Junyi Chai

PhD student, Elmore Family School of Electrical and Computer Engineering, Purdue University
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RESEARCH INTERESTS

Trustworthy Machine Learning, with particular interests in **Fairness in Machine Learning** and **Debiasing in Machine Learning**

EDUCATION

Purdue University, Indiana, USA 09/2021 — present
PhD student in Computer Engineering
Advisor: Professor Xiaoqian Wang

Purdue University, Indiana, USA 08/2020 — 09/2021
MS student in Computer Engineering (transferred to PhD program)

Xidian University, Shaanxi Province, China 09/2016 — 06/2020
Bachelor of Engineering in Aerospace Science and Technology
Advisor: Professor Hai Wang

INDUSTRY EXPERIENCE

Research Intern, SONY AI Ethics 06/2025 — 09/2025
Advisor: Dr. Shruti Nagpal

- Research on face recognition benchmarks.

PUBLICATIONS

Conference Publications

- **Chai, Junyi**, Taeuk Jang, Jing Gao, and Xiaoqian Wang. "On the Alignment between Fairness and Accuracy: from the Perspective of Adversarial Robustness." International Conference on Machine Learning (ICML), 2025, *acceptance rate: 26.9% (3,260/12,107).*
- **Chai, Junyi**, Shenyu Lu, and Xiaoqian Wang. "Identifying and Mitigating Spurious Correlation in Multi-Task Learning." IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR), 2025, *acceptance rate: 22.1% (2878/13,008).*
- Lu, Shenyu, **Junyi Chai**, and Xiaoqian Wang. "Mitigating Spurious Correlations in Zero-Shot Multimodal Models." International Conference on Learning Representations (ICLR), 2025, *acceptance rate: 31.2% (3646/11,672).*
- Jung, Hoin, **Junyi Chai**, and Xiaoqian Wang. "Adversarial Latent Feature Augmentation for Fairness." International Conference on Learning Representations (ICLR), 2025, *acceptance rate: 31.2% (3646/11,672).*

- Lu, Shenyu, **Junyi Chai**, and Xiaoqian Wang. "Neural Collapse Inspired Debiased Representation Learning for Min-max Fairness." ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), 2024, *acceptance rate: 20.1% (411/2046).*
- **Chai, Junyi**, and Xiaoqian Wang. "Fairness with adaptive weights." International Conference on Machine Learning (ICML), 2022, *acceptance rate: 21.9% (1235/5630).*
- **Chai, Junyi**, and Xiaoqian Wang. "Self-supervised fair representation learning without demographics." Advances in Neural Information Processing Systems (NeurIPS), 2022, *acceptance rate: 25.7% (2672/10411).*
- **Chai, Junyi**, Taeuk Jang, and Xiaoqian Wang. "Fairness without demographics through knowledge distillation." Advances in Neural Information Processing Systems (NeurIPS), 2022, *acceptance rate: 25.7% (2672/10411).*

Journal Publications

- Li, Linlin, Xu Wang, **Junyi Chai**, Xiaoqian Wang, Adrian Buganza-Tepole, and David M. Umulis. "Determining the role of advection in patterning by bone morphogenetic proteins through neural network model-based acceleration of a 3D finite element model of the zebrafish embryo." Frontiers in Systems Biology, 2022.
- Ma, Fengji*, **Junyi Chai***, and Hai Wang. "Two-dimensional compact variational mode decomposition-based low-light image enhancement." IEEE Access 7 (2019): 136299-136309. (*: equal contribution)

AWARDS

CVPR Travel Grant Award 2025
Hugh W. and Edna M. Donnan Fellowship, Purdue University 2025
NeurIPS Travel Grant Award 2022
ICML Travel Grant Award 2022
First-Class Scholarship, Xidian University 2017

RESEARCH EXPERIENCE

Understanding Trade-Offs in Debiased Generative Models 11/2024 — Current
Advisor: Professor Xiaoqian Wang

- Conducted research on issues of factuality and consistency in debiased generative models.
- Proposed a prompt engineering method for debiasing text-to-image generation while preserving factuality and consistency; improved both metrics by $\sim 40\%$ compared with baselines.
- Drafted a research paper and submitted to NeurIPS 2025.

Mitigating Spurious Correlations in Multi-Task Learning 03/2024 — 11/2024
Advisor: Professor Xiaoqian Wang

- Conducted research on identification of spurious correlations in multi-task learning.
- Proposed a novel method for identifying intra-task spurious correlations, achieving leading performance over baselines.
- Work accepted in CVPR 2025.

Fair Machine Learning with Distributional Awareness 01/2023 — 03/2024

Advisor: Professor Xiaoqian Wang

- Conducted research on fairness-utility trade-offs and robustness against adversarial attacks targeting fairness.
- Proposed a novel formulation for characterizing Pareto optimal fairness-utility trade-off.
- Proposed a novel framework for defending against adversarial attacks targeting fairness; improved adversarial robustness by over 50% compared to baselines.
- Work accepted in ICML 2025.

Fair Machine Learning with Data-Driven Insights 09/2021 — 12/2022

Advisor: Professor Xiaoqian Wang

- Conducted research on reweighing-based methods to enforce fairness in machine learning models.
- Improved fairness metrics by $\sim 25\%$ compared to baselines.
- Work published in ICML 2022 and NeurIPS 2022.

AI-Supported Biological Modeling Acceleration 08/2021 — 08/2023

EMBRIO Institute, Purdue University

Research Assistant, Advisor: Professor Xiaoqian Wang

- Conducted research on acceleration of PDE solver based on neural network.
- Reduced PDE solving time to less than 1% of numerical PDE toolbox while maintaining maximum estimation error up to 0.02 compared to numerical PDE toolbox.
- Work published in Frontiers in Systems Biology 2022.

VMD-Guided Image Enhancement 06/2018 — 09/2019

School of Aerospace Science and Technology, Xidian University

Undergraduate Research Assistant, Advisor: Professor Hai Wang

- Conducted research on image enhancement. Work published in IEEE Access 2019.

TEACHING EXPERIENCE

Artificial Intelligence 08/2024 — 12/2024

Teaching Assistant, with Professor Xiaoqian Wang and Professor Chaoyue Liu

Lumped Linear Systems 01/2024 — 05/2024

Teaching Assistant, with Professor Jianghai Hu

Applied Algorithms 08/2023 — 12/2023

Teaching assistant, with Professor Cheng-Kok Koh

SELECTED COURSEWORK

MA 69200, Matrix Methods for Data Science Fall 2023, Grade: A

MA 59800, Convex Optimization Spring 2023, Grade: A

ECE 59500, Machine Learning Spring 2021, Grade: A

ECE 60200, Computational Models and Methods Fall 2020, Grade: A

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, LATEX
Machine Learning Frameworks: PyTorch, Scikit-Learn
Languages: English, Mandarin

PROFESSIONAL ACTIVITIES

Conference Reviewer

- Conference on Neural Information Processing Systems (NeurIPS) 2022, 2023, 2024, 2025
- AAAI Conference on Artificial Intelligence (AAAI) 2024
- ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD) 2024
- European Conference on Computer Vision (ECCV) 2024
- IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR) 2025
- International Conference on Computer Vision (ICCV) 2025
- International Conference on Artificial Intelligence and Statistics (AISTATS) 2024
- International Conference on Machine Learning (ICML) 2025
- International Conference on Learning Representations (ICLR) 2026

Journal Reviewer

- Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Big Data (TBD)
- ACM Transaction on Intelligent Systems and Technology (TIST)