

Zhen Zhang

Curriculum Vitae

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Employment

- April 2022 - Now **Senior Research Fellow (Level C)**, *The University of Adelaide, Adelaide, Australia*, Supervisor: Prof. Javen Qinfeng Shi.
- Feb., 2020 - April 2022 **Research Fellow (Level B)**, *The University of Adelaide, Adelaide, Australia*, Supervisor: Prof. Javen Qinfeng Shi.
- Aug., 2017 - Jul. 2019 **Research Fellow**, *National University of Singapore, Singapore*, Supervisor: Prof. Lee Wee Sun.

Education

- Sep., 2010 – Jun., 2017 **Ph.D.**, *Northwestern Polytechnical University, Xi'an, China*, Supervisor: Prof. Yanning Zhang.
Thesis: Linear Programming Relaxation based MAP Inference For Graphical Models
- Dec., 2012 – Dec., 2014 **Visiting Ph.D. Student**, *The University of Adelaide, Adelaide, Australia*, Supervisor: Prof. Anton van den Hengel, Prof. Javen Qinfeng Shi.
- Sep., 2006 – Jul., 2010 **Bachelor**, *Northwestern Polytechnical University, Xi'an, China*, GPA: in top 10%.

Research Interests

- Machine Learning: Causality, Graph Neural Networks, Probabilistic Graphical Models
- Computer Vision: Graph Matching, Motion Analysis, Low Level Vision

Highlights

- Google Scholar Statistics:** 1575 citations; h-index 15; Ranked top-30 in Probabilistic Graphical Models worldwide; Ranked top-20 in Causation worldwide.
- Awards:**
 - Achieved 1st place in the Open Catalyst Challenge at NeurIPS 2023 AI for Science, leveraging AI to discover energy materials. Past winners of this prestigious challenge include tech giants Tencent (2022) and Microsoft (2021). NeurIPS is a premium AI venue.
 - Achieved 3rd place (Track 2) and 4th place (Track 1) in the CVPR 2022 NTIRE Challenge on High Dynamic Range Imaging, using novel CNN structures to achieve both high accuracy and high efficiency in reconstructing ghosting-free HDR images. The challenge was highly competitive, with participants including tech giants such as ByteDance, Tencent, Huawei, and others. CVPR is the top computer vision venue.
- Highly influential publications: Highly influential publications:**
 - My work [27] was one of the most widely used baselines for human motion prediction and attracted 389 citations according to Google Scholar.
 - My work [23] was a pioneering work exploring training a dynamic optimizer instead of a static mapper to solve the ill-posed de-convolutional problem. It attracted 130 citations according to Google Scholar.
- Contributions in causality:** My work in causality achieved state-of-the-art performance in differentiable causal discovery [7, 19], and we were the first to provide theoretical guarantees for latent causal discovery through the lens of change [11], allowing complex causal latent variables to be unveiled. These theoretical results lead to new RL and LLM approaches [1, 4].

- **Diverse Collaborations:** Besides machine learning and causality, I have also established collaborations with researchers from diverse scientific communities, including chemistry, biology, chromatography, computational fluid dynamics (CFD), *etc.* My expertise in machine learning and causality helps push research in these areas forward, resulting in top-tier publications in prestigious journals such as JACS (top journal in chemistry) [10], POF (top journal in CFD) [12], and Plant Methods (a highly influential journal in plants) [15].
- **Highly influential project:** I am responsible for developing computer vision modules for a highly influential project called Vitivisor. I design and implement novel machine learning approaches to address the sample efficiency problem in agriculture, enabling accurate and efficient vineyard monitoring and decision-making. The project has been covered by well-known media outlets such as the BBC (<https://www.bbc.com/news/av/technology-57850284>), as well as local media sources.

Teaching and Supervision

- I can deliver a wide range of courses in Machine Learning, Data Science, and Computer Vision for both undergraduate and postgraduate students, drawing upon my expertise as a senior researcher in machine learning, computer vision, deep learning, and causality. My publication list demonstrates my deep understanding of these topics. I have also served as a Course Coordinator and lecturer for courses at both the postgraduate and undergraduate levels.
- I have co-supervised 6 Ph.D. students, one of whom has successfully graduated. During this supervision, one of the students successfully published a paper in a top-tier computer vision conference, ECCV.

Publication Summary

I have authored 26 peer-reviewed papers in machine learning venues, including 17 conferences and 9 journals. Among these publications, 15 (88.2%) of conference papers have been accepted in CORE2023 rank A* conferences such as NeurIPS, ICLR, CVPR, and others, and 7 (77.8%) of my journal papers are featured in CORE2020 rank A* journals like JMLR, TPAMI, IJCV, and more.

Furthermore, I have developed AI models for various scientific communities and have had the privilege of publishing in top-tier journals related to chemistry, plant science, and computational fluid dynamics (CFD) such as JACS, Plant Methods, and PoF.

Working Papers

- [1] Haiyao Cao, Zhen Zhang, Yuhang Liu, Panpan Cai, Jinan Zou, Ehsan Abbasnejad, Biwei Huang, Mingming Gong, Anton Van Den Hengel, and Javen Qinfeng Shi. “Rethinking State Disentanglement in Causal Reinforcement Learning”. In: *Submitted to International Conference on Machine Learning (ICML)* (2025).
- [2] Hamed Damirchi, Ehsan Abbasnejad, Zhen Zhang, and Javen Qinfeng Shi. “Decomposing Task Vectors for Refined Model Editing”. In: *Submitted to International Conference on Computer Vision and Pattern Recognition (CVPR)* (2025).
- [3] Hamed Damirchi, Cristian Rodriguez-Opazo, Ehsan Abbasnejad, Zhen Zhang, and Javen Qinfeng Shi. “The Quest for Winning Tickets in Low-Rank Adapters”. In: *Submitted to International Conference on Machine Learning (ICML)* (2025).
- [4] Yuhang Liu, Dong Gong, Erdun Gao, Zhen Zhang, Biwei Huang, Mingming Gong, Anton Van Den Hengel, and Javen Qinfeng Shi. “I Predict Therefore I Am: Is Next Token Prediction Enough to Learn Human-Interpretable Concepts from Data?”. In: *Submitted to International Conference on Machine Learning (ICML)* (2025).
- [5] Yuhang Liu, Zhen Zhang, Dong Gong, Erdun Gao, Biwei Huang, Mingming Gong, Anton Van Den Hengel, Kun Zhang, and Javen Qinfeng Shi. “Silver Linings: On the Types of Distribution Shifts that Enhance Identifiability in Causal Representation Learning”. In: *Submitted to International Conference on Machine Learning (ICML)* (2025).
- [6] Yuhang Liu, Zhen Zhang, Dong Gong, Mingming Gong, Biwei Huang, Anton Van Den Hengel, Kun Zhang, and Javen Qinfeng Shi. “Identifying Weight-Variant Latent Causal Models”. In: *submitted to Journal of Machine Learning Research (JMLR)* (2024).

Published Papers

- [7] Zhen Zhang, Ignavier Ng, Dong Gong, Yuhang Liu, Mingming Gong, Biwei Huang, Kun Zhang, Anton van den Hengel, and Javen Qinfeng Shi. “Analytic DAG Constraints for Differentiable DAG Learning”. In: *The Thirteenth International Conference on Learning Representations*. 2025.
- [8] Yichao Cai, Yuhang Liu, Zhen Zhang, and Javen Qinfeng Shi. “CLAP: Isolating Content from Style Through Contrastive Learning with Augmented Prompts”. In: *European Conference on Computer Vision*. Springer. 2024, pp. 130–147.
- [9] Liang Chen, Yong Zhang, Yibing Song, Zhen Zhang, and Lingqiao Liu. “A Causal Inspired Early-Branching Structure for Domain Generalization”. In: *International Journal of Computer Vision* (2024), pp. 1–21.
- [10] Haobo Li, Xinyu Li, Pengtang Wang, Zhen Zhang, Kenneth Davey, Javen Qinfeng Shi, and Shi-Zhang Qiao. “Machine Learning Big Data Set Analysis Reveals C–C Electro-Coupling Mechanism”. In: *Journal of the American Chemical Society* 146.32 (2024), pp. 22850–22858.
- [11] Yuhang Liu, Zhen Zhang, Dong Gong, Mingming Gong, Biwei Huang, Anton van den Hengel, Kun Zhang, and Javen Qinfeng Shi. “Identifiable Latent Polynomial Causal Models through the Lens of Change”. In: *The Twelfth International Conference on Learning Representations*. 2024.
- [12] Xinchun Zhang, Zhen Zhang, Alfonso Chinnici, Zhiwei Sun, Javen Qinfeng Shi, Graham J Nathan, and Rey C Chin. “Physics-informed data-driven unsteady Reynolds-averaged Navier–Stokes turbulence modeling for particle-laden jet flows”. In: *Physics of Fluids* 36.5 (2024).
- [13] Xinyu Li, Haobo Li, Zhen Zhang, Javen Qinfeng Shi, Yan Jiao, and Shi-Zhang Qiao. “Active-learning accelerated computational screening of A2B@NG catalysts for CO₂ electrochemical reduction”. In: *Nano Energy* 115 (2023), p. 108695.
- [14] Jiajun Meng, Zhenhua Wang, Kaining Ying, Jianhua Zhang, Dongyan Guo, Zhen Zhang, Javen Qinfeng Shi, and Shengyong Chen. “Human Interaction Understanding with Consistency-Aware Learning”. In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* (2023).
- [15] Phetdalaphone Pathoumthong, Zhen Zhang, Stuart J Roy, and Abdeljalil El Habti. “Rapid non-destructive method to phenotype stomatal traits”. In: *Plant Methods* 19.1 (2023), pp. 1–9.
- [16] Qingsen Yan, Dong Gong, Pei Wang, Zhen Zhang, Yanning Zhang, and Javen Qinfeng Shi. “SharpFormer: Learning local feature preserving global representations for image deblurring”. In: *IEEE Transactions on Image Processing* 32 (2023), pp. 2857–2866.
- [17] Zhen Zhang, Mohammed Haroon Dupty, Fan Wu, Javen Qinfeng Shi, and Wee Sun Lee. “Factor Graph Neural Networks”. In: *Journal of Machine Learning Research* 24.181 (2023), pp. 1–54. URL: <http://jmlr.org/papers/v24/21-0434.html>.
- [18] Yanzhang Zhao, Huan Li, Jieqiong Shan, Zhen Zhang, Xinyu Li, Javen Qinfeng Shi, Yan Jiao, and Haobo Li. “Machine Learning Confirms the Formation Mechanism of a Single-Atom Catalyst via Infrared Spectroscopic Analysis”. In: *The Journal of Physical Chemistry Letters* 14.49 (2023), pp. 11058–11062.
- [19] Zhen Zhang*, Ignavier Ng*, Dong Gong, Yuhang Liu, Ehsan M Abbasnejad, Mingming Gong, Kun Zhang, and Javen Qinfeng Shi. “Truncated Matrix Power Iteration for Differentiable DAG Learning”. In: *NeurIPS*, (* equal contribution) (2022).
- [20] Dong Gong, Zhen Zhang, Javen Qinfeng Shi, and Anton van den Hengel. “Memory-Augmented Dynamic Neural Relational Inference”. In: *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*. Oct. 2021, pp. 11843–11852.
- [21] Yujiao Hu, Zhen Zhang, Yuan Yao, Xingpeng Huyan, Xingshe Zhou, and Wee Sun Lee. “A bidirectional graph neural network for traveling salesman problems on arbitrary symmetric graphs”. In: *Engineering Applications of Artificial Intelligence* 97 (2021), p. 104061.
- [22] Mohammed Haroon Dupty, Zhen Zhang, and Wee Sun Lee. “Visual Relationship Detection with Low Rank Non-Negative Tensor Decomposition”. In: *AAAI Conference on Artificial Intelligence* (2020).

- [23] Dong Gong*, Zhen Zhang*, Qinfeng Shi, Anton van den Hengel, Chunhua Shen, and Yanning Zhang. “Learning an Optimizer for Image Deconvolution”. In: *IEEE Transactions on Neural Networks and Learning Systems*, (* equal contribution) (2020).
- [24] Xuan Su, Wee Sun Lee, and Zhen Zhang. “Multiplicative Gaussian Particle Filter”. In: *AISTATS*. 2020.
- [25] Zhen Zhang, Fan Wu, and Wee Sun Lee. “Factor Graph Neural Network”. In: *NeurIPS* (2020).
- [26] Zhen Zhang and Wee Sun Lee. “Deep Graphical Feature Learning for the Feature Matching Problem”. In: *Proceedings of the IEEE International Conference on Computer Vision*. 2019.
- [27] Chen Li*, Zhen Zhang*, Gim Hee Lee, and Wee Sun Lee. “Convolutional Sequence to Sequence Model for Human Dynamics”. In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, (* equal contribution). 2018.
- [28] Suwichaya Suwanwimolkul, Lei Zhang, Dong Gong, Zhen Zhang, Chao Chen, Damith C Ranasinghe, and Javen Qinfeng Shi. “An adaptive markov random field for structured compressive sensing”. In: *IEEE Transactions on Image Processing* 28.3 (2018), pp. 1556–1570.
- [29] Zhen Zhang, Julian McAuley, Yong Li, Wei Wei, Yanning Zhang, and Qinfeng Shi. “Dynamic Programming Bipartite Belief Propagation For Hyper Graph Matching”. In: *International Joint Conference on Artificial Intelligence*. 2017.
- [30] Zhen Zhang, Qinfeng Shi, Julian McAuley, Wei Wei, Yanning Zhang, Rui Yao, and Anton van den Hengel. “Solving constrained combinatorial optimisation problems via MAP inference without high-order penalties”. In: *AAAI Conference on Artificial Intelligence*. 2017.
- [31] Seyed H. Rezatofighi, Anton Milan, Zhen Zhang, Qinfeng Shi, Anthony Dick, and Ian Reid. “Joint Probabilistic Matching Using m-Best Solutions”. In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2016.
- [32] Rui Yao, Shixiong Xia, Zhen Zhang, and Yanning Zhang. “Real-time Correlation Filter Tracking by Efficient Dense Belief Propagation with Structure Preserving”. In: *IEEE Transactions on Multimedia* PP.99 (2016), pp. 1–1.
- [33] Zhen Zhang, Qinfeng Shi, Julian McAuley, Wei Wei, Yanning Zhang, and Anton van den Hengel. “Pairwise Matching through Max-Weight Bipartite Belief Propagation”. In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2016.
- [34] Seyed Hamid Rezatofighi, Anton Milan, Zhen Zhang, Qinfeng Shi, Anthony Dick, and Ian Reid. “Joint Probabilistic Data Association Revisited”. In: *Proceedings of the IEEE International Conference on Computer Vision*. 2015, pp. 3047–3055.
- [35] Minghui Tan, Qinfeng Shi, Anton van den Hengel, Chunhua Shen, Junbin Gao, Fuyuan Hu, and Zhen Zhang. “Learning graph structure for multi-label image classification via clique generation”. In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2015, pp. 4100–4109.
- [36] Zhen Zhang and Yanning Zhang. “Variable kernel density estimation based robust regression and its applications”. In: *Neurocomputing* 134 (2014), pp. 30–37.

Service

Webchair of Australin Joint Conference on Artificial Intelligence 2024. Reviewer for top-tier venues including ICCV, CVPR, ICLR, and NeurIPS, and also other regional venues such as ACML, ACCV. Received Top Reviewers Award in NeurIPS 2022.

Other Information

Developing Languages and Platforms:

1. **C++, Python, Matlab:** Expert
2. **Linux:** Expert
3. **Tensorflow & Pytorch** Expert

Languages:

1. **Chinese:** Fluent, Mother-tongue
2. **English:** Fluent