Wanqi Zhou

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Xi'an, Shannxi - China

EDUCATION

• **Xi'an Jiaotong University** *Sept. 2019 - Jun. 2025*

Ph.D. candidate. of Control Science and Technology Shaanxi, China

◦ Advisor: Badong Chen

◦ Research Interests: Causal discovery; Information Theory; Domain Adaptation/ Generalization; LVLM;

• **RIKEN Center for Advanced Intelligence Project [⊕]** *Aug. 2023 - Nov. 2024*

International Program Associate (IPA) in Tensor Learning Team Tokyo, Japan

◦ Advisor: Qibin Zhao

◦ Research Interests: Causal discovery; Adversarial Defense, Visual-Language Model

• **Shandong University** *Sept. 2015 - Feb. 2019*

Bachelor of Engineering Shandong, China

◦ Thesis title: Stochastic Fourier Adaptive Algorithm based on MEE-MCC.

PUBLICATIONS C=CONFERENCE, J=JOURNAL, S=IN SUBMISSION

I. Causal Learning in Machine Learning

[C.1] **Wanqi Zhou**, Shuanghao Bai, Shujian Yu, Qibin Zhao, Badong Chen. Jacobian Regularizer-based Neural Granger Causality. In International Conference on Machine Learning (ICML). 2024. [Paper] [⊙]

[J.1] **Wanqi Zhou**, Shujian Yu, Badong Chen. Causality Detection with Matrix-based Transfer Entropy. In Information Sciences (INS). 2022. [Paper] [⊙]

[J.2] **Wanqi Zhou**, Shuanghao Bai, Yicong He, Badong Chen. An Information-Theoretic Approach for Heterogeneous Differentiable Causal Discovery. In Neural Networks (NN). 2025 [Paper]

II. Generalization in Vision-Language Models

[C.1] Shuanghao Bai*, Yuedi Zhang*, **Wanqi Zhou**, Zhirong Luan, and Badong Chen. Soft Prompt Generation for Domain Generalization. In European Conference on Computer Vision (ECCV). 2024. [Paper] [⊙]

[C.2] Shuanghao Bai, Min Zhang, **Wanqi Zhou**, Siteng Huang, Zhirong Luan, Donglin Wang, and Badong Chen. Prompt-based Distribution Alignment for Unsupervised Domain Adaptation. In Proceedings of the AAAI Conference on Artificial Intelligence (AAAI). 2024. [Paper] [⊙]

[C.3] Shuanghao Bai, **Wanqi Zhou**, Zhirong Luan, Donglin Wang, and Badong Chen. Improving Cross-domain Few-shot Classification with Multilayer Perceptron. In IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2024. [Paper] [⊙]

[C.4] Haoran Zhang*, Shuanghao Bai*, **Wanqi Zhou**, Jingwen Fu, and Badong Chen. PromptTA: Prompt-driven Text Adapter for Source-free Domain Generalization. In IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2025. [Paper] [⊙]

[S.2] **Wanqi Zhou**, Shuanghao Bai, Danilo P. Mandic, Qibin Zhao, Badong Chen. Revisiting the Adversarial Robustness of Vision Language Models: a Multimodal Perspective. ArXiv preprint arXiv:2404.19287. [Paper] [⊙]

III. Robot Learning

[S.2] Shuanghao Bai, **Wanqi Zhou**, Pengxiang Ding, Wei Zhao, Donglin Wang, Badong Chen. Rethinking Latent Representations in Behavior Cloning: An Information Bottleneck Approach for Robot Manipulation. arXiv preprint arXiv:2502.02853. [Paper] [⊙]

PROJECTS

• **Multi-Core Mutual Information Entropy Learning Theory and Methods** *Jan. 2020 - Dec. 2023*
National Natural Science Foundation of China (NSFC) General Program

During my participation in this project, I proposed a **matrix-based transfer entropy estimation method** that effectively circumvents the need for direct probability density function estimation. My key contributions include introducing **Matrix Conditional Transfer Entropy** and **Matrix Higher-Order Transfer Entropy**, which were used to model **indirect causal relationships, common causal relationships, and synergistic causal relationships** among multiple variables. Extensive experiments demonstrated the effectiveness of the proposed algorithms. The results were published in [J.1].

• **Cognitive Computing** *Jan. 2021 - Dec. 2025*
NSFC Basic Science Center Program

I contributed to the writing and execution of the proposal for this project. Addressing the limitations of existing **neural network-based Granger causality algorithms**, I proposed an innovative training method. Most current approaches rely on **sparsity constraints on the first-layer network parameters**, requiring a set of single-variable predictive models—each corresponding to one dimension—to decouple and learn Granger causality, leading to high complexity and suboptimal performance. Instead, I introduced a **Jacobian matrix constraint** between inputs and outputs, enabling a **single multivariate-to-multivariate prediction network** to learn Granger causality more effectively. Extensive experiments validated the effectiveness of the proposed algorithm, with results published in [C.1].

• **Cloud-Edge-Device Robot Platform** *Sept. 2022 - Dec. 2025*
NSFC Key Program

I contributed to the proposal writing and project execution.

• **Addressing the Generalization of CLIP Models:** I led three junior researchers in publishing three papers on this topic: **AAAI 2024 [C.2], ECCV 2024 [C.1], and ICASSP 2025 [C.4].**

  ◦ The **AAAI paper** introduced a **feature fusion module** for **prompt tuning CLIP**, enhancing its domain adaptation capability.

  ◦ The **ECCV paper** explored **prompt tuning from a generative perspective**. By constructing **prompt labels** for each training domain and utilizing **Conditional GANs (CGANs)**, we learned to generate domain-specific prompts, improving CLIP's domain generalization.

  ◦ The **ICASSP paper** focused on **text-based innovation**, where we learned **K styles of prompts** and incorporated an **adapter** to optimize CLIP's text classification generalization, indirectly enhancing its performance in vision tasks.

• **Exploring Embodied Intelligence:** I led three junior researchers in investigating this area.

  ◦ Our **ICML 2025 (under review)** paper [S.2] studies **feature redundancy from an information-theoretic perspective** and proposes using the **Information Bottleneck (IB) principle** to enhance **visual imitation learning**.

  ◦ We developed a **multimodal dataset and a multimodal grasp generation network**, aiming to create a **robot grasping model capable of understanding multimodal information**. This project is currently in the testing phase and is expected to be released publicly between **March and April 2025**.

HONORS AND AWARDS

• **Outstanding Graduate Student of Xi'an Jiaotong University.** *Dec. 2020,2022,2023*
• **National First Prize in the BCI Brain-Controlled Robot Competition at the 2021 World Robot Competition.** *Sep. 2021*
• **Outstanding Undergraduate Graduates of Shandong University** *Dec. 2019*
• **National First Prize in the Photoelectric Four-Wheel Group, The 13th National College Student NXP Intelligent Car Competition.** *Sep. 2018*
• **National Scholarship** *Sep. 2018, 2016*

ACADEMIC SERVICE

• **Conference Reviewer:** ACM MM 2024, ACML 2024, ICDM 2024, AAAI 2025, CVPR 2025

SKILLS

• **Programming Languages:** Python, MATLAB, Pytorch, C, LaTeX
• **Languages:** Mandarin Chinese, English