

# HONGKANG LI

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## EDUCATION

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**Rensselaer Polytechnic Institute, Troy, NY, United States** August 2019 - December 2024  
P.h.D. candidate, Electrical and Computer System Engineering  
GPA: 4.0/4.0  
Advisor: Prof. Meng Wang

**University of Science and Technology of China, Hefei, China** August 2015 - June 2019  
Bachelor of Engineering, GPA: 3.73/4.3

## RESEARCH INTEREST

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**Efficient AI:** data-efficient learning and inference.

**Trustworthy Machine Learning:** model explanation, fairness.

**Machine Learning Theory:** deep learning theory, generalization analysis of (graph) neural networks, theoretical mechanism of large language models.

## PROFESSIONAL EXPERIENCE

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**IBM Research** May 2023 - August 2023  
Research Intern, Supervisor: Dr. Songtao Lu, Dr. Hui Wan, Dr. Xiaodong Cui.  
Projects: Training Dynamics and Generalization of In-Context Learning and Chain-of-Thought with Nonlinear Transformers (Published at **ICML 2024** and **ICLR 2025**).

**Rensselaer Polytechnic Institute** August 2019 - December 2024  
Research Assistant, Supervisor: Prof. Meng Wang.  
Projects: (a) Optimization and Generalization Analysis of Transformer Models with Advanced Algorithms (**ICLR 2023**, **ICLR 2025**); (b) Generalization of Graph Neural Networks and Graph Transformers (**ICML 2022**, **ICML 2024**); (c) Theory in Imbalanced Learning (**JSTSP 2024**).

## PUBLICATIONS

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\* denotes equal contribution

### PREPRINT

Y. Zhang\*, **H. Li\***, Y. Yao\*, A. Chen, S. Zhang, P.-Y. Chen, M. Wang, S. Liu, “Visual Prompting Reimagined: The Power of Activation Prompts.” *In submission*.

### CONFERENCE

**H. Li**, Y. Zhang, S. Zhang, M. Wang, S. Liu, P.-Y. Chen. “When is Task Vector Provably Effective for Model Editing? A Generalization Analysis of Nonlinear Transformers,” *Accepted by International Conference on Learning Representations (ICLR) as an **Oral Presentation** (acceptance rate = 1.8%), 2025*.

**H. Li**, M. Wang, S. Lu, X. Cui, and P.-Y. Chen. “Training Nonlinear Transformers for Chain-of-Thought Inference: A Theoretical Generalization Analysis” *Accepted by International Conference on Learning Representations (ICLR)*(**acceptance rate = 32.1%**), 2025.

**H. Li**, M. Wang, S. Lu, X. Cui, and P.-Y. Chen. “How Do Nonlinear Transformers Learn and Generalize in In-Context Learning?” *Accepted by International Conference on Machine Learning (ICML)*(**acceptance rate = 27.5%**), 2024.

**H. Li**, M. Wang, T. Ma, S. Liu, Z. Zhang, P.-Y. Chen, “What Improves the Generalization of Graph Transformer? A Theoretical Dive into Self-attention and Positional Encoding. ” *Accepted by International Conference on Machine Learning (ICML)*(**acceptance rate = 27.5%**), 2024.

**H. Li**, M. Wang, S. Liu, P.-Y. Chen, “A theoretical understanding of shallow vision transformers: Learning, generalization, and sample complexity.” *Accepted by International Conference on Learning Representations (ICLR)*(**acceptance rate = 32.0%**), 2023.

**H. Li**, M. Wang, S. Liu, P.-Y. Chen, and J. Xiong. “Generalization guarantee of training graph convolutional networks with graph topology sampling.” *Accepted by International Conference on Machine Learning (ICML)*(**acceptance rate = 21.9%**), 2022.

**H. Li**, S. Zhang, and M. Wang. “Learning and generalization of one-hidden-layer neural networks, going beyond standard gaussian data.” *Accepted by 2022 56th Annual Conference on Information Sciences and Systems (CISS). IEEE*

Y. Luo, **H. Li**, Q. Liu, L. Shi, X.-M. Wu. “Node Identifiers: Compact, Discrete Representations for Efficient Graph Learning, ” *Accepted by International Conference on Learning Representations (ICLR)*(**acceptance rate = 32.1%**), 2025.

Y. Luo, **H. Li**, L. Shi, X. Wu, “Enhancing Graph Transformers with Hierarchical Distance Structural Encoding.” *Accepted by Annual Conference on Neural Information Processing Systems (Neurips) 2024*.

S. Zhang, **H. Li**, Meng Wang, Miao Liu, Pin-Yu Chen, Songtao Lu, Sijia Liu, Keerthiram Murugesan, Subhajit Chaudhury. “On the Convergence and Sample Complexity Analysis of Deep Q-Networks with -Greedy Exploration. ” *Accepted by Annual Conference on Neural Information Processing Systems (Neurips)* (**acceptance rate = 26.1%**), 2023.

H. Wan, **H. Li**, Songtao Lu, Xiaodong Cui, Marina Danilevsky. “How Can Personalized Context Help? Exploring Joint Retrieval of Passage and Personalized Context. ” *Accepted by IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2023.

## JOURNAL

**H. Li**, S. Zhang, M. Wang, Y. Zhang, P.-Y. Chen, S. Liu, “Theoretical characterization of neural network generalization group imbalance.” *Accepted by IEEE Journal of Selected Topics in Signal Processing*, 2024.

## WORKSHOP

**H. Li**, M. Wang, S. Zhang, S. Liu, P.-Y. Chen, “Learning on transformers is provable low-rank and sparse: A one-layer analysis.” *Accepted by 2024 IEEE 13rd Sensor Array and Multichannel Signal Processing Workshop (SAM)*.

## TALKS

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- NJIT DS Seminar October 2024  
*Theoretical Foundations of In-Context Learning and Chain-of-Thought with Trained Transformers*
- IBM-RPI FCRC Seminar Series February 2024  
*Theoretical and Algorithmic Foundations of In-Context Learning Using Properly Trained Transformer Models*

## PRESS COVERAGE

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- IBM Blog July 2024  
*IBM and RPI researchers demystify in-context learning in large language models*

## SERVICES

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- Reviewer of ICML 2022-2024; Neurips 2022-2024; ICLR 2024-2025; CVPR 2024-2025; AAAI 2025; AISTATS 2024-2025; UAI 2023; ICASSP 2023-2024; TMLR 2023-2024; IEEE Transactions on Artificial Intelligence 2024; IEEE Transactions on Signal Processing 2024.

Mentor of research of three ECSE undergraduate students of RPI.

## HONORS AND AWARDS

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- **IEEE SAM Travel Grant,** July 2024
- **Founders Award of Excellence,** Rensselaer Polytechnic Institute October 2023
- **Belsky Award,** School of Engineering, Rensselaer Polytechnic Institute January 2023
- **Zenghua Scholarship,** Top 5% of USTC September 2018
- **Outstanding Student Scholarship,** USTC 2016 - 2017