Jinye Ran

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RESEARCH INTERESTS

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

Southwest University Chongqing, China
M.Eng., Computer Science and Technology, Advisor: Prof. Zili Zhang *Sep. 2020 — Jun. 2023*
Thesis: Research on Single Image Super-Resolution for Real-World Scenes GPA: 3.80/4.00

Southwest University Chongqing, China
B.Eng., Chemical Engineering and Technology, Advisor: Prof. Hao Zhang *Sep. 2016 — Jun. 2020*
Thesis: A Study on Identifying Pericarpium Zanthoxyli before Pruning in Jiangjin District Based on Mask R-CNN

SELECTED RESEARCH EXPERIENCE

Feature Disentanglement for Diabetic Retinopathy Southwest University
Postgraduate Research Assistant, Advisor: Prof. Hao Zhang and Prof. Guanghua Zhang *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 Southwest University
Graduate Researcher, Advisor: Prof. Hao Zhang and Prof. Guanghua Zhang *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 Southwest University
Graduate Student Researcher, Advisor: Prof. Zili Zhang *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 Southwest University
Undergraduate Student Researcher, Advisor: Prof. Hao Zhang *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

- **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 BaCO3 nanorods," in *Proc. 7th Int. Conf. Energy, Environment and Sustainable Development (ICEESD 2018)*, May 2018, pp. 200-203. Atlantis Press.

PATENTS

- 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

Laboratory Safety Monitoring System Chongqing, China
Core contributor, Southwest University & Porton Pharma Solutions Ltd. *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 Chongqing, China
Experimental Lead, Southwest University *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

Teaching Assistant at Southwest University Chongqing, China
Course Design of Operating System *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 Chongqing, China
Hangzhou Xianshu Technology Co., Ltd. *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

The First Prize Scholarship for Excellence in Academic Performance Dec. 2018, Dec. 2020 — Dec. 2022
Southwest University

The Third Prize of the 18th China Post-Graduate Mathematical Contest In Modeling Dec. 2021
Association of Chinese Graduate Education

Outstanding Graduates Apr. 2020
Southwest University

The Second Prize Scholarship for Excellence in Academic Performance Dec. 2019
Southwest University

Excellent Student Cadre Dec. 2017 — Dec. 2019
Southwest University

SERVICE

- 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

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