

# Jinye Ran

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## RESEARCH INTERESTS

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My research interests lie in the general area of machine learning, particularly in **transfer learning** and **disentangled representation**. Currently, I focus on applications in the continuous and unstructured data setting such as **computer vision** (e.g., feature disentanglement and domain adaptation) and **healthcare** (e.g., how to improve label efficiency and model interpretability).

## EDUCATION

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### Southwest University

*M.Eng., Computer Science and Technology, Advisor: Prof. Zili Zhang*  
Thesis: Research on Single Image Super-Resolution for Real-World Scenes

Chongqing, China  
*Sep. 2020 — Jun. 2023*  
GPA: 3.80/4.00

### Southwest University

*B.Eng., Chemical Engineering and Technology, Advisor: Prof. Hao Zhang*  
Thesis: A Study on Identifying Pericarpium Zanthoxyli before Pruning in Jiangjin District Based on Mask R-CNN

Chongqing, China  
*Sep. 2016 — Jun. 2019*

## SELECTED RESEARCH EXPERIENCE

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### Feature Disentanglement for Diabetic Retinopathy

*Postgraduate Research Assistant, Advisor: Prof. Hao Zhang and Prof. Guanghua Zhang*

Southwest University  
*Jan. 2024 — Present*

- Proposed a model to capture the evolving relationships among different diabetic retinopathy grades and designed a novel diabetic retinopathy progression loss function.
- Designed a simple feature disentanglement loss to separate class-relevant features from class-irrelevant features.
- Introduced VAE to achieve feature disentanglement and validated the effectiveness of disentangled features in downstream classification tasks.
- Partial results have been consolidated into the patent titled ‘**A Method for Decoupling Diabetic Retinopathy Features in Ultra-Wide-Field Fundus Images**’.

### Domain Adaptation for Diabetic Retinopathy Grading

*Graduate Researcher, Advisor: Prof. Hao Zhang and Prof. Guanghua Zhang*

Southwest University  
*Apr. 2023 — Mar. 2024*

- Improved NT-Xent loss and applied it to train source feature generator, generating feature distributions in hypersphere space that better align with diabetic retinopathy diagnostic intuitions.
- Proposed a novel active domain adaptation method to effectively avoid outliers and fully utilize all samples.
- Outperformed strong baselines and achieved the state-of-the-art performance in diabetic retinopathy adaptation.
- **Source-free Active Domain Adaptation for Diabetic Retinopathy Grading Based on Ultra-Wide-Field Fundus Image** (accepted by Comput Biol Med 2024).

### Lightweight Transformer Research

*Graduate Student Researcher, Advisor: Prof. Zili Zhang*

Southwest University  
*Sep. 2021 — Jun. 2023*

- Designed a cosine-based matching module in Transformer encoder for aggregation of local and non-local features.
- Applied this novel encoder to single image super-resolution, effectively balancing model performance and parameter size by mining self-similarity information.
- Pioneered the introduction of stationary wavelet transform to enhance feature in super-resolution, enabling a more lightweight Transformer, and successfully integrating it into the computational graph of Pytorch.
- **Lightweight Wavelet-Based Transformer for Image Super-Resolution** (accepted by PRACAI 2022).

### Semantic Segmentation of Remote Sensing

*Undergraduate Student Researcher, Advisor: Prof. Hao Zhang*

Southwest University  
*Jan. 2020 — Mar. 2021*

- Following field surveys, drafted pixel-level annotation standards for Pericarpium Zanthoxyli across different periods and organized the dataset development.
- Applied and optimized the SegNet algorithm, achieving over 90% accuracy in identifying more than 1,200 square miles of land, and developed 3D visualization models of two towns for Pericarpium Zanthoxyli display.
- Published and authorized the patent ‘**Green Pricklyash Peel Identification Method Based on Semantic Segmentation**’.

## PUBLICATIONS

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- **J. Ran**, G. Zhang, F. Xia, et al., "Source-free active domain adaptation for diabetic retinopathy grading based on ultra-wide-field fundus images," *Computers in Biology and Medicine*, vol. 2024, p. 108418, 2024.
- **J. Ran** and Z. Zhang, "Lightweight Wavelet-Based Transformer for Image Super-Resolution," in *Proc. Pacific Rim Int. Conf. Artificial Intelligence*, Cham, Switzerland: Springer Nature, 2022, pp. 368-382.
- H. Zhang, Y. Lin, **J. Ran**, et al., "Evolution stage identification of haze pollution episodes in Beijing using constrained dynamic time warping and multiway principal component analysis," *Environmental Modelling & Software*, vol. 168, p. 105811, 2023.
- X. Qu, Z. Zhang, W. Xiao, **J. Ran**, et al., "Sparse Dense Transformer Network for Video Action Recognition," in *Proc. Int. Conf. Knowledge Science, Engineering and Management*, Cham, Switzerland: Springer Int. Publishing, 2022, pp. 43-56.
- X. He, **J. Ran**, W. Zhang, and H. Fu, "Microemulsion-based interfacial diffusion synthesis of uniform BaCO<sub>3</sub> nanorods," in *Proc. 7th Int. Conf. Energy, Environment and Sustainable Development (ICEESD 2018)*, May 2018, pp. 200-203. Atlantis Press.

## PATENTS

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- W. Peng, H. Peng, J. Ge, and **J. Ran**, "Transparent instrument instance segmentation method based on CTAIS-SOLOv2," CN118097125A, Published May 28, 2024.
- W. Peng, H. Peng, M. Zhu, and **J. Ran**, "Method, device, medium and equipment for monitoring solid precipitation in transparent container," CN117058102A, Published November 14, 2023.
- H. Zhang, **J. Ran**, S. Wang, et al., "Green pricklyash peel identification method based on semantic segmentation," CN112906627B, Granted November 15, 2022.

## PROJECTS

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### Laboratory Safety Monitoring System

Core contributor, Southwest University & Porton Pharma Solutions Ltd.

Chongqing, China

Apr. 2021 — Jan. 2022

- Developed, optimized, and deployed visual detection algorithms for unsafe behavior in laboratories.
- Built a robust live streaming backend and deployed a secure production environment using Docker.
- Achieved 12-channel video stream real-time processing on a single NVIDIA T4 GPU.

### Pollutant Time Series Analysis

Experimental Lead, Southwest University

Chongqing, China

Nov. 2018 — Mar. 2019

- Conducted data preprocessing for pollution data, which improved data quality and analysis performance.
- Modeled and analyzed time series patterns to identify key pollution events.
- Applied vector error correction models to examine the relationships between pollutant concentrations and meteorological as well as economic factors.

## TEACHING & INTERN

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### Teaching Assistant at Southwest University

Course Design of Operating System

Chongqing, China

Spring, 2021

- Collected, graded, and provided feedback on student assignments.
- Assisted students with course-related questions and provided academic support during office hours.

### Machine Learning Intern

Hangzhou Xianshu Technology Co., Ltd.

Chongqing, China

Jan. 2024 — Jun. 2024

- Implemented visual recognition models for monitoring chemical reaction states.
- Developed robust instance segmentation algorithms for transparent containers in complex visual environments.

## SELECTED AWARDS & HONOURS

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**The First Prize Scholarship for Excellence in Academic Performance**  
Southwest University

Dec. 2018, Dec. 2020 — Dec. 2022

<b>The Third Prize of the 18th China Post-Graduate Mathematical Contest In Modeling</b> Association of Chinese Graduate Education	Dec. 2021
<b>Outstanding Graduates</b> Southwest University	Apr. 2020
<b>The Second Prize Scholarship for Excellence in Academic Performance</b> Southwest University	Dec. 2019
<b>Excellent Student Cadre</b> Southwest University	Dec. 2017 — Dec. 2019

## SERVICE

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- Reviewed manuscripts for China Safety Science Journal, 2021-2024, upon recommendation by Prof. Hao Zhang.
- Executive Committee Member of the Southwest University Branch of the China Computer Federation (2021-2022)

## SKILLS

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- **Languages:** Mandarin Chinese, English.
- **Programming Language:** Python, MATLAB, Linux Bash, C++.
- **Development Skills:** PyTorch, Lightning, TensorFlow, TensorRT, Latex, Docker.