

# Tianyang Wang

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## EDUCATION

### Bachelor of Xi'an Jiaotong-Liverpool University

Suzhou, China

Major in Data Science and Big Data Technology, Weighted Average: 3.67 (First class Honours) Sep. 2021 – Jul. 2025

## CORE COURSES

Numerical Methods (93; Top 5%); Neural Networks (80; Top 5%); High Performance Computing (87; Top 5%); Databases (83; Top 5%); Calculus (Science and Engineering) (78; Top 10%); Fundamentals of Parallel Computing (79; Top 10%); Database Development and Design (77; Top 10%); Applied Linear Statistical Models (73; Top 10%);

## PUBLICATIONS

- [1]. X. Long<sup>1</sup>, **Tianyang. Wang**<sup>1</sup>, Y. Kan, Z. Wang, S. Chen, A. Zhou, X. Hou, J. Liu\*. “Pseudo Training Data Generation for Unsupervised Cell Membrane Segmentation in Immunohistochemistry Images,” in *2024 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, IEEE, 2024 ([Accepted-Camera ready](#).)
- [2]. **Tianyang. Wang**<sup>1</sup>, X. Nan<sup>1</sup>, Y. Wang, Y. Yan, Z. Gao, J. Liu\*. “Enhanced Corneal Endothelial Cell Segmentation via Frequency-Selected Residual Fourier Diffusion Models,” in *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, IEEE, 2025 ([Under Review](#).)
- Y. Wang<sup>1</sup>, S. Chen<sup>1</sup>, **Tianyang. Wang**<sup>1</sup>, Z. Zhang, J. Liu\*. “Wave-MAE: Wavelet Transform Meets Masked Autoencoder for Multiple Thorax Disease Classification,” in *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, IEEE, 2025 ([Under Review](#).)
- [4]. Y. Wang, S. Chen, **Tianyang. Wang**, J. Liu\*. “SDDA-MAE: Self-distillation Enhanced Dual Attention Masked Autoencoder for Small-scale Medical Image Datasets,” in *Medical Imaging with Deep Learning (MIDL)*, 2024 ([Accepted](#).)
- [5]. Y. Wang, S. Chen, X. Long, Y. Tian, Y. Huang, **Tianyang. Wang**, J. Liu\*. “BiF<sup>3</sup>-Net: A Full BiFormer Full-scale Fusion Network for Accurate Gastrointestinal Images Segmentation,” in *Medical Imaging with Deep Learning (MIDL)*, 2024 ([Accepted](#).)
- [6]. Q. Wu, Y. Xu, T. Xiao, Y. Xiao, Y. Li, **Tianyang. Wang**, Y. Zhang, S. Zhong, W. Lu, Y. Yang. “Surveying Attitudinal Alignment Between Large Language Models and Humans Towards 17 Sustainable Development Goals,” arXiv preprint arXiv:2404.13885 (2024).

<sup>1</sup> represents co-first author

## RESEARCH EXPERIENCE

### Research on Domain Generalization of Pathological Image Based on Self-supervised Learning

Team Leader

Jun. 2024 - Aug. 2024

Title: *Enhanced Corneal Endothelial Cell Segmentation via Frequency-Selected Residual Fourier Diffusion Models*

- Developed a novel two-stage framework leveraging Denoising Diffusion Probabilistic Models (DDPMs) to generate high-quality corneal endothelial cell image pairs for segmentation, resulting in a **15.6% reduction in Frechet Inception Distance (FID)** and significant improvements in **Dice score (+1.67%)**, **Sensitivity (+1.28%)**, and lowest **Modified Hausdorff Distance (-0.129)**.
- Introduced Fourier Residual Block with Frequency Selection (FRB-FS) to enhance high-frequency details, achieving a **12.5% improvement in image quality (FID)** and boosting segmentation performance by **5.3% Dice score** over baseline methods.

✓ A Conference paper published at the *2025 50th IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Hyderabad, India.

Title: *Wave-MAE: Wavelet Transform Meets Masked Autoencoder for Multiple Thorax Disease Classification*

Core Member

Oct. 2023 - Mar. 2024

- Proposed a **wavelet-based Masked Autoencoder (Wave-MAE)** for thorax disease classification, leveraging wavelet transforms to enhance **high-frequency feature sensitivity**, achieving a **3.2% higher F1-score** and improved boundary detection, with a notable **1.76% increase in mAUC** across multiple thorax conditions.
- Implemented a **two-step tuning strategy**: first applied linear probing to stabilize pre-trained feature representations, followed by **full fine-tuning**, leading to a **2.4% increase in Precision** and **2.1% improvement in Recall**, ensuring better feature adaptation across domain shifts and preventing overfitting to specific datasets.

✓ A Conference paper published at the *2025 50th IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Hyderabad, India.*

*Title: Pseudo Training Data Generation for Unsupervised Cell Membrane Segmentation in IHC Images*

*Team Leader*

*Aug. 2023 - Jul. 2024*

- Developed an unsupervised three-stage framework for cell membrane segmentation leveraging Voronoi diagrams to generate realistic membrane curvilinear structures. These structures were utilized to create pseudo-paired training data using **CycleGAN**, resulting in a **Dice score** improvement from **43.58%** to **52.15%** (+**8.57%**) over traditional segmentation methods.
- Developed a **dual-encoder segmentation model** with a **Gradient Reversal Layer (GRL)** to mitigate domain shifts between synthetic and real IHC data. The **GRL** effectively aligned features across domains, enhancing segmentation robustness in complex and noisy environments. This approach reduced **Hausdorff Distance** by **21.98%** and improved segmentation accuracy by **4.73%**.

✓ A Conference paper published at the *2024 18th International Conference on Bioinformatics and Biomedicine (BIBM), Lisbon, Portugal.*

*Title: BiF3-Net: A Full BiFormer Full-scale Fusion Network for Gastrointestinal Image Segmentation*

*Core Member*

*Dec. 2023 - Apr. 2024*

- Proposed a **BiFormer-based architecture** to capture long-range dependencies and address over-segmentation in gastrointestinal images using the BiFormer Fusion Bridge (**BFB**) module, resulting in a Dice score of **90.98%** (+**1.59%**) and an IoU of **88.71%** (+**1.77%**) compared to other SOTA methods.
- Designed and implemented the **Dense Inception Classifier (DIC)** module to effectively mitigate the over-segmentation of non-organ areas, reducing Hausdorff Distance by **1.02** and further improving segmentation robustness in complex medical images.

✓ A Conference paper to be presented at the *2024 7th Medical Imaging with Deep Learning (MIDL), Paris, France.*

*Title: SDDA-MAE: Self-distillation Enhanced Dual Attention Masked Autoencoder for Small-scale Medical Image*

*Datasets Team Core Member*

*Dec. 2023 - Apr. 2024*

- Proposed a **self-distillation enhanced MAE** for small-scale datasets, addressing the limitations of pre-training with large datasets by incorporating a **Dual Attention Transformer (DAT)**. Achieved a Dice score of **85.75%** (+**2.63%**) on the SIIM-ACR dataset and **84.12%** (+**2.97%**) on the BUSI dataset compared to other self-supervised methods.
- Enhanced medical image representation by integrating **spatial** and **channel-wise attention**, achieving a classification accuracy of **94.64%** (+**1.41%**) on the SIIM-ACR dataset, surpassing other SOTA methods.

✓ A Conference paper to be presented at the *2024 7th Medical Imaging with Deep Learning (MIDL), Paris, France.*

**Tool Life Prediction Using Industrial Big Data White Paper competition**

*Team Core member*

*Jul. 2023 - Dec. 2023*

- Constructed a virtual health index for tools based on existing data and used this index as a feature with the remaining life ratio as the training label, transforming the prediction problem into a regression problem for fitting.
- Optimized the regression model by integrating **machine learning algorithms** to enhance predictive accuracy and reliability, significantly reducing maintenance costs and improving operational efficiency.

## INTERNSHIP EXPERIENCE

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### Research Assistant

Jul. 2023 - Present

*Biomedical AI Lab, Xi'an Jiaotong-Liverpool University*

- Developed and optimized deep learning models for healthcare applications, specifically focusing on **medical image segmentation** and **classification**. This work involved using **PyTorch** to implement **CNNs**, **GANs**, and **diffusion models** to enhance diagnostic accuracy.

### Internship Member

Jun. 2023 - Aug. 2023

*Tencent Cloud Summer Internship*

- Conducted **linear regression analysis** using **R software** to predict relationships between enterprise data variables, which contributed to winning the **2<sup>nd</sup> Prize** in Tencent Cloud Competition.

PATENT

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Novel Cell Membrane Image Unsupervised Segmentation Model Training Method	Jul. 2023 - May 2024
China Patent Application No. 2024105960735	
Inventors: Jingxin Liu, Tianyang Wang, Yanjia Kan	
<ul style="list-style-type: none"><li>Developed an innovative approach using <b>Voronoi diagram algorithm</b> to simulate complex cell membrane structures, thereby generating pseudo-paired data for training data in an unsupervised learning setup.</li><li>Applied image translation techniques via <b>CycleGAN</b> to convert these pseudo-labeled images into pseudo-paired training data, effectively enhancing unsupervised segmentation accuracy.</li></ul>	

AWARDS AND HONORS

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2 <sup>nd</sup> Prize, Tencent Cloud Competition	Aug 2023
University Academic Achievement Award (Top <b>10%</b> in Xi'an Jiaotong-Liverpool University)	2022 - 2023

TECHNICAL SKILLS

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<b>Programming Languages:</b> Python, Matlab, L <sup>A</sup> T <sub>E</sub> X, C++, R
<b>Software:</b> PyCharm, Visual Studio, Jupyter, Git, Docker, PyTorch, RStudio, Overleaf
<b>Hobbies:</b> Half-marathon, Badminton, Running, Guitar, Table tennis
<b>Volunteer work:</b> Xi'an Jiaotong-Liverpool University Gym Assistant (2021-2022)
<b>LEC Club Membership:</b> Linux Makes your Life Easier (LEC) Member (2023-Present)