

# Haorui (Harry) Li

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## RESEARCH FOCUS

As a **junior researcher**, my research focuses on **Machine Learning** on non-Euclidean data (e.g. **graphs**), with fundamental understanding in theory and applications to real-world problems in **Life Science (Chemistry/Biology)**.

- **Fields:** AI for Science, Generative Model, Deep Learning for Molecule/Protein, Drug Discovery
- **Methods:** Graph Neural Networks, Generative Models, Organic Chemistry, Physical Chemistry

## EXPERIENCES

California Institute of Technology, Pasadena, California

July, 2024 – Present

- Undergraduate researcher in Computing + Mathematical Sciences Department
- Advisor: Dr. Shengchao Liu & Prof. Anima Anandkumar

Huazhong University of Science and Technology, Wuhan, Hubei

Sep., 2021 – Present

- Year 4 Undergraduate
- Bachelor of Science, School of Chemistry and Chemical Engineering
- Bachelor of Engineering, School of Computer Science & Technology

GPA: 4.0/4.0, Average Score: 91.8/100, Ranking: 1<sup>st</sup> (Chemistry)  
4.0/4.0, Average Score: 91.6/100, Ranking: Not available (Computer Science)

Vanderbilt University, Nashville, Tennessee

Aug., 2024 – Present

- Intern in Department of Computer Science
- Advisors: Dr. Yu Wang & Prof. Tyler Derr

National University of Singapore, Singapore

July, 2023 – Aug., 2023

- Intern in School of Computing
- Advisor: Prof. LEK HSIANG HUI

## SCHOLARSHIPS & AWARDS

- 2023 National Scholarship (Highest scholarship awarded by the Chinese government, < 0.1%)
- 2023 Merit Student Scholarship (given to students that excel in academics, athletics, arts or other areas of special interest, < 1%)
- 2022 Outstanding Undergraduates in Term of Academic Performance (Greatest honor for undergraduates in HUST, < 0.1%)
- 2022 National Scholarship (Highest scholarship awarded by the Chinese government, < 0.1%)
- 2022 Merit Student Scholarship (given to students that excel in academics, athletics, arts or other areas of special interest, < 1%)

## PUBLICATIONS

Haorui Li, Shengchao Liu, Hongyu Guo, Anima Anandkumar. **Geometry-text Multi-modal Foundation Model for Reactivity-oriented Molecule Editing**. *AI for New Drug Modalities Workshop, 38th Conference on Neural Information Processing Systems (NeurIPS 2024)*

## RESEARCH PROJECTS

California Institute of Technology, Pasadena, California

Computing + Mathematical Sciences Department

July, 2024 – Present

Advisors: Dr. Shengchao Liu & Prof. Anima Anandkumar

**Project : Geometry-text Multi-modal Foundation Model for Molecule Discovery**

- Construct a novel large-scale 3D structure-text dataset containing approximately 163K molecules with 202K text-structure pairs.
- Apply contrastive learning to align latent representations between 3D molecular structure (processed by 3D GNNs) and textual descriptions (handled by LLMs).
- Design a range of novel and challenging downstream tasks, such as reactivity-oriented molecule editing, to demonstrate the superiority of the 3D structure-text joint molecular representation.

**Vanderbilt University**, Nashville, Tennessee

*Department of Computer Science*

*Aug., 2024 – Present*

Advisors: Dr. Yu Wang & Prof. Tyler Derr

**Project : On Domain Transferability of Diffusion-augmented Graph Classification**

- Perform graph classification on various datasets within two major categories: chemistry and social networks, using GIN and GCN models.
- Train a diffusion model (DiGRESS) on individual datasets and use it to generate new graphs through diffusion-augment, followed by graph classification.
- Train DiGRESS on the entire chemistry or social networks category, apply it to individual datasets to generate new graphs via diffusion-augment, and analyze the transferability across different datasets during graph classification.

**Huazhong University of Science and Technology**, Wuhan, Hubei

*College of Computer Science and Technology*

*May, 2023 – Sep, 2023*

Advisor: Prof. Yao Wan

**Project : An overview of the evolution of NL2VIS—from the era of deep-learning to the era of LLM**

- Conduct literature search, review almost all papers related to NL2VIS, and thoroughly read influential articles in the field.
- Summarize the development of the NL2VIS field, particularly during the eras of deep learning and large model, and extract key points and innovations from significant articles in the domain.

**National University of Singapore**, Singapore

*Department of Information Systems and Analytics, School of Computing*

*July, 2023 – Aug, 2023*

Advisor: Prof. LEK HSIANG HUI

**Project : A player recommendation system for NBA team managers—utilizing web mining techniques to collect player and team data**

- Lead a team of four undergraduate students in the successful development of a recommendation system.
- Propose and conceptualize the design of an advanced NBA player recommendation system to assist team managers in making informed decisions during player recruitment processes.
- Leverage web crawler, machine learning, and data analytics to provide personalized recommendations based on team requirements and playing strategies.

**Huazhong University of Science and Technology**, Wuhan, Hubei

*College of Chemistry and Chemical Engineering*

*March, 2022 – July, 2022*

Advisor: Prof. Deli Wang

**Project : High-nickel ternary layered cathode materials for lithium-ion batteries**

- Focus on addressing the challenges of microcrack formation and poor structural stability in high-nickel cathodes, which lead to reduced rate performance and cycling life in lithium-ion batteries.
- Propose a dual modification strategy, combining primary particle structure design and tungsten and fluorine co-doping (W-F-NCM95) to modify the  $Li[Ni_{0.95}Co_{0.025}Mn_{0.025}]O_2$  cathode.

## SKILLS

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**Computer Science:** Proficient in Python, PyTorch, LaTeX, Gaussian09

**Chemistry:** Proficient in Organic Chemistry, Physical Chemistry and Quantum Chemistry

**Language:** English, Mandarin(Native)