

# Zhuosheng Liu

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June 2025 graduate seeking internship/full-time opportunities in ML & AI (Pending 485)

## Experience

**Information Fusion and Mining Lab, Graduate Research Assistant co-advised by Dr. Jiawei Zhang**

May 2023 - Now

- Developed and optimized **classic machine learning and deep learning** models for microbial pangenome, achieving rapid and accurate pathogenicity assessment of pathogenic bacteria.
- Drove advanced solutions and compared different **parameter efficient-fine-tuning** methods for **vision language model**.

**Data-intensive Biology Lab: Graduate Research Assistant co-advised by Dr. Titus Brown**

March 2021 - Now

- Conducted and analyzed large-scale transcriptomics data of microbial-system by building **high-throughput and fully automatic bioinformatics pipelines**
- Organized and maintained large scientific projects on **High Performance Computer** over the cloud and kept **git version control** up-to-date

**Food Microbiology Lab: Graduate Research Assistant advised by Dr. Luxin Wang**

June 2020 - Now

- Conducted experiments using both culture-dependent and **next-generation sequencing biotechnology** to characterize fitness and behaviors of pathogenic foodborne pathogens

**UC Davis FST, MIC and ECS department Graduate Teaching Assistant**

June 2020 - Now

- Graduate tutor for ECS 122A algorithm analysis and design**, holding two hours office hours/week to answer undergraduate questions regarding course material
- Graduate TA for MIC 103L and FST 104L**, teaching students in microbiology lab practice and guiding students in journal club

## Education

3.97/4.0 **PhD. in Food Science, UC Davis** | California, USA

2020-25

3.93/4.0 **Master's degree in Computer Science, UC Davis** | California, USA

2023-25

3.84/4.0 **Master's degree in Biotechnology, Columbia University** | New York, USA

2019-20

**Research Focus:** Food Microbiology | Microbial Genomics & Transcriptomics | Applied Bioinformatics | Applied ML/AI

**International Publications:** Microbiology Spectrum (**IF9.1**) | Food Research International (**IF8.1**) | Food Control (**IF6.1**) | LWT (**IF6.0**) | CVPR 2024 (Submitted) | PNAS (ready to submit)

**Courses:** ECS 271 **Advanced Machine Learning (A+)** | ECS 174 **Computer Vision (A)** | ECS 122A **Algorithm Analysis and Design (A)** | ECS 124 **Bioinformatics Theory and Practice (A)** | STA 141 **Advanced Statistical Computing A-B-C (A)** | ECS 201A **Computer Architecture**

## Skills

**Programming Software** Python (NumPy, SciPy, pandas, Matplotlib, Jupyter), C/C++, Java, Perl, R, CUDA, CMake, Git, Bash Scripting, LaTeX

**Bioinformatic skills** Linux, Tensorflow, Pytorch, OpenCV, Snakemake, scikit-learn, Automatic workflow construct using Snakemake, 16s rRNA-sequencing analysis, RNA-sequencing analysis, Whole-genome sequencing analysis, Pangenome construction and analysis

## Projects

**Virulence prediction of pathogenic foodborne pathogens using ML/DL based on Pangenome**

June 2023 - Now

Manuscript in preparation

- Constructed pangenome ( 100,000 unique gene feature) using **fully integrated and scalable bioinformatics pipeline** (automation achieved using Snakemake)
- Visualized high-dimensional pangenomic gene feature using **dimensional reduction PCA**
- Trained, optimized, validated and statistically compared fundamental **unsupervised and supervised machine learning model** performance, including **Kmean, GMM, KNN, SVM, RF, Naive Baye**
- Trained and validated **deep neural network (MLP and CNN)** and achieved 93% virulence prediction accuracy

**Parameter-Efficient Fine-Tuning for Vision-Language Models**

June 2023 - Now

Preliminary report available at [Here](#)

- Conducted an extensive study on the application of **Parameter-Efficient Fine-Tuning (PEFT)** methods to vision-language models, particularly focusing on the **CLIP**.
- Conducted comprehensive empirical analysis across various datasets, such as VTAB-1K, to understand the adaptability and effectiveness of PEFT methods in different scenarios.
- Investigated the effectiveness of **prompt engineering** and **adapter technique such as LoRA** in improving model performance
- Implemented and optimized various hyperparameters through **systematic grid search** methods to ascertain the most effective settings for the models.
- Demonstrated the potential of PEFT in vision-language models through empirical studies, highlighting the need for enhanced approaches in complex multimodal scenarios.

**Transcriptomic analysis of pathogenic *Vibrio parahaemolyticus***

June 2021 - June 2023

Paper has been accepted and published in Microbiology Spectrum [Here](#)

- Obtained biological insights of *Vibrio parahaemolyticus* using **RNA-seq data analysis** (genome reference-free Salmon pipeline)
- Python-oriented web-script extracting essential information gene annotation from **JSON-based KEGG database**
- Conducted **statistical differential expression gene analysis** over 4000 unique genes using Deseq2