JING SUN

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Education

Nanyang Technological University (NTU) — Singapore
Ph.D. in Computer Science. — *Aug 2021 – Present*

University of Macao (UM) — Macao, China
Master of Science in Mathematics. — *Sep 2017 – Jun 2019*

Jiangsu Normal University — Jiangsu, China
Bachelor of Applied Statistics. — *Sep 2013 – July 2017*

Background and Research Interests

- During my PhD, my research mainly focuses on **agent modelling in multiagent systems**. I am particularly interested in leveraging deep reinforcement learning to solve challenging decision-making problems in multiagent systems with agent modeling. Furthermore, I also have a great interest in LLM-based agents and apply multi-agent reinforcement learning (MARL) algorithms to solve combinatorial optimization (CO) problems.
- I have a solid foundation in the fields of mathematical analysis and modeling, which published one research paper and won awards in the field of mathematical modeling.

Publication and Preprint

[1] **Jing Sun**, Shuo Chen, Cong Zhang, and Jie Zhang. Decision-making with speculative opponent models. In *IEEE Transactions on Neural Networks and Learning Systems*, 2023. (`TNNLS-2023`, **Accepted**)

[2] **Jing Sun**, Shuo Chen, Cong Zhang, and Jie Zhang. Online adaptation with dynamic teammates in open ad hoc teamwork. In *Proceedings of the 40th conference on uncertainty in artificial intelligence*, 2024. (`UAI-2024`, Under review)

[3] **Jing Sun**, Zhiguang Cao, Wen Song, Yaoxin Wu, Yining Ma, and Jie Zhang. Solving fairness-aware heterogeneous vehicle routing problem with multi-agent reinforcement learning. In *Proceedings of the 30th SIGKDD Conference on Knowledge Discovery and Data Mining*, 2024. (`KDD-2024`, Under review)

[4] **Jing Sun**, Shuo Chen, Cong Zhang, and Jie Zhang. A generic framework for decision-making with speculative opponent model. In *Artificial Intelligent*, 2023. (`AIJ-2023`, Major revision)

[5] **Jing Sun**, Fangwei Zhang, Peicheng Lu, and Janney Yee. Optimized modeling and opportunity cost analysis for overloaded interconnected dangerous goods in warehouse operations. *Applied Mathematical Modelling*, 90:151–164, 2021.

[6] Cong Zhang, Zhiguang Cao, Yaoxin Wu, Wen Song, and **Jing Sun**. Learning topological representations with bidirectional graph attention network for solving job shop scheduling problem. In *Proceedings of the 40th conference on uncertainty in artificial intelligence*, 2024. (`UAI-2024`, Under review)

[7] Jianbo Li and **Jing Sun**. B-spline estimation of single index model with missing data. *Chinese Journal of Applied Probability and Statistics*, 35(5):525–534, 2019.

[8] Zhongjun Wu, Fangwei Zhang, **Jing Sun**, Wenjing Wang, and Xufeng Tang. Novel parameterized utility function on dual hesitant fuzzy rough sets and its application in pattern recognition. *Information*, 10(2):71, 2019.

[9] Jiaru Li, Fangwei Zhang, Qiang Li, **Jing Sun**, Janney Yee, Shuhong Wang, and Shujun Xiao. Novel parameterized distance measures on hesitant fuzzy sets with credibility degree and their application in decision-making. *Symmetry*, 10(11):557, 2018.

[10] Fangwei Zhang, Jianbo Li, Jihong Chen, **Jing Sun**, and Augustine Attey. Hesitant distance set on hesitant fuzzy sets and its application in urban road traffic state identification. *Engineering Applications of Artificial Intelligence*, 61:57–64, 2017.

Research Project Experience

Research Associate, NTU | Advisors: Prof. Zhang Jie *Jan 2022 – present*

I participated in the "Research and Application of Deep Reinforcement Learning in Retail Logistics Supply Chain Optimization" project where I jointly proposed a deep reinforcement learning-based approach to solve the multi-vehicle routing problems.

- We implement two state-of-the-art methods of CVRPTW and compare them with two heuristic baselines (LKH3 and Or-tools), implemented by Python, to illustrate the promise of DRL methods. (DRL methods obtain the optimization advantage by 3.42% and generate solutions up to 3.44 times faster in real-world datasets.)
- We develop cooperative multi-agent deep reinforcement learning (MADRL) techniques to learn fairness policies for Heterogeneous CVRP, implemented by Pytorch.
- Proposed a novel MARL approach to address the fairness-aware heterogeneous vehicle routing problem, and a conference paper is submitted to KDD 2024 (paper [3]).

Research Associate, NTU | Advisors: Prof. Zhang Jie *Feb 2020 – Dec 2021*

I participated in the "RIE 2020 Advanced Manufacturing and Engineering (AME) IAF-PP, Cyber-Physical Production System (CPPS) - Towards Contextual and Intelligent Response" project where I jointly proposed a deep Reinforcement learning-based approach to solve the multi-site inventory problem.

- We utilize DRL techniques to improve the computation speed and obtain a more accurate optimal solution in multi-site inventory management with uncertainty demand and a Technology Disclosure (TD) is under review.

Work Experiences

Research Associate, Faculty of Health Science, University of Macau (UM). *Sep 2019 – Jan 2020*

∗ Engaged in the analysis and prediction of medical data with statistical methods.

Teaching Assistant, School of Computer Science and Engineering, NTU. *Jan 2023 – Present*

∗ Engaged in lab sessions and provided support in grading assignments and exams.

Teaching Assistant, Faculty of Science and Technology, University of Macao. *Sep 2017 – Sep 2019*

∗ Engaged in course preparation, conducted tutorial, and provided support in grading assignments and exams.

Intern, Institute of finance, Chinese Academic of Social Science. *Nov 2015– Mar 2016*

∗ Engaged in the analysis and processing of financial data.

Intern, Bureau of Statistics at Xuzhou. *Jun 2015– Aug 2015*

∗ Engaged in the collection and processing of data.

Skills

Programming Languages: Python, C/C++, Matlab, R, Java, SQL, Cplex
Frameworks & Tools: Pytorch, TensorFlow, Visual Studio Code, Docker, Git, LaTeX
Soft Skill: English Writing; Presentation Skills

Honors and Awards

Second Prize, Mathematical Contest in Modeling (MCM).	2017, China
Third Prize, China Undergraduate Mathematical Contest in Modeling.	2016, China
The excellent graduation thesis, Jiangsu Normal University.	2017, China
The second class scholarship, Jiangsu Normal University.	2015-2016, China
Innovation and Entrepreneurship Competition Outstanding Award.	2015, China

Patent

[1] Fangwei Zhang, **Jing Sun**, Zhongjun Wu, Shuhong Wang, Jiaru Li. A method of dangerous goods warehouse isolation door selection based on hesitation distance set (Application, NO.201811385382.9)

[2] Fangwei Zhang, **Jing Sun**, Zhongjun Wu, Jiaru Li, Shuhong Wang. A method for selecting an isolation door for dangerous goods warehouses (Application, NO. 201811385396.0)

[3] Fangwei Zhang, Jiaru Li, Zhongjun Wu, **Jing Sun**, Shuhong Wang. A method to determine the forklift running route in interconnected warehouse for improving the efficiency of dangerous goods storage and retrieval management. (Application, NO. 201910029182.8)