

Education

University of Electronic Science and Technology of China (UESTC)

Advisor: Prof. Ting-Zhu Huang and Prof. Liang-Jian Deng

Driving force of the team | Key team member

Ph.D. in Mathematics

2023.09-Present

University of Electronic Science and Technology of China (UESTC)

Advisor: Prof. Ting-Zhu Huang and Prof. Liang-Jian Deng

Driving force of the team | Key team member

M.Sc. in Artificial Intelligence

2020.09-2023.06

Chongqing University of Posts and Telecommunications

Laboratory: Chongqing Key Laboratory of Computational Intelligence

Advisor: Yucheng Shu

Student Team Leader

B.Sc. in Intelligent Science and Technology

2015.09-2019.06

Research Experience

Water Cube3d - Research Intern

2020.03-2020.07

- Integrated image segmentation techniques into virtual reality programs and their installations
- Force estimation in 3D skeletal models

Laboratory of Computational Intelligence - Research Intern

2017.07-2019.07

- Medical image segmentation: weak-supervised learning, deformable convolution network, and edge-aware Techniques
- One paper was accepted by MICCAI 2019

Research Interest: Deep Learning and Mathematics

- Machine Learning (Deep Learning) and Optimization
 - a) Deep Plug-and-Play, deep unfolding, deep equilibrium model, self-supervised learning
 - b) Neural operator (e.g., implicit neural representation, physics-informed neural network, neural ordinary differential equation)
- Optimization (e.g., imaging inverse problem, tensor learning, sparse representation)
- Computer Vision and Image Processing
 - a) Image enhancement, fusion, super-resolution, restoration
 - b) Generative models: GAN, Flow, DDPM, SDE
 - d) Medical image analysis

Publications

In Preparation

- **Xiao Wu**, Ting-Zhu Huang, Liang-Jian Deng, Zihan Cao. A Unified Perspective on Self-Attention Mechanism and Convolution. *In preparation.*

In Review

- **Xiao Wu**, Ting-Zhu Huang, Liang-Jian Deng, Zhong-Cheng Wu. A Robust Tensor Wheel Decomposition-Based Regularization method and Its Application to Image Completion. *Journal of Scientific Computing (JSC)*. *Minor Revision.*

- **Xiao Wu**, Zihan Cao, Ting-Zhu Huang, Liang-Jian Deng, Jocelyn Chanussot, Gemine Vivone. Fully-Connected Transformer for Multi-Source Image Fusion. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*. Major Revision.
- Yu Zhong¹, **Xiao Wu**¹, Zihan Cao, Hong-Xia Dou, Liang-Jian Deng. SSDiff: Spatial-spectral Integrated Diffusion Model for Remote Sensing Pansharpening. *Conference on Neural Information Processing Systems (NeurIPS)*, 2024. Under Review. (1 denotes the equal contribution)
- Gemine Vivone, Liang-Jian Deng, Dan-Feng Hong, Wei Li, Huanfeng Shen, **Xiao Wu**, et al. Deep Learning in Remote Sensing Image Fusion: Methods, Protocols, Data and Future Perspectives. *IEEE Geoscience and Remote Sensing Magazine (GRSM)*. Under Review. (**Review**)

Accepted & Preprint

- Zihan Cao¹, **Xiao Wu**¹, Liang-Jian Deng, Yu Zhong. A Novel State Space Model with Local Enhancement and State Sharing for Image Fusion. *Proceedings of the ACM International Conference on Multimedia (ACM MM)*, 2024.
- Yule Duan¹, **Xiao Wu**¹, Haoyu Deng, Liang-Jian Deng. Content-Adaptive Non-Local Convolution for Remote Sensing Pansharpening. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2024.
- **Xiao Wu**, Ting-Zhu Huang, Liang-Jian Deng, Tian-Jing Zhang. A Decoder-free Transformer-like Architecture for High-efficiency Single Image Deraining. *International Joint Conferences on Artificial Intelligence (IJCAI)*, 2022. (**Long Oral, 3.7%**)
- **Xiao Wu**, Ting-Zhu Huang, Liang-Jian Deng, Tian-Jing Zhang. Dynamic Cross Feature Fusion for Remote Sensing Pansharpening. *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, 2021. (**Poster**)
- Haoyu Deng, Zijing Xu, Yule Duan, **Xiao Wu**, Wen-Jie Shu, Liang-Jian Deng. Exploring the Low-Pass Filtering Behavior in Image Super-Resolution. *International Conference on Machine Learning (ICML)*, 2024.
- Zihan Cao, **Xiao Wu**, Liang-Jian Deng. Neural Schrödinger Bridge Matching for Pansharpening. Arxiv, 2024.
- Wen-Jie Shu, Hong-Xia Dou, Rui Wen, **Xiao Wu**, Liang-Jian Deng. CMT: Cross Modulation Transformer with Hybrid Loss for Pansharpening. *IEEE Geoscience and Remote Sensing Letters (GRSL)*, 2024.
- Ran Ran, Liang-Jian Deng, **Xiao Wu**, Tian-Jing Zhang, Jian-Long Chang Qi-Tian. KNLConv: Kernel-space Non-local Convolution for Hyperspectral Image Super-resolution. *IEEE Transactions on Multimedia (TMM)*, 2024.
- Zihan Cao, Shiqi Cao, Liang-Jian Deng, **Xiao Wu**, Junming Hou, Gemine Vivone. Diffusion model with disentangled modulations for sharpening multispectral and hyperspectral images. *Information Fusion*, 2023.
- Jun-Da Wang, Liang-Jian Deng, Chen-Yu Zhao, **Xiao Wu**, Hong-Ming Chen, Gemine Vivone. Cascadic Multi-Receptive Learning for Multispectral Pansharpening. *IEEE Transactions on Geoscience and Remote Sensing (TGRS)*, 2023.
- Siran Peng, Chenhao Guo, **Xiao Wu**, Liang-Jian Deng. U2Net: A General Framework with Spatial-Spectral-Integrated Double U-Net for Image Fusion. *Proceedings of the ACM International Conference on Multimedia (ACM MM)*, 2023.
- Shang-Qi Deng, Liang-Jian Deng, **Xiao Wu**, Ran Ran, Rui Wen. Bidirectional Dilation Transformer for Multispectral and Hyperspectral Image Fusion. *International Joint Conferences on Artificial Intelligence (IJCAI)*, 2023.
- Jin-Liang Xiao, Ting-Zhu Huang, Liang-Jian Deng, Zhong-Chen Wu, **Xiao Wu**, Gemine Vivone. Variational pansharpening based on coefficient estimation with nonlocal regression. *IEEE Transactions on Geoscience and Remote Sensing (TGRS)*, 2023.
- Xue-Rui Qiu¹, Zhao-Rui Wang¹, Zheng Luan¹, Rui-Jie Zhu, **Xiao Wu**, Ma-Lu Zhang, Liang-Jian Deng. VTSNN: A Virtual Temporal Spiking Neural Network. *Frontiers in Neuroscience*, 2023.

- Rui Wen, Liang-Jian Deng, Zhong-Cheng Wu, **Xiao Wu**, Gemine Vivone. A Novel Spatial Fidelity with Learnable Nonlinear Mapping for Panchromatic Sharpening. *IEEE Transactions on Geoscience and Remote Sensing (TGRS)*, 2023.
- Shang-Qi Deng, Liang-Jian Deng, **Xiao Wu**, Ran Ran, Dan-Feng Hong, Gemine Vivone. PSRT: Pyramid Shuffle-and-Reshuffle Transformer for Multispectral and Hyperspectral Image Fusion. *IEEE Transactions on Geoscience and Remote Sensing (TGRS)*, 2023.
- Liang-Jian Deng, Ran Ran, **Xiao Wu**, Tian-Jing Zhang. Research progress on convolutional neural network methods for pan-sharpening of remote sensing images. *Chinese Journal of Image and Graphics*, 2022. **(Review)**
- Zhi-Xuan Chen¹, Cheng Jin¹, Tian-Jing Zhang, **Xiao Wu**, Liang-Jian Deng. SpanConv: A New Convolution via Spanning Kernel Space for Lightweight Pansharpening. *International Joint Conferences on Artificial Intelligence (IJCAI)*, 2022. **(Long Oral, 3.7%)**
- Yudong Wang, Liang-Jian Deng, Tian-Jing Zhang, **Xiao Wu**. SSconv: Explicit Spectral-to-Spatial Convolution for Pansharpening. *Proceedings of the ACM International Conference on Multimedia (ACM MM)*, 2021. **(Poster)**
- Yucheng Shu, **Xiao Wu**, Weisheng Li. LVC-Net: Medical image segmentation with noisy label based on local visual cues. *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI, first author (excluding supervisor))*, 2019. **(Early Accept)**
- Cheng Jin, Rui-Jie Zhu, **Xiao Wu**, Liang-Jian Deng. SIT: A Bionic and Non-Linear Neuron for Spiking Neural Network. Arxiv, 2022.

Projects

- Pytorch Toolbox
 - **UDL-VIS** (A unified AutoDL framework for computer vision):
 - * Faster library loading speed based on reflection mechanism
 - * UDL is based on **MMCV** which provides various functionalities
 - * UDL is based on **NNI** to perform automatic machine learning
 - * UDL provides distributed computing based on **Accerlerate** (huggingface) and Pytorch implementation
 - PanCollection (Public remote sensing image pansharpening **dataset** and **toolbox**)
 - **Image Deraining**
 - Multi-source Image Fusion (Multispectral-visible, multispectral-hyperspectral, visible-infrared image fusion) is coming soon
 - * The **first edition** has been released
- MATLAB Toolbox
 - **Tensor Decomposition**
 - Toolbox for multi-source image fusion benchmark is coming soon

Academical Activities

- Reviewer
 - NeurIPS 2024, IJCAI 2024, CVPR 2024, MICCAI 2024, ICPR 2024...
 - IEEE TGRS, IEEE JSTARS, IEEE GRSL, ...
- Presentation
 - ICCV 2021, IJCAI 2022, IJCAI 2023

Selected Honors & Awards

Special Postgraduate Scholarship of Science

Best Master Thesis Award

Best Bachelor Thesis Award

Academic Scholarship

Third Prize · National Huawei Cup Graduate Mathematical Modeling Competition

Third Prize · National Discovery Cup

Leader · Undergraduate Innovation and Entrepreneurship Training Program in Provinces

Skills

Programming: *Python (Pytorch, TensorFlow) with 7 years, Matlab, C, CUDA*

Language: *Mandarin, English (CET-6)*