

SHIKANG ZHANG

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EDUCATION

Zhejiang University of Technology(ZJUT)

September 2023 – June 2026 (expected) M.S. in Control Engineering

GPA: 3.4/4.0

Related courses&scores: Optimization Methods:91, Deep Learning:90, Advanced Algorithm:94, Reinforcement Learning:94. Average score:85

Wuhan University of Science and Technology(WUST)

September 2018 – June 2022 BEE in Automation

GPA: 3.67/4.0

Rank:5/223

Related courses&scores: Advanced Mathematics(A):94, Probability Theory(A):94, Principles of Automatic Control:92. Average score: 88

RESEARCH INTERESTS

My current research focuses on weakly supervised learning based on object detection and instance-level representation learning, aiming to address challenges in cell-level feature extraction and classification on pathological images through these approaches. Additionally, I am interested in several cutting-edge fields, such as diffusion models, model acceleration, and edge computing. I also actively devote my spare time to studying fundamental theories of deep learning, hoping to pursue deeper research in one or more of these directions in the future.

RESEARCH EXPERIENCE

Cell Detection Based on Pathological Images

Feb 2025 - Present

Mainly addressing the issues of labeling difficulty and insufficient training data for pathological images, we utilized spatial transcriptomics technology combined with other tools to construct a dataset comprising weakly-supervised data (slide-level proportion information) and semi-supervised data (including partial instance-level label information). This fully automated dataset construction pipeline can generate a large amount of data for training, and we aim to mitigate the difficulties in cell-level feature extraction and classification on pathological images through large-scale data training. Furthermore, to better adapt to training on multiple data types, we developed a new model architecture based on Deformable DETR. The main innovation of this model lies in the decoupled decoder design that separates the detection and classification tasks, while the classification part enhances the model's feature extraction capability through a spatially restricted attention mechanism. Currently, we have validated our model's performance on a supervised dataset in terms of training speed, detection, and classification metrics, achieving significant improvement especially in classification accuracy. Additionally, by training with large-scale weakly-supervised data and validating on a supervised dataset, the model has acquired initial classification capability. Finally, we are further exploring more training and fine-tuning methods to verify the feasibility of the entire pipeline.

Key Objectives:

- 1.A novel method for constructing a pathological image detection dataset.*
- 2.A novel model architecture incorporating a decoupled decoder with spatially constrained attention.*
- 3.Novel training data types coupled with innovative training methods.*

- **Role:** Initiater and Implementor.
- **Stage:** The model structure is basically determined, and the validation of the model and process is underway, along with paper writing.
- **Deadline:** Early February 2026

A detection-based pre-training model for pathological images.

Dec 2024 - present

As an extension of the previous project, since we constructed a detection framework with a decoupled

decoder architecture, the classification part can query the features within the input bounding boxes. We aim to construct positive and negative samples by varying these bounding boxes, and to achieve instance-level pre-training and feature extraction in pathology through a contrastive learning approach. Meanwhile, our model architecture enables parallel training of the two decoupled parts, thereby allowing us to simultaneously focus on both feature extraction and detection tasks. During inference, we only need to feed the results from the detection part into the feature extraction module. We have already experimented with several contrastive learning methods and have validated, through visualizations of attention maps and feature similarity between instances, that the model can extract instance-level representations with practical semantic meaning. We will next explore more contrastive learning strategies and validate the model's capabilities on larger-scale datasets.

Key Objectives:

1. Positive-negative sample pair construction strategy.
2. Method for instance-level pre-training and feature extraction.
3. Construction of attention masks for multi-head attention (MHA) and their role.
4. Validation on downstream tasks.

- **Role:** Initiator and Implementor.
- **Stage:** Implementation of contrastive learning training and preliminary validation of project feasibility.
- **Deadline:** February 2026

Research on Cluster-guided Contrastive Learning Clustering Algorithm Applied to Spatial Transcriptome

Dec 2024 - present

This research focuses on developing a cluster-guided contrastive learning algorithm tailored for spatial transcriptomics. The primary goal is to enhance the clustering of spatial gene expression data by leveraging contrastive learning techniques and fusing multi-modal information.

- **Role:** Participation.
- **Stage:** Writing paper.
- **Deadline:** August

Bioinformatics Analysis of Triple-negative Breast Cancer

May 2024 - present

This is a collaborative research project aimed at understanding the mechanism of metastasis of triple-negative breast cancer through bioinformatics approaches. What mostly fulfills me was the optimization of a tool, enabling significant gains in speed alongside reduced GPU memory footprint.

- **Role:** Participation and modifying tools for accelerating.
- **Stage:** analysis and visualization.
- **Deadline:** Unknown

PUBLICATIONS

I don't have any publications yet, but I am working on several projects and hope to publish the first two jobs in the near future.

ACHIEVEMENTS

Outstanding Undergraduate Thesis, awarded by WUST	Summer 2022
Outstanding Graduate, awarded by WUST	Summer 2022
Freshman Scholarship, awarded by ZJUT	Fall 2023

SKILLS/HOBBIES

Programming Languages	Python, C/C++ , Latex
Machine Learning Tools	Pytorch, Pandas, Numpy, OpenCV ,Github
English level	CET-6, IELTS(6.0)
Hobbies	Badminton
Self-evaluation	Responsible, proactive, quick learner, enjoy thinking and brainstorming.