Travor Zihao Liu
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Stanford, California, USA

Education

2025– **Ph.D.**, Mathematics, Stanford University

- Advanced to candidacy in Sept 2025

2022–2025 **B.Sc.** Mathematics, University College London

- First Class, Ranked 1st out of 341

Research Experience

2025– Large Values of Dirichlet Polynomials (Supervisor: Dr. Kannan Soundararajan)

- Investigating large value estimates and their applications to zeros of L-functions (Guth–Maynard) and multiplicative functions (Matomäki–Radziwiłł)

2025– Higher Order Fourier Analysis (Supervisor: Dr. Sarah Peluse).

- Exploring Gowers norm and its applications to the theorems of Szemerédi, Green–Tao, and Green–Sawhney

2024–2025 Explicit Quadratic Large Sieve Inequality, (Supervisor: Dr. Ian Petrow)

- Funded by LMS Undergraduate Research Bursaries (URB-2024-41)
- Followed the work of Heath-Brown and produced a research paper

2024 Special Values of the Riemann Zeta Function (Supervisor: Dr. Cecilia Busuioc)

- Investigated Bernoulli numbers and computed $\zeta(2k)$ for integers $k \geq 1$
- Studied Beukers's proof that $\zeta(3)$ is irrational

2023–2024 p-adic Numbers (Supervisor: Dr. Cecilia Busuioc)

- With Hantang Guo, May Jiang, and Qing Su
- Proved Ostrowski's theorem and p-adic Weierstrass preparation theorem
- Wrote Python code for visualization

2023 Axiom of Choice (Supervisor: Dr. Cecilia Busuioc)

- With Yi Liu, Daya Singh, and Tairan Wang
- Investigated equivalent forms, consequences, and the independence of the Axiom of Choice from ZF set theory
- Studied well-ordered sets, ordinals, and transfinite recursion

2021 Prime Number Theorem

- Developed a new method to prove the prime number theorem
- Published an academic research paper and presented at ICPAM 2021

2020 PM2.5 Density Prediction

- Studied PM2.5 density using signal processing, Pandas, and LightGBM
- Innovated and published a paper on a new PM2.5 prediction model

2017–2019 Operating System Development

- Created two 32-bit operating systems from scratch
- Implemented keyboard driver and virtual memory using C and x86 assembly

Publications

1. Liu, Z. *Explicit quadratic large sieve inequality* arXiv:2505.09637 [math]. May 2025. http://arxiv.org/abs/2505.09637.
2. Liu, Z. *On a weighted sum over multiplicative functions and its applications to the GPY sieve* arXiv:2210.01671 [math]. Mar. 2023. http://arxiv.org/abs/2210.01671.
3. Liu, Z. A Direct Proof of the Prime Number Theorem using Riemann's Prime-counting Function. *Journal of Physics: Conference Series* **2287.** Publisher: IOP Publishing, 012008. https://doi.org/10.1088/1742-6596/2287/1/012008 (2022).
4. Liu, Z. *A Corrected Simplified Proof of Chen's Theorem* arXiv:2203.07871 [math]. Mar. 2022. http://arxiv.org/abs/2203.07871.
5. Liu, Z. *PM2.5 Density Prediction Based on a Two-Stage Rolling Forecast Model Using LightGBM* in *Computing and Data Science* (eds Cao, W., Ozcan, A., Xie, H. & Guan, B.) (Springer Nature Singapore, Singapore, 2021), 228–248. ISBN: 978-981-16-8885-0.

Presentations

Student-Run Seminars on Number Theory and Function Theory

1. *On the distribution of zeros of $\zeta(s)$.* July 2025.
2. *Ω results in number theory.* July 2023.
3. *GPY sieve - from Selberg to Maynard.* July 2022.

UCL Undergraduate Math Colloquium

1. *Special values of the Riemann zeta function.* Oct. 2024.

2. *Introduction to p-adic analysis*. Feb. 2024.
3. *Ray reflection and rational approximation.* Oct. 2023.
4. *Ellipses, pendulum, and double periodicity.* Mar. 2023.
5. *Bounded gaps between primes.* Oct. 2022.

UCL Undergraduate Project Talks

1. *Inverse Galois Problem.* Dec. 2024.
2. *Axiom of Choice: Equivalents, Consequences, and Independence.* June 2023.

Teaching

Stanford University

2025 Head Teaching Assistant, Applied Matrix Theory (Math 104)

- Holding 3 hours of Q& A sessions every week
- Leading 5 course assistants to grade homeworks of over 130 students

Attended Seminars

2025 Summer School on Analytic Number Theory (Xi'an, China)
2024 International Number Theory Conference in Commemoration of Chengdong Pan (Jinan, China)
2022–2025 London Number Theory Seminars
2022–2025 London Junior Number Theory Seminars
2022–2025 London Heilbronn Colloquia

Other Experience

2020– Math Stack Exchange and Math Overflow

- Answered 250+ questions on complex analysis and number theory
- Earned 7.5k+ score MSE and 1.3k+ scores on MO as of 2025
- Top answerer under the tag "analytic number theory"

2020– Math Blogging on Zhihu

- Composed 160+ articles for 8 self-initiated math columns
- Answered 980+ math questions from netizens
- Obtained 82k+ followers, 87k+ upvotes, and 77k bookmarks as of 2025

Awards & Honors

2025–2026	IMA Membership
2025	UCL Dean's List Nomination
2025	Wynne Roberts Prize (Best graduating math student)
2024	LMS Undergraduate Research Bursaries (URB-2024-41)
2024	MSci Prize in Mathematics (Best Year 2 overall performance)
2024	Kestelman Prize (Best Year 2 performance in Real and Complex Analysis)
2023	Filon Prize (Best Year 1 overall performance)
2022	Platinum Division, USA Computing Olympiad
2021	Bronze, S.-T. Yau High School Science Award (Mathematics)
2019	Finalist Award, High School Mathematical Contest in Modeling

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