YUFAN CAO

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EDUCATION

Tsinghua University, Department of Electronic Engineering *Sep 2020 - June 2024*(exp.)
Major GPA: **3.99/4.00** Ranking: **1**/232 Overall GPA: **3.96/4.00** Ranking: **2**/232

Carnegie Mellon University, School of Computer Science, Computational Biology Department *Sep 2023 - Dec 2023*(exp.)
Visiting student under the supervision of Chair Professor **Jian Ma**

PUBLICATIONS

Yufan Cao, Tunhou Zhang, Wei Wen, Feng Yan, Hai Li, Yiran Chen, "*Farthest Greedy Path Sampling for Two-shot Recommender Search*," in submission. *Under Review.* *preprint.*

Tunhou Zhang, Dehua Cheng, Yuchen He, Zhengxing Chen, Xiaoliang Dai, Liang Xiong, Yudong Liu, Feng Cheng, **Yufan Cao**, Feng Yan, Hai Li, Yiran Chen, Wei Wen, "*Towards Automated Model Design on Recommender Systems*," in submission.

Hongzhi Shi, Jingtao Ding, **Yufan Cao**, Quanming Yao, Li Liu, Yong Li, "*Learning Symbolic Models for Graph-structured Physical Mechanism*," ICLR, 2023. *paper.*

RESEARCH EXPERIENCES

Foundation Model for Single-cell Transcriptomics with Integration of Multi-modal Data Research Assistant
Advisor: Ray and Stephanie Lane Professor **Jian Ma**, **Carnegie Mellon University** *Sep 2023 - present*

- Developed an interpretable, transformer-like model for distinguishing spatial information from single-cell data.
- Validated the model's implicit batch-correction ability and nice clustering properties in the representation space.
- Established a contrastive-learning workflow to learn a joint representation across modalities for perturbational predictions.

Farthest Greedy Path Sampling for Two-shot Recommender Search Research Assistant
Advisor: John Cocke Distinguished Professor **Yiran Chen**, Remote through **Duke University** *Feb 2023 - Aug 2023*

- Attributed the optimization gap in one-shot Neural Architecture Search to co-adaptation and supernet coverage limitations.
- Innovated an advanced path sampling algorithm called Farthest Greedy Path Sampling to mitigate identified issues.
- Conducted massive experiments and achieved SOTA on two famous CTR datasets for Recommender Systems.

Diffusion Maps for Dynamics and Regulators of Cell Fate Decisions Research Assistant
Advisor: Associate Professor **Jianzhu Ma**, **Tsinghua University** *Oct 2022 - Feb 2023*

- Established a neural rectified-flow model to capture transport between gene expressions in PCA space across checkpoints.
- Validated the dynamics learned by the model and explored the flow model's extrapolating abilities.
- Augmented data with a diffusion model bridging the distributions of gene expressions and Gaussian.

Zero-cost Neural Architecture Search on Graph Neural Networks Research Assistant
Advisor: John Cocke Distinguished Professor **Yiran Chen**, Remote through **Duke University** *July 2022 - Jan 2023*

- Proposed and formulated evaluation of a GNN's performance with gradient kernel method or spectral method.
- Constructed a GNN architecture search space based on GraphGym and a NAS pipeline for GNNs.
- Executed experiments of zero-cost NAS with a theoretical foundation of Graph Signal Processing.

Learning Symbolic Models for Graph-structured Physical Mechanism Research Assistant
Advisor: Assistant Professor **Quanming Yao**, **Tsinghua University** *Jan 2022 - May 2022*

- Proposed searching message-passing flows in GNNs to decompose the raw graph-structured Symbolic Regression problem.
- Designed a pruning search algorithm for flows based on an observation regarding structure redundancy and learning losses.
- Simulated datasets for physical mechanisms with diverse underlying message-passing flow structures.
- Achieved great advances in results measured by simplicity and accuracy, oversaw the majority of manuscript writing.

HONORS, AWARDS & OTHER EXPERIENCES

- Scholarship for Comprehensive Excellence (Academic Performance, Scientific Research) *Oct 2022, Oct 2023*
- Member of the Sixteenth Spark Program (45 most competent undergrad. researchers in Tsinghua of the year) *June 2022*
- Teaching Assistant in *Project Design and Making of Electronic System*, gave one lecture. *Sep 2021 - Jan 2022*
- Scholarship for Excellent Academic Performances (4/240) *Dec 2021*
- First Prize, National Undergraduate Students' Physics Competition *Dec 2021*
- Second Prize, the 36$^{\text{th}}$ Annual Chinese Physics Olympiad (Second Round in Shanghai) *Oct 2019*