Neil He

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Introduction

I'm a senior at Yale university pursuing a joint BS/MS degree in mathematics and a minor in computer science. With over 5 years of theoretical and applied research experiences, I'm interested in pursuing graduate school in computer science, focusing on machine learning. My current research is in representation learning on structured datasets. Often times, a dataset (such as events on earth, which is a approximately a sphere) exhibit the geometric and topological structure. I work on developing algorithms and deep learning models that effectively and efficiently learns on datasets that have additional geometric constraints, especially those that do not live in Eulidean space. I'm especially interested in hyperbolic spaces, where the negative curvature of the manifolds facilitates exponential growth in volume with distance from the origin, making them particularly suitable for processing hierarchical data. I'm also interested in HPC-enabled learning for science, with methods grounded in properties of the natural sciences. I'm currently working closely with Prof. Rex Ying on building a unified HNN library. I'm also working with Profs. Nisheeth Vishnoi and Oren Mangoubi to design efficient diffusion models on Riemannian manifolds.

Education

Yale University New Haven, CT
Combined 4 years B.S./M.S. in Mathematics; minor in Computer Science *Expected May 2025*

Research Experience

Graph and Geometric Learning Group at Yale April 2023 - Present
Undergraduate Researcher, Advised by Prof. Rex Ying *New Haven, CT*

- Design and create an end-to-end residual network that operates entirely on the Lorentzian ball model of hyperbolic space, with the goal of creating a novel hyperbolic learning model based on the Lorentz model for ResNet
- Creating a comprehensive library and benchmark for hyperbolic deep learning models to investigate often neglected effects contributed by properties such as hyperbolicity, curvature, etc

High Power Computing REU May 2024 - July 2024
Undergraduate Researcher, advised by Prof. Yu Liu and Prof. Ming-Cheng Cheng *Potsdam, NY*

- Designing and implementing a GPU-accelerated program that uses mathematical modeling grounded in physical properties to accurately and efficiently simulate temperature behavior on chips with tens of thousands of cores, to predict hotspots in real time for task management on GPU and CPU chips

Efficient Computing Lab May 2022 - August 2022
Undergraduate Research Assistant *New Haven, CT*

- Use Rust and surface code to create a comprehensive research tool for quantum error correction simulation
- Create a user friendly Python interface for the quantum error correction simulator written in Rust

Michaelson Lab at Harvard Medical School December 2018 - September 2021
Research Assistant *Remote*

- Collected data of human cellular allometry to study human growth and development
- Analyzed the data using Excel and Python; co-author on published paper
- Collected and analyzed data of Drosophila embryos to study the geometry of cell division

Industry and Work Experience

Scale AI
LLM Consultant *Feb 2024 - Present*

- Oversee the training and deployment of large language models (LLMs) by providing strategic solutions and correction to over 5 large-scale training projects to meet customer needs.

Yale University
Teaching Assistant *Feb 2023 - Present*

- Hold office hours and grade problem sets for the Data Structure, Set Theory, and Real Analysis courses at Yale

Publications/Preprints

papers can be found in links in my personal website

Neil He, Menglin Yang, Rex Ying. Lorentzian Residual Neural Network. *Full Paper accepted to* ***SIGKDD 2025****, Extened abstract at* ***2024 ICML GRaM Workshop***. Full PDF Link, Extended Abstract Link

Neil He, Ming-Cheng Cheng, Yu liu. PyPOD-GP: Using PyTorch for Accelerated Chip-Level Thermal Simulation of the GPU. *submitting to SoftwareX Journal* PDF Link

Chodrow, P., Su, J., Lee, D., Ahmed, T., **He, N.**, Ruben, D. M., Tiwari, A., Mannherz, W., Citi, L., DiCorpo, D., Michaelson, J. S. (2021). How our cells become our selves: The Cellular Phylodynamic Biology of growth and development.