Weining Wang

Tel.: 314-680-6221 Email: w.weining@wustl.edu

Research Interests: computational imaging, medical imaging, inverse problems, and distribution shift

EDUCATION

Washington University at St. Louis (WashU) 08/2024-05/2026

• **Degree:** Master of Science in **Computer Science** GPA: **3.67**/4.0

Xinjiang University 09/2019-06/2023

• **Degree:** Bachelor of Engineering in **Software Engineering** Class Ranking: **2**/39 Grade Ranking: **14**/330

PUBLICATIONS

[1] **W. Wang**, S. Shoushtari, E. P. Chandler, M. S. Asif, and U. S. Kamilov, "Distribution Shift Estimation in Imaging Inverse Problems," *2025 IEEE Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*. (**Accepted**)

[2] J. Fu, **W. Wang**, and L. Chang, "Visual Aided Training of Billiards Based on Depth Estimation," in *2022 IEEE Conference on Telecommunications, Optics and Computer Science (TOCS)*, Dalian, China, 2022, pp. 397-403, DOI: 10.1109/TOCS56154.2022.10015948

[3] H. Fu, Y. Li, **W. Wang**, and X. Xu, "Target Detection Models Based on Deep Learning," *in 2022 International Conference on Cloud Computing, Performance Computing, and Deep Learning (CCPCDL)*, 2022, DOI: 10.1117/12.2641024

RESEARCH PROJECTS

Research Assistant | **Corrupted MRI Brain Image Restoration with Neural Network** 07/2025-Present

Supervisor: Prof. Ulugbek Kamilov, Computational Imaging Group (CIG), WashU

Description: Developed an end-to-end deep learning pipeline to reconstruct high-quality R2* maps from 4x accelerated MRI k-space data, enabling rapid quantitative medical imaging.

- Constructed a pseudo-target image dataset using the GRAPPA interpolation algorithm to address the limitation of having only 4x accelerated k-space data. Trained a U-Net model to benchmark the performance of subsequent reconstruction methods
- Designed and optimized a deep unfolding-based MRI reconstruction network. Implemented a multi-component loss function integrating L1, SSIM, and L1-kspace losess to mitigate phase information loss and prevent shortcut learning. Employed a dynamic weight-balancing technique in PyTorch to balance gradients from both image and frequency domains
- Developed and implemented a self-supervised learning model for R2* mapping, incorporating a biophysical model that transforms the network's R2* prediction back to the multi-echo MRI magnitude domain for loss calculation
- Validated the efficacy of the end-to-end pipeline, which successfully transforms undersampled MRI data into high-quality R2* images suitable for medical research

Research Assistant | **Distribution Shift Estimation in Imaging Inverse Problems** 05/2025-09/2025

Supervisor: Prof. Ulugbek Kamilov, Computational Imaging Group (CIG), WashU

Description: Proposed a diffusion-based framework to quantify distribution shift between blurred and noisy image distributions. This enables matching an unseen, corrupted image to its most suitable pre-trained diffusion model for high-quality restoration.

- Designed a two-phase validation strategy, including a toy problem and a practical experiment
- Constructed Gaussian Mixture Models (GMMs) to simulate distributions, applying blur and noise to verify method consistency with KL divergence
- Trained the diffusion model on four facial datasets, utilizing output gradients to compute distribution differences and assess robustness under Gaussian noise
- Authored the experimental section for the paper “Distribution Shift Estimation in Imaging Inverse Problems," published at CAMSAP 2025

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Undergraduate Thesis Project | **Facial Micro-Expression Recognition Based on Convolutional Neural Network** 12/2022-06/2023

Supervisor: Prof, Yurong Qian, School of Software Laboratory, Xinjiang University

- Investigated limitations in micro-expression classification via literature review, and introduced an attention mechanism to enhance feature representation in key facial regions (eyes, nose, mouth)
- Designed a multi-stream convolutional network to separately process cropped facial regions, extract and aggregate feature vectors, and construct a refined dataset for apex frame recognition using PyTorch
- Developed a multi-channel residual attention model to capture fine-grained and transient micro-expression variations, and validated its superiority through ablation experiments
- Implemented the improved model into a deployable software system with a front-end interface, adopting a front-end/back-end separation architecture

Core Developer | **AI Recognition of Ecological Remote Sensing in Arid Areas** 06/2022-09/2022

Supervisor: Jun Geng, Senior Engineer, School of Software Laboratory, Xinjiang University

- Studied DeepLab V3+ and U-Net framework
- Designed the ecological remote sensing imagery data sets by cropping the image according to the performance of the computer graphics card in the laboratory of Xinjiang University and the requirements of the model, and stored the data sets in the MySQL database
- Fine-tuned the Unet model and and achieved an 82% identification rate
- Applied for **software copyright** that was successfully granted later

Core Developer | **Visual Aid Training for Snooker Based on Depth Estimation**

10/2021-04/2022

- Utilized Monocular Image Depth Estimation techniques and double-peak histogram threshold selection for greyscale image conversion and used the Sobel-Feldman operator for edge detection of green and brown colors to recreate top-view photo
- Realized location identification of ball applying OpenCV functions from Python and Hough transformation
- Published a mobile phone application that calculates billiard hit angle and force based on side photos

Core Member | **Computer Vision Research Based on Machine Learning (Online)** 07/2021-10/2021

Supervisor: Prof. Noah Gift, University of California, Davis

- Implemented Intel® Movidius™ Neural Compute Stick (NCS) for object detection of traffic-related obstacles Classified data sets into pedestrians, zebra crossings, and cars, marked data sets through Colab, and distributed workloads among members
- Implemented VOLO V3 neural framework with 85% precision and deployed it to iPhone with Android studio using for accomplishing detection of relevant traffic targets via edge devices
- Analyzed YOLO structure and methodology, improvements, core network changes, and relevant loss functions of different versions of YOLO to compared their Pros and Cons

AWARDS AND HONORS

Excellent Undergraduate Graduate Student, School of Software, Xinjiang University 06/2023

Third Prize (Non-Mathematics-Major Group), 12th National University Mathematics Competition for College Students 12/2022

National Encouragement Scholarship, Ministry of Education of the People's Republic of China 10/2022

Merit Student (School Level), Xinjiang University 10/2021

First Prize in Question C, Xinjiang Division, China Undergraduate Mathematical Contest in Modeling 09/2021

Second Prize in University Group A of C/C++ Programming Section, Blue Bridge Cup National Software and Information Technology Professionals Competition Xinjiang Regional 05/2021

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COMPUTER SKILLS

C; C++; JAVA; Python; SQL; MySQL; Matlab; SPSS; Eclipse