Jiangguo Zhang

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EDUCATION

Rice University, *Houston, TX*

Ph.D. in Bioengineering — GPA: 3.96/4.00 — Aug. 2018 - Dec. 2024(expected)

- ***Thesis:*** Using Deep Learning to Extract Multicellular Aggregation Features of *Myxococcus Xanthus*

M.S. in Computer Science — GPA: 3.96/4.00 — Jan. 2023 - Dec. 2024(expected)

Peking University, *Beijing, China*

B.S. in Biology (Undergraduate Honors Program in Biology) — Sept. 2014 - July 2018

- ***Thesis:*** The Application of Neural Network in Protein Structure Prediction

SKILLS

Modeling Techniques: Agent-Based Modeling, Generative Modeling, Chemical Kinetics Modeling
Programming Language: Python, Matlab, C/C++, Java, R, Javascript, HTML, Verilog
Machine Learning Frameworks: PyTorch, TensorFlow, Scikit-learn
Parallel Programming: OpenMP, MPI, CUDA
Bioinformatics Tools: BLAST, PyMOL, Gromacs, ImageJ

RESEARCH EXPERIENCES

Graduate Research Assistant — Aug. 2018 - Present

Rice University, *Houston, TX*

- Collaborated with interdisciplinary teams across 5 institutes to develop deep learning models for microscopic image transformation and chemical kinetic models for studying synthetic bacterial co-culture systems.
- Designed a **Siamese network** to quantify phenotypic similarity and created a **Variational AutoEncoder (VAE)** using **ResNet** and **StyleGAN2** for high-resolution image encoding and reconstruction.
- Developed a **Generative Adversarial Network (GAN)** in **PyTorch** to convert high-resolution phase-contrast microscopic images into fluorescence microscopic images, leading to over 7% improvement in aggregate segmentation precision and recall.
- Monitored the deep-learning training process using **TensorBoard** and executed model training on Rice's hosted clusters. Fine-tuned hyperparameters based on observed training curve patterns.
- Authored research proposals and successfully obtained travel grants amounting in $1,000.
- Published two research papers with an additional three expected for publication within the current year.
- Presented research findings at several scientific conferences, promoting active dialogue within the scientific community.

Teaching Assistant — Jan. 2020 - Dec. 2020

Rice University, *Houston, TX*

- Updated and designed course materials, including assignments and rubrics, for biostatistics and computational biology courses.
- Conducted office hours and instructed classes of 50+ students in Rice Bioengineering.

Research Intern — May 2019 - Aug. 2019

Fudan University, *Shanghai, China*

- Mastered the Cryogenic Electron Microscopy (Cryo-EM) single-particle reconstruction pipeline, including particle picking, reference-free 2D class averaging, de novo 3D model generation, and high-resolution 3D refinement.
- Optimized the Cryo-EM high-resolution 3D refinement step within the RELION 2.1 software, leveraging **CUDA** implementation, which resulted in an improved resolution of the reconstructed proteins.

Research Intern — June 2016 - Aug. 2018

Peking University, *Beijing, China*

- Developed a **DCRNN** for membrane contact probability (MCP) prediction, and a Deep **ResNet** model using **TensorFlow** for protein contact map prediction. The inclusion of predicted MCP increased contact map precision by 28%.
- Utilized CONFOLD2 to reconstruct protein structures from contact maps and refined these structures using **Gromacs** for molecular dynamics simulations.

PROJECT EXPERIENCES

Hackathon Project Developer — June 2023

ThirdAI, *Houston, TX*

- Led the development of "ExpertDexAI", an expert search tool leveraging ThirdAI's **NeuralDB** and OpenAI's **ChatGPT** API.
- Delivered a succinct 5-minute demonstration, highlighting the strategic use of AI technologies, robust problem-solving abilities, and effective project management, culminating in the second-place finish at the hackathon.

Project Lead — Aug. 2019 - Dec. 2019

Rice University, *Houston, TX*

- Spearheaded the development and launch of a Pac-Man game and chat room, utilizing **Java** and **JavaScript** based on object-oriented programming principles and design techniques.
- Led a diverse team of seven graduate students, fostering collaboration and managing project timelines to ensure timely updates.
- Presented project progress and final results, effectively communicating team efforts and project outcomes.

Web Development Engineer — Aug. 2019 - Dec. 2019

Rice University, *Houston, TX*

- Created dynamic, interactive web pages using **HTML**, **CSS**, **JavaScript**, and **React.js**.
- Conducted comprehensive research on web development technologies, culminating in impactful presentations to peers.

PUBLICATIONS

[1] Quantification of *Myxococcus xanthus* Aggregation and Rippling Behaviors: Deep-Learning Transformation of Phase-Contrast into Fluorescence Microscopy Images (**First Author**), Microorganisms, Aug. 2021

[2] Membrane contact probability: An essential and predictive character for the structural and functional studies of membrane proteins, PLoS computational biology, Mar. 2022

[3] Cell behaviors underlying *Myxococcus xanthus* aggregate dispersal, bioRxiv, May 2023

AWARDS

Second Prize Winner, ThirdAI Hackathon — June 2023
2022 IBB (Institute of Biosciences and Bioengineering) Travel Award — May 2022
Exceptional Award for Academic Innovation, Peking University — Oct. 2017
First Prize, National University Physics Competition (Non-physical group) — Dec. 2016

ACTIVITIES

Vice Secretary General - Houston Beida Alumni Association (BAA) — Sept. 2021 - Present
Member - Center for Theoretical Biological Physics (CTBP) — Nov. 2019 - Present
Vice President - Rice Chinese Students and Scholars Association — May 2019 – May 2020