Hao Zhang

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EDUCATION

University of California, Berkeley Berkeley, United States
Major Course: Math 254A Algebraic Number Theory, Math 250A Groups, Rings and Fields, Math 250B Commutative Algebra, Math 128B Numerical Analysis, Math 54 Linear Algebra and Differential Equations
Jan 2025 – Dec 2025

Dalian University of Technology Dalian, China
Bachelor of Science in Mathematics Sep 2022 – Jan 2025

Major Courses: Mathematical Analysis $H_1H_2H_3H_4$, Higher Algebra $H_1H_2H_3$, Elementary Number Theory, Complex Funtion Theory H, Geometry H_1 H_2, Abstract Algebra H, Ordinary Differential Equations H, Theory of Functions of Real variables H, Probability and Mathematics Statistics H, Complex Representation of finite groups, Optimization method H, Numerical Approximation H, Elementary Topology H
Note: Courses marked with H are honors-level, indicating increased difficulty and academic rigor.

RESEARCH EXPERIENCES

University of California, Berkeley Berkeley, United States
Department of mathematics
Aug 2025 – Dec 2025

Expository of Lubin-Tate Theory
Prof. Sugwoo Shin, Xiaolei Liu Aug 2025 – Dec 2025
Overview: This project was completed in the form of a term paper, accompanied by a presentation in Math 254A (Algebraic Number Theory), focusing on how Lubin-Tate formal group describes abelian extensions of non-Archimedean local fields.
Details: This project studies Lubin–Tate theory as an explicit realization of local class field theory. Starting from a one-dimensional Lubin–Tate formal group F_f associated with a uniformizer π, the project constructs the extensions L_f^m generated by the π^m-torsion points of F_f, and shows that each L_f^m/K is a finite abelian, totally ramified extension. Taking the direct limit $L_f = \bigcup_{m\geq 1} L_f^m$, the project explains how $\mathrm{Gal}(L_f/K)$ is canonically identified with $\mathcal{O}_K^\times$, and how this construction realizes the local Artin reciprocity map.

Dalian University of Technology Dalian, China
School of Mathematical Sciences
Research Assistant Feb 2024 – Present
New Rational Approximation Formulae and Error Behavior for the EulerMascheroni Constant
Prof. Dawei Lu Feb 2024 – Present
Overview: This project investigates novel sequences for approximating Eulers constant γ, aiming to improve convergence speed over classical methods such as DeTemples and Mortici-type approximations. The approach combines asymptotic analysis, symbolic computation, and rigorous proof techniques.
Establishment of a Parameterized Polynomial Sequence for Approximating Eulers Constant

- Proposed and analyzed a new family of rational sequences $\omega_{r,k,n}^{(s)}$ for approximating Euler's constant, with tunable parameters r and k, improving convergence over classical methods.
- $\omega_{r,k,n}^{(s)} = \sum_{i=1}^{rn} \frac{1}{i} - \ln n - \frac{1}{k}\ln\left(1 + \frac{a_1}{n} + \frac{a_2}{n^2} + \cdots + \frac{a_s}{n^s}\right)$, where $a_1 = \frac{(2-r)k}{2r}$, $a_2 = \frac{k(3kr^2-12kr-2r^2+12k)}{24r^2}$, and so on.

Error Analysis and Asymptotic Expansion in Euler Constant Approximation

- Computed the optimal value of the parameter k for a fixed s to achieve the best approximation, and conducted a qualitative analysis of the error function using Maple.
- The precision of the given approximation formula was evaluated for four different parameterized variables, $\omega_{r,k.n}$ and $s_{c,n}$.

HONORS & AWARDS

National Second Prize, Chinese Mathematical Competition (top 12% out of 325304 students) Dec 2024
National Third Prize, Chinese Mathematical Competition (top 15% out of 288355 students) Dec 2023
Advanced to the Preliminary Round of the Alibaba Global Mathematics Competition (top 0.32% of 250000+ participants) Jun 2024
Science and Innovation Scholarship, Dalian University of Technology(top 4% of 180 students) Aug 2024
Innovation Scholarship, School of Mathematical Sciences, Dalian University of Technology Jan 2023

SKILLS

Latex, Maple