

# Rico Zhu

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## EDUCATION

### Duke University

Double Major B.S in Computer Science with a Concentration in AI & ML, B. S in Mathematics

Durham, NC

Class of 2025

- **GPA:** 3.82/4.0
- **Relevant Coursework:** Graduate Level Machine Learning (CS 671), Graduate Level Deep Learning (CS 675), Graduate Level Algorithms (CS 532), Natural Language Processing (CS 572), Geometric Algorithms (CS 634), Data Structures & Algorithms (CS 201), Computer Systems (CS 210), Databases (CS 316), Linear Algebra (Math 218), Probability (Math 340), Topological Data Analysis (Math 412), Abstract Algebra (Math 401), Real Analysis (Math 431).
- **Activities and Societies:** Duke Robotics Club (Software Team Lead).

### Technical Skills:

- **Languages:** Advanced: Python, Java, HTML, CSS, JavaScript, Linux; Proficient: C++, C, SQL, React, Vue.js, Node.js.
- **Frameworks:** Advanced: Pytorch, Jax, NumPy, Matplotlib, Pandas, Flask; Proficient: Tensorflow, Android, Unity.

## EXPERIENCE

### Lawrence Berkeley National Lab

Research Intern

Remote

January 2024 – Present

- As part of the transfer learning group, developed geometric sampling methods for space-filling designs to efficiently use posterior distribution from statistical studies. Formulated sampling as a linear programming problem and implemented a novel optimization algorithm to solve this problem.
- Designed and established a general software framework for performing closure tests to verify experiment results.

### Duke University Department of Computer Science

Head Teaching Assistant – Data Structures & Algorithms

Durham, NC

December 2023 – Present

- Developed critical back-end course infrastructure including project auto-graders and the Gradescope course website for Duke University's largest undergraduate computer science course; advised on project designs on how to best facilitate active student engagement.
- Deployed an automated notification system for monitoring student discussion forum updates, integrated with the TA work Slack platform via a custom built bot using the Python Slack API.
- Led weekly office hours and discussion sections with 30+ students, receiving a 100% student rating in two semesters. Also a teaching assistant for CS 330: Design & Analysis of Algorithms.

### Interpretable Machine Learning Lab

Research Assistant

Durham, NC

December 2022 – Present

- With Prof. Cynthia Rudin, Simon Mak, and Yue Jiang, led the development of novel sentiment-informed music generation models, achieving SOTA performance at a fraction of the computational cost; models have resulted in 2 publications at **KDD**, a top machine learning and data mining conference.
- Currently developing novel graph neural networks for learning hierarchical music representations, with applications to harmonic analysis and symbolic music generation; first author publication under submission to **AAAI**, the top conference for general AI research.

### CERN

Research Intern

Geneva, Switzerland

May 2022 – September 2022

- Contributed to CERN's Large Hadron Collider Run 3 analysis by optimizing the PFlow particle collision reconstruction algorithm via a graph neural network classifier, increasing model accuracy from 88.3% to 90.8%.
- Implemented a comprehensive set of bash scripts on CERN's HPC network for model execution, enabling efficient and parallelized model training and inference on a large scale.

## PROJECTS

### SentHYMNent

- Designed and implemented a novel sentiment-infused music generation model using higher-order Markov models.
- Built a small video game demo to interface with the model, where the user can collect different types of sentiment notes to influence the background music; this resulted in a demo at **NeurIPS**, the top machine learning conference.

### Autonomous Underwater Robot – Computer Vision Team Lead for Robotics Club

- Chief architect of custom vision pipeline, from camera to model, which led to an 11<sup>th</sup> overall team placement (out of ~40 teams) at the 2023 Robosub competition. Team technical report describing robot design was ranked 2<sup>nd</sup> overall.
- Engineered a novel Unity-based synthetic image generation system to help generate training and testing images to address imbalance dataset, resulting in over 97% mean-average precision accuracy on image segmentation CNN.