

Xiao Liu

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Research Interests: Artificial Intelligence, Computer Vision, Low-Level Vision

Personal Profile

Xiao Liu is a Ph.D. candidate at Sichuan University. His research spans artificial intelligence and computer vision, with a focus on real-world image restoration and enhancement. His work addresses challenges in complex degradation modeling, efficient neural network design, and high-quality image reconstruction under computational constraints. He aims to develop unified frameworks that bridge theoretical modeling and practical deployment, with particular emphasis on real-world image enhancement and lightweight vision systems.
He has published seven first-author papers in leading international journals and conferences, including IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Multimedia, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Industrial Informatics, Knowledge-Based Systems, ACM Multimedia, and the European Conference on Artificial Intelligence.

Education

Sichuan University, Chengdu, Sichuan, China — 2024 – Present
Information and Communication Engineering — *Ph.D*

Sichuan University, Chengdu, Sichuan, China — 2021 – 2024
Electronic Science and Technology — *M.S.*

Chengdu University of Information Technology, Chengdu, Sichuan, China — 2017 – 2021
Electronic Science and Technology — *B.S.*

Research Projects

Huawei Industry Challenge: Real-Time Video Super-Resolution on Resource-Constrained Devices (Aug. 2024 – Dec. 2024)

- Led the overall design and technical development of an industry challenge project for Huawei Cloud Core Network Convergence, developing a deep neural network-based video super-resolution algorithm for on-device enhancement.
- Adapted and optimized inference for a 2T-compute NPU platform, upscaling 480p video to 1080p at 30 fps with end-to-end latency below 50 ms and a VMAF score above 90.
- Successfully completed the Huawei Cloud Core Network industry challenge; the outcome was recognized for its practical value and received Huawei's Spark Award.

Real-World Image Super-Resolution Based on Domain Modeling and Analysis (National Natural Science Foundation of China General Program) (Dec. 2022 – Dec. 2025)

- Degradation modeling: Studied coupled real-world degradations, including camera shake, motion blur, noise, downsampling, compression artifacts, and channel interference, to provide degradation priors and training data for high-fidelity image reconstruction.
- Network design: Investigated lightweight super-resolution architectures by analyzing connections between convolution and self-attention in feature modeling, spatial interaction, and global dependency representation; translated insights from Transformers into design principles for efficient convolutional networks.
- On-device deployment: Studied lightweight architectures, model quantization, and inference acceleration to improve reconstruction quality and efficiency on low-power, resource-constrained devices.

Publications

- **Xiao Liu**, Xiuya Shi, Yizhong Pan, Shuhang Gu, Wei Liu, Chao Ren. D2S-RSG-SSD: Dual Double-Sampling with Random Sub-Samples Generation for Self-Supervised Real Image Denoising[J]. IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE TPAMI), 2026, 48(7): 7766-7783. (JCR-Q1, CAS Q1-TOP, IF=20.4)
- **Xiao Liu**, Xiaofeng Wang, Chao Ren. Progressive Supervision with Disentangled Learning and Density-Aware for Image Dehazing from Unpaired Clean and Hazy Images[J]. IEEE Transactions on Multimedia (IEEE TMM). online. (JCR-Q1, IF=9.9)
- **Xiao Liu**, Xiaofeng Wang, Shouyi Wang, Haosong Gou, Zhengyong Wang, Chao Ren. GBPG-Net: Global background prior-guided rain and snow image restoration[J]. IEEE Transactions on Neural Networks and Learning Systems (IEEE TNNLS), 2025, 36(10): 18448-18462. (JCR-Q1, CAS Q1-TOP, IF=9.7)
- **Xiao Liu**, Zhengyong Wang, Hong Yang, Xiaohai He, Haosong Gou, Chao Ren. Transformer-style convolutional network for efficient natural and industrial image superresolution[J]. IEEE Transactions on Industrial Informatics (IEEE TII), 2025, 21(7): 5138-5149. (JCR-Q1, CAS Q1-TOP, IF=9.8)
- **Xiao Liu**, Xiaofeng Wang, Zhengyong Wang, Xiaohai He, Chao Ren. Real-world blind image super-resolution with mixed and probabilistic scheme based synthetic degradation pipeline[J]. Knowledge-Based Systems (KBS), 2025, 331: 114643. (JCR-Q1, CAS Q1-TOP, IF=8.0)
- **Xiao Liu**, Xiuya Shi, Lufei Chen, Linbo Qing, Chao Ren. Efficient parallel multi-scale detail and semantic encoding network for lightweight semantic segmentation[C]. Proceedings of the ACM International Conference on Multimedia (ACM MM), 2023: 2544-2552. (CCF-A)
- **Xiao Liu**, Xiangyu Liao, Xiuya Shi, Linbo Qing, Chao Ren. Efficient information modulation network for image super-resolution[C]. Proceedings of the European Conference on Artificial Intelligence (ECAI), 2023: 1544-1551. (CCF-B)
- Jie Huang, **Xiao Liu**, Yizhong Pan, Xiaohai He, Chao Ren. CasaPuNet: Channel affine self-attention based progressively updated network for real image denoising[J]. IEEE Transactions on Industrial Informatics (IEEE TII), 2022, 19(8): 9145-9156. (JCR-Q1, CAS Q1-TOP, IF=9.8)
- Xiaofeng Wang, **Xiao Liu**, Hong Yang, Zhengyong Wang, Xiaoyue Wen, Xiaohai He, Linbo Qing. Degradation modeling for restoration-enhanced object detection in adverse weather scenes[J]. IEEE transactions on intelligent vehicles, 2024. (JCR-Q1, CAS Q1-TOP, IF=14.0)
- Yizhong Pan, **Xiao Liu**, Xiangyu Liao, Yuanzhouhan Cao, Chao Ren. Random sub-samples generation for self-supervised real image denoising[C]. Proceedings of the International Conference on Computer Vision (ICCV), 2023: 12150-12159. (CCF-A)
- Xin Lin, Chao Ren, **Xiao Liu**, Jie Huang, Yinjie Lei. Unsupervised image denoising in real-world scenarios via self-collaboration parallel generative adversarial branches[C]. Proceedings of the International Conference on Computer Vision (ICCV), 2023: 12642-12652. (CCF-A)

Honors and Awards

- 2026, **National Scholarship**, Ministry of Education of China.
- 2026, **Outstanding Graduate Student**, Sichuan University.
- 2025, **Yanbao Scholarship**, Sichuan University.
- 2024, **National First Prize**, ICDT Huawei Device New Display Technology Competition (Mobile Display Enhancement Track).
- 2024, **First-Class Academic Scholarship for Doctoral Students**, Sichuan University.

- 2024, **Outstanding Master's Thesis**, Sichuan University.
- 2024, **Xiaomi Scholarship for Master's Students**, Sichuan University.
- 2023, **Outstanding Graduate Student**, Sichuan University.

Professional Service

- Journal reviewer: Scientific Reports, Neurocomputing, Visual Intelligence, Computer Vision and Image Understanding, Pattern Recognition.
- Conference reviewer: IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), ACM International Conference on Multimedia (ACM MM), Chinese Conference on Pattern Recognition and Computer Vision (PRCV).