Wanchen Zhao

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github.com/WanchenZ — Seattle, WA(open to relocation) — Work Authorization: US Permanent Resident

Summary

Machine Learning Scientist and Mathematics PhD specializing in the intersection of Topological Data Analysis and robust representation learning. Expert in translating complex mathematical frameworks into high-performance Python/C++ pipelines. Proven track record in developing stability-guaranteed models for high-dimensional data, with experience taking ambiguous research prototypes to production-quality deployment.

Technical Skills

Languages: Python, C++, SQL, Julia
ML & Data: PyTorch, TensorFlow, scikit-learn, NumPy, Pandas, PySpark
Systems & Tools: Linux, Git, HPC clusters, GPU acceleration
Methods: Model evaluation, robustness analysis, simulation, metric design, statistical modeling, failure-mode analysis

Selected Professional Experience

Operations Analyst (Contract) 2024 – Present
C2 Education of Bellevue (Remote)

- Designed and maintained Python systems to evaluate operational performance, supporting daily decision-making.

- Built automated evaluation pipelines, reducing manual reporting time by 70% while improving reliability.

- Collaborated with non-technical stakeholders to translate ambiguous requirements into measurable metrics and tooling.

Graduate Research Assistant (Geometric ML Evaluation & Wasserstein Robustness) 2021 – Present
University of Florida

- Designed ML representations for high-dimensional data; designed metrics and proved Wasserstein robustness.

- Reduced memory costs using k-d tree structure optimized for large-scale distance computations.

- Taught Calculus, Linear Algebra, Differential Equations.

Researcher – Mathematical Research Community (MRC) Jun – Jul 2024
American Mathematical Society

- Collaborated with climate scientists to analyze weather regimes linked to the North Atlantic Oscillation.

- Ran large-scale, reproducible experiments on Linux-based HPC clusters and presented results at JMM 2025.

Visiting Undergraduate Researcher – Particle Physics Simulation May – Aug 2018
SLAC National Accelerator Laboratory

- Optimized particle physics C++ simulations, achieving an $18\times$ runtime improvement for dark matter detection models.

- Collaborated within large-scale experimental teams to validate simulation data against real-world constraints, ensuring high fidelity in high-stakes environments.

Selected Projects

Neural Dynamics Analysis with Topological Data Analysis

- Built a topology-based feature selection method using stochstic gradient descent for multivariate time series with provable robustness to noise.

- Applied the method to *C. elegans* neural recordings, identifying neurons that drive coordinated system dynamics.

Geometric Wasserstein Autoencoder

- Built PyTorch autoencoders with Wasserstein loss for geometric data, outperforming standard MSE loss in capturing point cloud topology.

- Implemented end-to-end training pipelines with batching, GPU acceleration, and convergence diagnostics.

Dynamical Systems Classification

- Developed supervised ML pipeline for structured time-series classification.

- Applied PCA for dimensionality reduction and visualization; trained and evaluated SVM classifiers using ANOVA.

Education

Ph.D. in Mathematics Expected May 2026
University of Florida
B.Sc. in Applied Physics May 2021
Columbia University