Yuchen Liang

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EDUCATION

Ph.D. in Electrical and Computer Engineering *August 2019–August 2023*
B.S. in Computer Engineering *August 2015–May 2019*
University of Illinois at Urbana-Champaign (UIUC)

- Ph.D. Concentration: Data Science and Signal Processing
- Ph.D. Thesis: Quickest Change Detection under Post-change Non-stationarity and Uncertainty

Research Expertise: Deep generative models, Machine learning, Anomaly detection, Bayesian analysis

RESEARCH EXPERIENCE

Postdoc Scholar @ OSU *September 2023–Present*

- Proposed an accelerated **diffusion generative model** (i.e., DDPM) using hessian acceleration, analyzing with novel Bayesian tilting factors and performing numerical validations with simulated data
- Designed an optimized **zero-shot** conditional diffusion sampler, numerically outperforming previous samplers by achieving 1/10 of the convergence error given similar computation resources
- Performed real-image experiments by implementing the algorithms in **PyTorch**

Graduate Research Assistant @ UIUC *August 2019–August 2023*

- Proposed and studied 5 **online anomaly detection** algorithms for **sequential data**, proving their optimal performances when the anomalous distribution is unknown and/or non-stationary
- Showed that these detectors greatly reduce the sample size needed in classical algorithms for training (e.g., NGLR-CuSum and NWLA-CuSum, no training needed) and for detection (e.g., MCT, only ~1/6)
- Validated practical effectiveness in detecting new pandemic waves (using geographical infection data), in monitoring passing vehicles (using **time-series** sensor data), and in human activity monitoring
- Published 7 peer-reviewed papers as first and co-first author in top ML conferences and journals

INDUSTRIAL EXPERIENCE

Data Science Intern @ Corteva Agriscience *May–August 2022*

- Cleaned and transformed **bio-genetic** data with ~130,000 records and ~10 **categorical** features with **Pandas** and **Dask**, encoding features, merging tables, and creating visualizations on **Kubeflow**
- Built and optimized 2 ML **regression** models (SVM and **XGBoost**) by **Scikit-learn** to predict insecticidal protein levels based on transgenic designs and plant traits
- Reduced baseline RMSLE by 0.25 and performed detailed error analysis for each design
- Presented data-collection suggestions to bio-scientist coworkers

Data Engineering Intern @ Nat'l. Ctr. for Supercomp. App. *June 2018–May 2019*

- Maintained 2 **AWS** EC2 VMs and a **PostgreSQL** database to store Giga-byte Zillow housing data
- Automated data loading and extraction by creating **Bash** scripts and an **R package**

MENTORED PROJECTS

- **Poké Generator**: Created unique Pokémon character images via a fine-tuned Stable-diffusion model on the generated Pokémon dataset
- **GestureVision**: Augmented the existing ASL Alphabet gesture image dataset by fine-tuning the Google's DDPM; performed preliminary gesture recognition using Vision Transformer (ViT)
- **Monetify**: Generated Monet-style art pieces through Neural Style Transfer (NST), initializing content images with DCGAN and obtain style images from VGG19 from 1000 Monet's paintings

COMPUTER SKILLS

- **Languages & Libraries:** Python (PyTorch, Numpy, Numba, Matplotlib, Pandas, Dask, Scikit-learn, Keras), Jupyter Notebook, SQL, R (dplyr), Bash, C++
- **Frameworks & Applications:** AWS, Git, PostgreSQL, Docker, Tableau
- **Certificates:** Deep Learning Specialization (DeepLearning.AI), AWS Solution Architect (SAA-C03)

SELECTED PUBLICATIONS

- **Y. Liang**, P. Ju, Y. Liang, N. Shroff, "Non-asymptotic Analysis of Zero-Shot Conditional Diffusion Model," in preparation.
- **Y. Liang**, P. Ju, Y. Liang, N. Shroff, "Non-asymptotic Convergence of Accelerated Discrete-time Diffusion Model: A Novel Analysis," in preparation.
- L. Xie, **Y. Liang** and V. V. Veeravalli, "Distributionally Robust Quickest Change Detection using Wasserstein Uncertainty Sets," in *Proceedings of the 27th International Conference on Artificial Intelligence and Statistics*, PMLR vol. 238, pp. 1063-1071, 2024.
- **Y. Liang** and V. V. Veeravalli, "Quickest Change Detection with Post-Change Density Estimation," in *IEEE Transactions on Information Theory*, 2024.
- **Y. Liang** and V. V. Veeravalli, "Non-Parametric Quickest Mean-Change Detection," in *IEEE Transactions on Information Theory*, vol. 68, no. 12, pp. 8040-8052, 2022.