Jianxiong Zhou

Email: jianxiongzhou2026@u.northwestern.edu
Homepage: jianxiong-zhou.github.io
Mobile: (206)-476-5117
Linkedin: Jianxiong Zhou

Education

- **Northwestern University** — Evanston, IL, United States
  Ph.D. Candidate of Electrical Engineering, advised by Prof. Ying Wu — *Sep. 2021 - Jun. 2025 (Expected)*
  - **GPA**: **3.94/4.0**
  - **Research Direction**: Active Recognition in Embodied AI, Anomaly Detection, Temporal Action Localization
- **University of Washington** — Seattle, WA, United States
  Master of Science in Electrical Engineering, advised by Prof. Jenq-Neng Hwang — *Sep. 2019 - Mar. 2021*
  - **GPA**: **3.89/4.0**
  - **Research Direction**: Human Pose Estimation
- **Shanghai Jiao Tong University** — Shanghai, China
  Bachelor of Science in Information Engineering — *Sep. 2015 - Jul. 2019*
  - **GPA**: **3.82/4.0 (Top 2%)**

Research Interests

- **Active Recognition in Embodied AI**
  Integrating intelligent control strategies into the visual recognition process to address different recognition challenges.
- **Unsupervised Anomaly Detection**
  Using only normal sample images to fit a model for anomaly detection for visual inspection of industrial images.
- **Temporal Action Localization**
  Classifying and localizing action instances in videos, especially for meaningful events in videos.

Computer Vision (Classification, Segmentation, Keypoint Detection, etc.); Medical Image Analysis; Domain Adaptation and Generalization; Out-of-distribution Generalization; Transfer and Few-shot Learning; Multi-modality Learning (e.g., vision and language); Open Vocabulary Detection and Recognition; Machine Learning

Publications [Google Scholar]

[1] Lei Fan, **Jianxiong Zhou**, Xiaoying Xing, and Ying Wu, "Active Open-Vocabulary Recognition: Let Intelligent Moving Mitigate CLIP Limitations," Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2024.

[2] **Jianxiong Zhou**, and Ying Wu, "Outlier-Probability-Based Feature Adaptation for Robust Unsupervised Anomaly Detection on Contaminated Training Data," IEEE Transactions on Circuits and Systems for Video Technology 2024.

[3] **Jianxiong Zhou**, and Ying Wu, "Micro-expression spotting with a novel wavelet convolution magnification network in long videos," Pattern Recognition Letter 2024.

[4] **Jianxiong Zhou**, and Ying Wu, "Temporal Feature Enhancement Dilated Convolution Network for Weakly-supervised Temporal Action Localization," Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) 2023.

[5] **Jianxiong Zhou**, et al, "Hierarchical pose classification for infant action analysis and mental development assessment," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2021.

[6] S. Xu, **J. Zhou**, F. Zhou, Y. Liu, "State-of-charge estimation for LiNi0.6Co0.2Mn0.2O2/ graphite batteries using the compound method with improved extended Kalman filter and long short-term memory network," Int J Energy Res 2021.

[7] Z. Chen, **J. Zhou**, F. Zhou, S. Xu, "State-of-charge estimation of lithium-ion batteries based on improved H infinity filter algorithm and its novel equalization method," Journal of Cleaner Production 2021.

[8] W. Zheng, X. Zhang, L. Xu, **J. Zhou**, "Unfolded Coprime Planar Array for 2D Direction of Arrival Estimation: An Aperture-Augmented Perspective," IEEE Access 2018.

Selected Research Projects

- **Active Visual Recognition with Open Vocabulary Object Detection**
  Develop active recognition in a realistic simulator and deploy it on a mobile platform — *Sep. 2023 - Present*
  - **Motivations**: Most of the existing active recognition works have been done with toy datasets, such as manipulating unobscured 3D CAD models. Realistic recognition challenges, such as poor viewing positions, occlusion, and other unsatisfactory recognition conditions, have been largely ignored in previous works.
  - **Details**: Define the active recognition task. Collect and organize active recognition datasets based on different levels of recognition difficulty. Develop a recognition agent that can actively explore open environments and then recognize target objects based on temporal and scene context. This work was accepted by CVPR 2024.

- **Machine Vision of Videofluoroscopy for Scoring Impaired Swallows**
  Create an algorithm to assign MBSImP scores to medical images of single swallows *Sep. 2023 - Present*
  - **Motivations**: Just like human clinicians, ML models need to learn how to score. Leverage expert knowledge to "teach" ML models to score with Modified Barium Swallow Impairment Profile (MBSImP) protocols.
  - **Details**: First, videofluoroscopy samples of swallowing action instance were collected and experts gave samples MBSImP scores. Then, key landmarks of the human face were detected and their movements were tracked. Finally, the model was trained to associate landmark features with MBSImP scores.
- **Robust Unsupervised Anomaly Detection by Contaminated Training Data**
  Explore a robust anomaly detection method that tolerates contaminated training data *Dec. 2022 - May 2023*
  - **Motivations**: Contaminated data is inevitably introduced during the labeling process. But current unsupervised anomaly detection algorithms are vulnerable to contaminated training data and thus have limited performance in real-world applications.
  - **Details**: The proposed method OPFA combines outlier detection, memory bank modeling and model learning, which could reduce the influence of contaminated training data and detect anomalous samples. OPFA outperforms other methods in contaminated data scenarios. This work was accepted by IEEE TCSVT.
- **Micro-expression Spotting with Wavelet Convolution Magnification Network**
  Explore magnification mechanism to facilitate spotting Micro-expressions in long videos *Aug. 2022 - Nov. 2022*
  - **Motivations**: It is challenging to spot micro-expressions in long videos due to the short duration and low intensity of MEs, and many background disturbances. Moreover, magnification mechanism is not considered in most previous works because it magnifies background disturbances meanwhile.
  - **Details**: The proposed Wavelet Convolution Magnification Network has a U-Net-like architecture and consists of discrete wavelet transform networks and attention magnification mechanism. It can effectively suppress background disturbances and magnify the optical flow features of MEs, making them easy to be detected. This work was accepted by Pattern Recognition Letter.
- **Weakly-Supervised Temporal Action Localization**
  Efficiently use temporal features to enhance RGB features and improve performance *Nov. 2021 - Mar. 2022*
  - **Motivations**: Existing methods typically use snippet-level RGB and optical flow features extracted from pre-trained extractors directly. Because of two limitations: the short temporal span of snippets and the inappropriate initial features, these WTAL methods suffer from the lack of effective use of temporal information and have limited performance.
  - **Details**: The proposed method has an enlarged receptive field that covers a long temporal span to observe the full dynamics of action instances, which makes it powerful to capture temporal dependencies between snippets. Furthermore, the Modality Enhancement Module can enhance RGB features with the help of enhanced optical flow features, making the overall features appropriate for the WTAL task. The work was accepted by WACV 2023.

Work Experience

- **Information Processing Lab, University of Washington** Seattle, WA, United States
  Research Assistant, Mentor: Prof. Jenq-Neng Hwang *Jun. 2020 - Dec. 2020*
  - **Topic**: Hierarchical pose classification for infant action analysis and mental development assessment
  - **Details**: Implemented an image-based pose classifier to classify infant actions based on AIMS to provide early diagnosis of a potential develop-mental disorder such as Autism. The method is a hierarchical pose classifier that combines the advantages of 3D human pose estimation and scene context information. The research was published at ICASSP 2021.
- **Nanjing Zhenchao Technology Co., Ltd.** Nanjing, China
  Research Intern, Mentor: Prof. Baozhen Li *Aug. 2019 - Sep. 2019*
  - **Topic**: Intelligent audit for documents.
  - **Details**: Designed and implemented an intelligent audit system to automatically learn keywords and related synonyms from documents.

Selected Scholarships & Honors

- Outstanding Graduate of Shanghai Jiao Tong University - Jul. 2019
- China Electronic Instrument Scholarship, Shanghai Jiao Tong University (Top 5%) - Apr. 2019
- Honorable Mention, Interdisciplinary Contest in Modeling, COMAP - Apr. 2018
- Second Prize of Shanghai Competition Area in the National Mathematical Modeling Competition - Dec. 2017
- Academic Excellent Scholarship, Shanghai Jiao Tong University (Top 10%) - Dec. 2016 & Dec. 2017 & Dec. 2018
- China National Scholarship (Top 0.2%) - Nov. 2016

Academic Services

- **Invited Reviewer**: CVPR 2024, ECCV 2024, IEEE TCSVT

Skills Summary

- **Languages & Techniques**: Python, C++, MATLAB, SQL, Linux, Git, Verilog, VHDL
- **Data Science & Computer Vision Toolkits**: Pandas, NumPy, SciPy, Sklearn, OpenCV (Python), Detectron2 (Python), PIL, Scikit-Image, FFmpeg, Matplotlib, PyTorch, TensorFlow, Jupyter Notebook (Lab)
- **Courses Studied**: Computer Vision, Machine Learning, Advanced Algorithms, Data Structure, Operating Systems, Reinforcement Learning, Mathematical Optimization, Statistical Learning Theory, Information Theory