Xinxu Wei

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🎓 EDUCATION

•Lehigh University *2023.08 - 2027.01 (Expected)*
Ph.D. in Computer Engineering. Advisor: Prof. Yu Zhang and Prof. Lifang He Bethlehem PA, USA

•McGill University (Dual Master Degree) *2021.08 - 2023.05*
M.Sc. in Neuroscience. Advisor: Prof. Danilo Bzdok Montreal QC, Canada

•University of Electronic Science and Technology of China (UESTC) *2020.08 - 2023.05*
M.Eng. in Biomedical Engineering. Advisor: Prof. Yongjie Li Chengdu, China

•University of Electronic Science and Technology of China (UESTC) *2016.08 - 2020.05*
B.Eng. in Computer Engineering Chengdu, China

⚗ RESEARCH INTERESTS & DIRECTIONS

Graph & Foundation Models: Graph Neural Networks (GNNs), Hyper-Graphs, Graph Pre-training, Graph Prompts, Graph/HyperGraph Augmentation, GraphCL, GraphMAE, MoCo, CLIP, Graph Foundation Model, Graph Prompt-tuning, Graph Contrastive Learning, Masked Autoencoders (MAE)
Learning Paradigms: Pre-training & Fine-tuning, Contrastive Learning, Self-supervised Learning, Meta Learning, Multi-task Learning, Zero-shot Learning, Transfer Learning, Knowledge Distillation, SimCLR, BYOL
NLP & Transformers: Transformers, BERT, RoBERTa, ViT, Large Language Models (LLMs), Agents, Self-attention, Masked Modeling, Text Embedding, HuggingFace, RAG, MoE
Medical Image Analysis & AI for Neuroscience: Brain Graph Modeling, Brain Foundation Models, fMRI/EEG Representation Learning, Multi-atlas Learning, Multi-modal Brain Fusion, Brain Graph Pre-training, EEG Graph, Retinal Vessel Segmentation
Neural Networks: ANN, CNN, RNN, LSTM, GRU, GCN, GAT, Capsule Networks, Residual Networks, Siamese Networks, Autoencoders, Variational Autoencoders (VAE)
Computer Vision: Vision-Language Models (VLMs), Image Segmentation, Object Detection (YOLO, SSD), Image Denoising and Enhancement, Activation Visualization (Grad-CAM), Data Augmentation (Mixup, RandAugment), VQVAE, Codebook, Autoencoders, Non-local Networks
Traditional Machine Learning: SVM, KNN, T-SNE, Clustering, Naive Bayes, XGBoost, Model Ensembling

🔧 TECHNICAL SKILLS

Programming Languages: Python, C/C++, Java, Bash, Matlab
Libraries: Numpy, Scikit-Learn, Pandas, Matplotlib, Seaborn, OpenCV, Scipy, Transformers, HuggingFace
Dev Tools: VScode, Git, Github, Docker, Linux Shell, Jupyter Notebook, Conda, Vim
Frameworks: PyTorch, TensorFlow, Keras, DGL, PyG, PyGame
Soft Skills: Problem Solving, Self-learning, Technical Writing, Presentation, Collaboration, Project Management
Personal Interests: Playing Basketball, Hiking, Gaming, Watching Movies, Traveling, Sunbathing

💼 EXPERIENCE & PROJECTS

•Lehigh University *2023.08 - Present*
*Research Assistant (Completed **5** research papers, including **3** as the first author and **2** as a co-author)* Bethlehem PA, USA

- **(Large-Scale Brain fMRI Foundation Model/Graph Foundation Model/Graph&Hyper-Graph Pre-training/Graph Prompt/Fine-tuning/Few-shot and Zero-shot):** Worked on brain foundation model projects by constructing large-scale fMRI brain graphs and developing pre-training strategies using graph neural networks. Integrated graph prompts, language prompts, and meta-learning to enable few-shot and zero-shot transfer across brain disorders and parcellations [NeurIPS 2025 Submission].
- **(EEG Foundation Model/Graph Pre-training/Graph Fine-tuning/Knowledge Distillation):** Conducted brain data mining projects and proposed a novel pre-training method for EEG graph data, incorporating knowledge distillation to transfer representations from high-density to low-density EEG [ICML 2025].
- **(Multi-modal Fusion/Self-supervised Learning/Pre-training/Knowledge Distillation/Contrastive Learning):** Conducted multi-modal analysis, focusing on brain modality fusion [MP 2025], cross-modal self-supervised contrastive pre-training & fine-tuning, knowledge distillation and transfer learning [NN 2025].

•Mila - Quebec AI Institute *2022.01-2022.08*
*Research Assistant (Completed **5** research papers, including **3** as the first author and **2** as a co-author)* Montreal QC, Canada

- **(Medical Image Analysis/Retinal Fundus Image Segmentation/Dynamic Convolution/Self-attention/Graph Neural Networks/Capsule Neural Networks):** Conducted medical image analysis projects on retinal vessel segmentation from fundus images. Designed an orientation-aware dynamic convolution module and an imbalance-aware attention module **[ESWA 2023]**. Further incorporated graph convolutional networks and capsule convolution to capture the spatial structure and continuity of vessels **[IEEE TAI Submission]**. Additionally, developed a novel evaluation metric tailored for assessing vessel segmentation performance **[ISBI 2025]**. And designed a codebook for vessels to improve vascular segmentation performance **[PR 2025 Submission]**.
- Performed pneumonia image recognition using a self-supervised contrastive learning pretraining strategy to initialize the image recognition model. To address class imbalance, the focal loss was adopted **[IEEE BigData 2022]**.

- **UESTC**   *2020.08-2023.05*
  *Research Assistant (Completed **3** first-author research papers and **2** patents)*   Chengdu, China
  - Conducted projects on low-light image denoising and enhancement. Proposed a fast and plug-and-play low-light image enhancement model suitable for real-world applications **[IEEE ICRAE 2021]**. Improved the RetinexNet by accelerating the processing speed and addressing color distortion issues **[DSP 2024]**. Leveraged the characteristics of RGB channels and the HSV color space to design a low-light enhancement model capable of perceiving channel-specific features **[ICANN 2022]**.
  - Conducted face detection and localization, as well as facial feature-based emotion analysis, to train a lightweight deep learning model. Developed a driver fatigue detection software and obtained a patent **[Patent 1]**. Developed a deep learning software for facial recognition and emotion recognition, and obtained a patent **[Patent 2]**.

📖 PUBLICATIONS

- **X. Wei**, K. Zhao, Y. Jiao, H. Xie, L. He, and Y. Zhang. *Pre-Training Graph Contrastive Masked Autoencoders Are Strong Distillers For EEG.* In **Proceedings of the International Conference on Machine Learning (ICML)**, 2025, Accepted. (CCF A, Core A*) **[OpenReview] [Paper] [Code]**
- **X. Wei**, K. Zhao, Y. Jiao, H. Zhu, L. He, and Y. Zhang. *A Brain Graph Foundation Model: Pre-Training And Prompt-Tuning For Any Atlas And Disorder.* In **Proceedings of the Conference on Neural Information Processing Systems (NeurIPS)**, 2025, Under Review. (CCF A, Core A*) **[Paper] [Code]**
- **X. Wei**, K. Zhao, Y. Jiao, N. B. Carlisle, H. Xie, G. A. Fonzo, and Y. Zhang. *Multi-Modal Cross-Domain Self-Supervised Pre-Training For fMRI And EEG Fusion.* **Neural Networks**, 2025. (JCR Q1, CCF B, IF=6.4) **[Paper]**
- **X. Wei**, K. Yang, D. Bzdok, and Y. Li. *Orientation And Context Entangled Network For Retinal Vessel Segmentation.* **Expert Systems with Applications**, 2023. (JCR Q1, IF=7.5) **[Paper] [Code]**
- **X. Wei**, X. Zhang, and Y. Li. *DA-DRN: Degradation-Aware Deep Retinex Network For Low-Light Image Enhancement.* **Digital Signal Processing**, 2024. (JCR Q2, IF=2.9) **[Paper]**
- **X. Wei**, X. Niu, X. Zhang, and Y. Li. *Deep Pneumonia: Attention-Based Contrastive Learning For Class-Imbalanced Pneumonia Lesion Recognition In Chest X-Rays.* In **Proceedings of the IEEE International Conference on Big Data (BigData)**, 2022. (Core B) **[Paper]**
- **X. Wei**, X. Zhang, and Y. Li. *TSN-CA: A Two-Stage Network With Channel Attention For Low-Light Image Enhancement.* In **Proceedings of the International Conference on Artificial Neural Networks (ICANN)**, 2022. (Core B) **[Paper]**
- **X. Wei**, X. Zhang, and Y. Li. *SARN: A Lightweight Stacked Attention Residual Network For Low-Light Image Enhancement.* In **Proceedings of the International Conference on Robotics and Automation Engineering (ICRAE)**, 2021. **[Paper] [Code]**
- **X. Wei**, X. Lin, and Y. Li. *Retinal Vessel Segmentation With Deep Graph And Capsule Reasoning.* Submitted to **IEEE Transactions on Artificial Intelligence (TAI)**, under review, 2024. **[Paper]**
- X. Lin, **X. Wei**, S. Zhao, and Y. Li. *Vascular Skeleton Deformation Evaluation Based On The Metric Of Sinkhorn Distance.* In **Proceedings of the IEEE International Symposium on Biomedical Imaging (ISBI)**, 2024. (Core B) **[Paper] [Code]**
- Y. Jiao, K. Zhao, **X. Wei**, N. Carlisle, C. Keller, D. Oathes, G. Fonzo, and Y. Zhang. *Deep Graph Learning Of Multimodal Brain Networks Defines Treatment-Predictive Signatures In Major Depression.* **Molecular Psychiatry**, 2025. (JCR Q1, IF=9.6) **[Paper] [Code]**
- Y. Jiao, **X. Wei**, L. He, and Y. Zhang. *A Functional System-Informed Graph Neural Network Framework To Quantify Interpretable Brain Dysfunction In ASD.* Submitted to **Neural Networks**, under major revision, 2025.
- X. Lin, **X. Wei**, A. Shmuel, and Y. Li. *VPBSD: Vessel-Pattern-Based Semi-Supervised Distillation For Efficient 3D Microscopic Cerebrovascular Segmentation.* Submitted to **Pattern Recognition**, 2024. **[Paper]**

💼 ACADEMIC SERVICES

- **Conference Reviewer**: AAAI 2024, ISBI 2023, ICPR 2022
- **Journal Reviewer**: IEEE Transactions on Circuits and Systems for Video Technology (TCSVT), Expert Systems with Applications (ESWA), Pattern Analysis and Applications (PAA), Signal, Image and Video Processing (SIVP), Digital Signal Processing (DSP), IET Image Processing (IET-IP), Cybernetics and Systems (C&S), The Visual Computer (TVCJ)

🏆 HONORS AND AWARDS

- 2023.08 Lehigh University Fellowship
- 2022.05 First-Class Scholarship of UESTC
- 2022.04 Soochow Industrial Park Scholarship