# 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. Supported by substantial external funding, including *NSF CAREER*, *III*, *SELS*, and *D-ISN* grants, as well as *Department of Defense* support, my research underscores its scientific merit and societal impact, contributing to trustworthy AI systems that are reliable, interpretable, and resilient to operational uncertainties.

## 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

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).