

# Ruizhe Li

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## Biography and Research Interests

I'm now in the department of mathematics at Southern University of Science and Technology. In the first two years of my undergraduate career, I studied pure maths. What I loved most is the finite group theory. But when I'm taking the convex optimization class(2024 fall), I begin to be interested in optimization gradually. Now, my research interest is in the intersection of optimization and machine learning, especially the neural networks for optimization problems. Meanwhile, I'm also interested in the theoretical analysis of transformers and large language models, and efficient training of deep learning models.

## Education

### Southern University of Science and Technology

Sept. 2022 – Present

#### BS in Mathematics and Applied Mathematics

- GPA: 3.92/4.0, Rank 2/102.
- Fields Honor class, led by the Fields Medal Winner Efim Zelmanov
- *Core course and related course:* *Topology(A, 94), Abstract Algebra(H)(A<sup>+</sup>, 97), Complex Analysis(H)(A<sup>+</sup>, 98), Real Analysis(H)(A, 96), Number Theory(A<sup>+</sup>, 99), Numerical Analysis(A<sup>+</sup>, 97), Probability Theory(A<sup>+</sup>, 100), Mathematical Statistics(A<sup>+</sup>, 99), Ordinary Differential Equations(H)(A, 95) Partial Differential Equations(H)(A<sup>+</sup>, 97), Convex Analysis and application in machine learning(A<sup>+</sup>, 100) Applied Stochastic Process(A<sup>+</sup>, 100), Numerical methods for PDE solving(A<sup>+</sup>, 98) Operations Research(A<sup>+</sup>, 99), Introduction to big data(A<sup>+</sup>, 99)(About statistical learning)*

## Research Experience

### NN for solution mapping

Hongkong, China

Advised by [Enming Liang](#) ↗ and [Minghua Chen](#) ↗

March. 2025 - Present

- Explore the connection between neural networks, especially GNNs, and key properties of optimization problems by leveraging the underlying structure of the problem to design a new neural network architecture for second-order cone programming. And our paradigms can be extend to  $p$ -order cone programming directly.
- Give the generalization bound and sample complexity of the proposed neural network architecture.

## Seminars

### Set theory

Mar. 2023 - Jul. 2023

Advised by [Bochen Liu](#) ↗

### Fourier Analysis

Sep. 2023 - Jan. 2024

Advised by [Bochen Liu](#) ↗

## SKILLS & HONORS

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**Languages:** Chinese(native), English(fluent)

**Programming Languages:** Java, Python

<b>Scholarship:</b> Merit Student Scholarship of SUSTech	Oct. 2023
Outstanding Student of SUSTech	Nov. 2023
Merit Student Scholarship of SUSTech	Oct. 2024
Outstanding Student of SUSTech	Oct. 2024
Merit Student Scholarship of SUSTech	Oct. 2025
Outstanding Student of SUSTech	Nov. 2025
<b>Competition:</b> National Second prize in China Undergraduate Mathematical Contest in Modeling (As the captain)	Oct. 2023
First prize in China Undergraduate Mathematical Contest	Oct. 2024

## Teaching

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**Numerical Analysis**(by [Prof. Yang](#)): Teaching Assistant, 2025 fall, SUSTech

## Publication

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Ruizhe Li, Enming Liang, Minghua Chen. *On the Expressivity of GNN for Solving Second Order Cone Programs*. In NeurIPS Workshop on GPU-Accelerated and Scalable Optimization, 2025.