Fengchun **Qiao**

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Research Interests

My research focuses on advancing Out-of-Distribution (OoD) generalization by developing robust and trustworthy AI systems for dynamic, real-world environments. I establish rigorous theoretical foundations by integrating principles from *robust optimization*, *graph theory*, and *combinatorial optimization* to design mathematically principled frameworks for AI reliability. These theoretical advances are translated into scalable algorithmic innovations, validated through impactful applications in *environmental monitoring*, *marine science*, and *urban planning*. With publications in top-tier AI/ML conferences such as ICML, ICLR, NeurIPS, and CVPR, my work bridges the gap between theory and practice.

Education

University of Delaware — *Newark, DE, USA*
Ph.D. in Computer Science — *February 2020 - Present*

University of Chinese Academy of Sciences — *Beijing, China*
M.S. in Computer Science — *September 2016 - June 2019*

Beijing Forestry University — *Beijing, China*
B.Eng. in Electronic and Information Technology — *September 2012 - June 2016*

Experience

Deep-REAL Lab, University of Delaware — *Newark, DE USA*
Research Assistant. Advised by Prof. Xi Peng — *September 2022 - Present*

- Single Domain Generalization [**CVPR′20 (Citations: 500+), CVPR′21, TPAMI′22**]
- Topology-informed Out-of-Distribution Generalization [**ICLR′23** , **ICML′24**]
- Explainable Out-of-Distribution Generalization [**CVPR′23**]
- Continual Test-Time Adaptation via Self-Supervised Learning [**CIKM′24**]
- Vision-Language Datasets and Models for Seafloor Mapping [**NeurIPS′24 Datasets and Benchmarks Track**]

Amazon Web Services (AWS) AI Labs — *Remote*
Applied Scientist Intern. Advised by Dr. Gukyeong Kwon and Dr. Zhiguo Wang — *June 2021 - August 2021*

- Vision-Language Models, Multimodal Learning [**CSoNet′24**]
  - We utilize the CLIP model to develop probabilistic models for multimodal retrieval.

Institute of Software, Chinese Academy of Sciences — *Beijing, China*
Research Assistant. Advised by Prof. Hui Chen — *September 2016 - June 2019*

- Generative AI [**CASA′18**]
  - We utilize Generative Adversarial Networks (GANs) for facial expression synthesis.
- Robust Facial Expression Recognition [**ACII Asia′18, Acta Automatica Sinica′18**]

Publications

Conference Proceedings

C10. K. Nguyen, **F. Qiao**, and X. Peng. "Adaptive Cascading Network for Continual Test-Time Adaptation." In *Conference on Information and Knowledge Management (**CIKM**)*, 2024 (Co-first author).

C9. K. Nguyen, **F. Qiao**, A. Trembanis, and X. Peng. "SeafloorAI: A Large-scale Vision-Language Dataset for Seafloor Geological Survey." In *Neural Information Processing Systems (**NeurIPS**) Datasets and Benchmarks Track*, 2024.

C8. **F. Qiao** and X. Peng. "Calibrating Probabilistic Embeddings for Cross-Modal Retrieval." In *International Conference on Computational Data and Social Networks. (**CSoNet**)*, 2024.

C7. **F. Qiao** and X. Peng. "Ensemble Pruning for Out-of-distribution Generalization." In *International Conference on Machine Learning (**ICML**)*, 2024.

C6. T. Li, **F. Qiao**, M. Ma, and X. Peng. "Are Data-driven Explanations Robust against Out-of-distribution Data?." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2023.

C5. **F. Qiao** and X. Peng. "Topology-aware Robust Optimization for Out-of-Distribution Generalization." In *International Conference on Learning Representations (**ICLR**)*, 2023.

C4. **F. Qiao** and X. Peng. "Uncertainty-guided Model Generalization to Unseen Domains." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2021.

C3. **F. Qiao**, L. Zhao, and X. Peng. "Learning to Learn Single Domain Generalization." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2020.

C2. Z. Jiao, **F. Qiao**, N. Yao, Z. Li, H. Chen, and H. Wang. "An Ensemble of VGG Networks for Video-Based Facial Expression Recognition." In *Asian Conference on Affective Computing and Intelligent Interaction (**ACII Asia**)*, 2018.

C1. **F. Qiao**, N. Yao, Z. Jiao, Z. Li, H. Chen, and H. Wang. "Emotional Facial Expression Transfer From a Single Image via Generative Adversarial Nets." In *International Conference on Computer Animation and Social Agents (**CASA**)*, 2018.

Journals

J2. X. Peng, **F. Qiao**, and L. Zhao. "Out-of-Domain Generalization From a Single Source: An Uncertainty Quantification Approach." *IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**)*, IEEE, 2022. (Impact Factor: 23.6).

J1. N. Yao, Q. Guo, **F. Qiao**, H. Chen, and H. Wang. "Robust Facial Expression Recognition with GANs." *Acta Automatica Sinica*, 2018.

Preprints and Workshops

T2. **F. Qiao** and X. Peng. "Graph-Relational Distributionally Robust Optimization." *NeurIPS 2022 Workshop on Distribution Shifts*, 2022.

T1. **F. Qiao**, N. Yao, Z. Jiao, Z. Li, H. Chen, and H. Wang. "Geometry-contrastive GAN for Facial Expression Transfer." *arXiv*, 2018.

Professional Services

Conference reviewer/Program committee

- ICLR 2024-2025, ICML 2022-2024, NeurIPS 2022-2024, AISTATS 2025, AAAI 2023-2025, IJCAI 2024-2025, CVPR 2024, ICCV 2023, ECCV 2024, BMVC 2024, CoLLAs 2023-2024

Journal Reviewer

- TPAMI, TNNLS, TIP, TMM, TCSVT, TIM

Honors & Awards

2024 **Frank A. Pehrson Graduate Student Award for Outstanding Computer Science Research**, University of Delaware
2022 **NeurIPS 2022 Top Reviewer Award**
2022 **Outstanding Graduate Student Award**, University of Delaware
2021 **Distinguished Graduate Student Award**, University of Delaware
2018 **National Scholarship for Graduate Students**, Ministry Of Education of the People's Republic of China

Teaching

Spring 2025 **Instructor** for CISC 484 (Machine Learning)
Summer 2024 **Instructor** for CISC 484/684 (Machine Learning)
Spring 2024 Teaching Assistant for CISC 684 (Machine Learning)
Spring 2022 Teaching Assistant for CISC 320 (Introduction to Algorithms)
Fall 2021 Teaching Assistant for CISC 484 (Machine Learning), CISC 621 (Algorithm Design and Analysis).
Spring 2021 Teaching Assistant for CISC 484/684 (Machine Learning).
Fall 2020 Teaching Assistant for CISC 481 (Artificial Intelligence), CISC 482 (Introduction to Human-Computer Interaction).