao

Curriculum Vitae

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Introduction

My research focuses on core areas of computer science, specifically heuristic search and automated planning, with strong connections to urban computing, the Internet of Things, and robotics. During my PhD research, I developed high-performance algorithms for path planning in various environments. This experience has equipped me with strong skills in implementation, problem-solving, and data analysis.

Research Interests

Other areas that interest me are multi-agent path planning, traffic optimisation, and general problem-solving techniques such as constraint programming, mixed integer programming, and local search. Additionally, I am open to modern techniques for data-driven tasks, such as predict+optimisation and machine learning.

Education

2019–2023 : **PhD, Computer Science**, *Monash University*, Melbourne, Australia.
Supervisors: Daniel Harabor, Peter Stuckey
Dissertation title: *Improving Pruning and Compression Techniques in Path Planning*

2016–2018 : **Master in Information Technology**, *Monash University*, Melbourne, Australia.
Supervisors: David Taniar, Daniel Harabor
Dissertation title: *Fast Obstacle Spatial Query Processing on Navigation Mesh*

2010–2014 : **Bachelor in Art of Recording**, *Xidian University*, Xi'an China.

Research Assistant Experience

04/2023 : **Battery on wheels**, *Urban Computing Lab*, to present.
Supervisor: Prof. Muhammad Aamir Cheema, *Faculty of IT, Monash University*
• Developing an efficient algorithm to optimise an objective function that considers greenhouse gas emissions and operational costs of an electric vehicle for a given trip plan.
• Skills: *Combinatorial Optimisation, Modelling, Python, MiniZinc, Gurobi*

10/2022 : **Time-dependent oracle for route planning**, *Optimisation Group*, 5 months.
Supervisor: Dr. Daniel Harabor, *Faculty of IT, Monash University*
• Developing a route planning software that aware real-time traffic for VIC transportation department.
• It is a continuing project of *Customised shortest paths using a distributed reverse oracle (SoCS2021)*.
• Skills: *C++, Python, Distributed System*

06/2021 : **Grid-based Pathfinding Competition**, *Optimisation Group*, 1 year.
Supervisor: Dr. Daniel Harabor, *Faculty of IT, Monash University*
• Developing dataset, solution validator and management tools for the upcoming GPPC (Grid-based Pathfinding Competition)
• Skills: *C++, Python, Shell Script (bash), Docker*

03/2017 : ***Improving Constraint Programming Model by Log Analysis***, *Optimisation Group*, 4 months.
Supervisor: Dr. Guido Tack, *Faculty of IT, Monash University*
• Applying data mining on semi-structured logs produced by constraint programming solver to improve the model
• Skills: *Data Mining, Constraint Programming, Python*

09/2016 : ***Immersive Data Visualisation***, *SensiLab*, 5 months.
Supervisor: Dr. Tim Dywer, *Faculty of IT, Monash University*
• Developing software to visualize data in VR with interactions.
• Skills: *Unity, C#, Virtual Reality*

07/2016 : ***Constraint Programming Profiler Visualisation***, *Optimisation Group*, 2 months.
Supervisor: Dr. Guido Tack, *Faculty of IT, Monash University*
• Improving the rendering time of a cp-solver visualizer from 200ms to 15ms.
• Skills: *Constraint Programming, C++, Visualisation*

Non-academic Projects

01/2021 : **Online Shopping Packing Optimisation**.
• **Background** A business owner wanted to add a "packaging recommendation" function to his online shopping app for retailers, as they were eager to reduce delivery costs but tired of manual work. He hired a team to develop the function. From the software developers' perspective, many items were associated with various constraints and pricing policies that were difficult to solve using an if-then-else approach. The project failed after an expenditure of 200k AUD.
• **Solution** My friend took over the project and consulted me. From an optimiser's perspective, the core of the problem is a mixed integer programming model, and the scale is small. I quickly implemented a prototype, and they were very satisfied.
• Skills: *Combinatorial Optimisation, Modelling*.

06/2018 : **Melbourne Datathon**, *PTV*, 3 months.
• Applying data mining on the PTV dataset of 1.8 billion Myki touch on/off
• **Highlight** I extracted some commuting patterns, which can be a guidance for better replacement bus plan and building new railways.
• Skills: *Item-set mining*, *Python (pandas, numpy)*, *AWS*

02/2014 : **Backend Engineer**, 18 months.
• Building a user management backend for online business retailer.
• **Highlight** The main challenge is access control for various user types. To avoid developing multiple APIs and front-end pages for different types of users, I implemented a decorator at the backend to generate APIs and render templates automatically.
• Skills: *Python, Flask, AWS*

Publications

Conference

2023 **Shizhe Zhao**, Daniel Harabor, and Peter J. Stuckey. Reducing redundant work in jump point search. In *Proceedings of the 16th International Symposium on Combinatorial Search, SOCS 2023*. AAAI Press, 2023.

2023 Jinchun Du, Bojie Shen, **Shizhe Zhao**, Muhammad Aamir Cheema, and Adel N. Toosi. Efficient object search in game maps. In *Proceedings of International Joint Conference on Artificial Intelligence, IJCAI*, 2023.

2021 Arthur Maheo, **Shizhe Zhao**, Afzaal Hassan, Daniel Damir Harabor, Peter Stuckey, and Mark Wallace. Customised shortest paths using a distributed reverse oracle. In *Proceedings of the Eleventh International Symposium on Combinatorial Search, SOCS*, 2021.

2020 **Shizhe Zhao**, Mattia Chiari, Adi Botea, Alfonso Gerevini, Daniel Harabor, Alessandro Saetti, and Peter J. Stuckey. Bounded suboptimal path planning with compressed path databases. In Nir Lipovetzky, Eva Onaindia, and David Smith, editors, *Proceedings of the 30th International Conference on Automated Planning and Scheduling*. AAAI Press, 2020.

2019 Mattia Chiari, **Shizhe Zhao**, Adi Botea, Alfonso Gerevini, Daniel Harabor, Alessandro Saetti, Matteo Salvetti, and Peter J. Stuckey. Cutting the size of compressed path databases with wildcards and redundant symbols. In Nir Lipovetzky, Eva Onaindia, and David Smith, editors, *Proceedings of the 29th International Conference on Automated Planning and Scheduling*, pages 106–113. AAAI Press, 2019.

2018 **Shizhe Zhao**, David Taniar, and Daniel Damir Harabor. Fast k-nearest neighbor on a navigation mesh. In Vadim Bulitko and Sabine Storandt, editors, *Proceedings of the Eleventh International Symposium on Combinatorial Search, SOCS 2018, Stockholm, Sweden - 14-15 July 2018*, pages 124–132. AAAI Press, 2018.

2018 **Shizhe Zhao**, Daniel D Harabor, and David Taniar. Faster and more robust mesh-based algorithms for obstacle k-nearest neighbour. *arXiv preprint arXiv:1808.04043*, 2018.

Honors & Awards

2016 IEEEXtreme Programming Competition, World Top 5

2016 International Collegiate Programming Contest (ACM/ICPC) South Pacific Ocean Regional Final, 7th

2016 International Collegiate Programming Contest (ACM/ICPC) South Pacific Ocean subregional, 2nd

2013 International Collegiate Programming Contest (ACM/ICPC) Asia Invitational Contest (Nanjing, China), Gold

2013 Math Contest in Modelling (MCM/ICM), Honorable Mention

2012 International Collegiate Programming Contest (ACM/ICPC) Asia Regional Contest (Changchun, China), Bronze

Position of Responsibility

Conference reviewer, *ICAPS, AAAI, AAMAS, SoCS*.

2020-2021 **Organizer and Problem Setter**, *Digital Health Competition*.

2019-2021 **Coach**, *Competitive Programming Group*, Monash University.

2019-2020 **Organizer and Problem Setter**, *Monash Collegiate Programming Contest (MCPC)*.

Teaching Assistantship

2019–2021 **FIT3155: Advance Algorithm and Data Structure**, Monash University.