

EDUCATION

- **University of Michigan - Ann Arbor** Ann Arbor, MI
B.S., Computer Science, Honor Mathematics Sep 2021 - May 2024 (expected)
- **Xi'an Jiaotong - Liverpool University (transferred out)** China
B.S., Applied Mathematics Sep 2019-Jul 2021

RESEARCH EXPERIENCE

- **University of Michigan - Ann Arbor** Feb 2023 - Present
Research Assistant, Advisor: Hui Deng

Far-Field Imaging Below Diffraction Limit:

- * Utilized the Metasurface Scattering Microscopy (MSM) method, where the metalens is used to scatter information from the near to far field.
- * Employed a filter simulated by Discrete Dipole Approximation to transform from k-space near-field images to images seen by detectors, enabling the network to be trained on synthetic data.
- * Trained a U-Net neural network against the metalens, reconstructing the near field image from the scattered far-field data.
- * Compared the U-Net reconstruction performance with a direct reconstruction approach that uses a least-squares calculation.

Deep Learning for Photonic Crystal Design:

- * Developed deep learning models to engineer Valley Photonic Crystal patterns through both inverse design and forward prediction, drawing on FDTD simulation data.
- * The objective was to achieve a resonant frequency, ensure a direct bandgap with a large bandgap, and optimize the coupling strength.
- * Currently working on using Bayesian Optimization to generate more samples with high quality factor

Photoluminescence Spectroscopy Analysis:

- * Enhanced Photoluminescence Spectroscopy data analysis through a multi-output neural network that automatically identified Lorentzian peaks and extracted peak features.

- **University of Michigan - Ann Arbor** Nov 2022 - Present
Research Assistant, Advisor: Oliver He, Justin Johnson

Deep Learning for Vaccine Design:

- * Utilized Reverse Vaccinology and designed an MLP method for identifying bacteria protective antigens BPAGs with biological and physiochemical features annotated using bioinformatics software
- * Addressed the imbalance in the dataset by employing various sampling strategies and assigning appropriate weights.
- * Enhanced model applicability against new emerging pathogens by implementing a leave-one-pathogen-out strategy and benchmarked on a curated independent dataset. Model achieved an AUC-ROC score of 0.95 and prediction accuracy 95%.
- * Currently working on AlphaFold to derive structural information from bacterial protein genomic sequences, enlarging the features in dataset for better prediction

PROJECTS

- **Predicting Music Popularity Based on Extracted Instrumental Features:** Generated a Mel-Spectrogram dataset of over 50,000 songs obtained from raw MP3 files. Leveraged models including XGBoost, SVM ANOVA with ranking loss, ResNet model, and Transformers for Mel spectrogram analysis.
- **Multi-Threaded Network File Server:** Developed a multi-threaded network file server that supported numerous client interactions via network messages. Designed a hierarchical file system where each entity was referenced through unique full pathnames.

- **Memory Manager:** Architected a robust pager system to manage the kernel's virtual address spaces of application processes, effectively optimizing system call functions for space allocation, creation, and management.
- **Thread Library:** Engineered a comprehensive thread library to bolster support for multi-threaded applications. The interface consists of CPU, thread, mutex, and cv, effectively enabling thread creation, interruption, synchronization, and context switching, thereby enhancing application performance and concurrency.

TALKS

- Zhang Y., He O., Johnson J. Deep learning reverse vaccinology model for prediction of bacterial protective antigens. In: *Undergraduate Research Opportunity Program: The Spring Symposium, April 2023*

HONORS & AWARDS

University of Michigan - Ann Arbor

- University honors (FA 2021, WN 2022, FA 2022, WN 2023)

Xi'an Jiaotong - Liverpool University

- 2020/21 University Academic Excellence Award—Scholarship Equivalent to \$2000
- 2021/22 University Academic Achievement Award—Scholarship Equivalent to \$1000

TECHNICAL SKILLS

Programming Languages: Python, C++, C, Java, Javascript

Libraries: PyTorch, TensorFlow

Others: Matlab, SQL, Docker, Git

RELEVANT COURSEWORK

Mathematics: Real Analysis, Applied Functional Analysis, Probability Theory, Introduction to Numerical Methods, Abstract Algebra, ODEs and PDEs

Computer Science: Computer Vision, Natural Language Processing, Machine Learning, Operating System, Computer Organization, Algorithms, Data Structure