

## 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 Zhong<sup>1</sup>, **Xiao Wu**<sup>1</sup>, 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 Cao<sup>1</sup>, **Xiao Wu**<sup>1</sup>, 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 Duan<sup>1</sup>, **Xiao Wu**<sup>1</sup>, 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**)
- 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**)
- 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 Qiu<sup>1</sup>, Zhao-Rui Wang<sup>1</sup>, Zheng Luan<sup>1</sup>, 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 Chen<sup>1</sup>, Cheng Jin<sup>1</sup>, 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)**
- Cheng Jin, Rui-Jie Zhu, **Xiao Wu**, Liang-Jian Deng. SIT: A Bionic and Non-Linear Neuron for Spiking Neural Network. Arxiv, 2022.

## Projects

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- 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

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- 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

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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**

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

**Tools:** Linux, Docker, Slurm, Origin, etc.

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