Aditya Ghosh

Curriculum Vitae

Personal Details

Name	Aditya Ghosh
Date of Birth	15 June, 2001 — Kolkata, India
Nationality	Indian
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Education

2023–   **PhD Mathematics**, *Columbia University*, USA

2019–2023   **MMath Mathematics**, *University of Oxford*, UK
Part A (2nd year) and B (3rd year) Result – First Class, 81% weighted average, Rank 11/132
Part C (4th year) Result – First Class, 82%, Rank 13/94

2010–2018   **High School Qualifications**, *Garden High*, Kolkata, India
ISC examinations (A-Level equivalent) - Weighted average 96.5%, Mathematics 100%

Research Experience

2021 Summer   **Summer Research Project**, *Supervisor : Kobi Kremnitzer*, Oxford
Title: Closure Problems equivalent to the Riemann Hypothesis

- Read books on Category Theory, Bornological Spaces, Hardy Spaces and papers on Closure Problems related to RH.
- Explored ways to generalize results in the papers on Closure Problems.

Nov 2021 – April 2022   **Part B Extended Essay**, *Supervisor: Kobi Kremnitzer*, Oxford
Title: Hilbert Space Approaches to the Riemann Hypothesis

- Starting with the closure problem in Hardy Spaces $H^2(\mathbb{D}) \cong \ell^2$, I weakened the topology by choice of a weighted ℓ^2 space.
- Obtained conditions that imply the existence of a zero-free region of $\zeta(s)$ and developed a general framework for such analysis.
- Gave a presentation on it to Prof. Jon Keating.

April 2022 – present	**Research Collaboration**, *with Kobi Kremnitzer, S. Waleed Noor, Charles F. Santos* Title: Zero-free half-planes of the ζ-function via spaces of analytic functions • We generalized the result in Noor's paper (`https://doi.org/10.1016/j.aim.2019.04.064`) using methods developed in my Extended Essay. • We looked at it in the context of classical Hardy Spaces $H^p(0 < p \leq 2)$ as well. • We wrote a paper together which was submitted on 28th July 2022 to a journal, and is currently in the second round of reviews.
2022 Summer	**Summer Research Project**, *Supervisor : Jon Keating*, Oxford Title: Approximations of Zeta-Zeroes via truncated symmetrized Euler products • Read about Analytic Number Theory, Random Matrix Theory Applications in Number Theory and papers on approximations of the Zeta Function using symmetrized Euler Products. • Learned Mathematica and computed the statistics of errors in the approximations of Zeta-Zeroes and tried to formulate conjectures regarding growth of these errors. • Wrote a report on my observations.
Nov 2021 – April 2022	**Part C Dissertation**, *Supervisor: Emmanuel Breuillard*, Oxford Title: Applications of effective versions of the Chebotarev Density Theorem • The thesis explored the Chebotarev Density Theorem. It proved novel results about the number of prime ideals of a fixed degree in a Number Field lying over primes upto a certain value. • An asymptotic result was proved using Parker Numbers which appear in Permutation Group Theory. An explicit result was proved and thoroughly improved using results from Representation Theory and Kostka Numbers.
April 2023 – present	**Research Collaboration**, *with Emmanuel Breuillard* Title: Counting prime ideals of a given degree in number fields • Improved on the results in the dissertation. • A preprint is to be sent for publication soon.

Papers/Reports

2022	**Paper**, *Authors: A Ghosh, K Kremnizer, SW Noor, C Santos* Title: Zero-free half-planes of the ζ-function via spaces of analytic functions, Advances in Mathematics, Volume 455 `https://www.sciencedirect.com/science/article/pii/S0001870824003876`
2022	**Report**, *Author: A Ghosh* Title: Report: Statistics of approximations to zeroes of ζ-function via truncated symmetrized Euler products `https://arxiv.org/abs/2211.11042`
2023	**Paper**, *Author: E Breuillard, A Ghosh* Title: Counting prime ideals of a given degree in number fields Preprint to be published soon

Conferences/Workshops

15-26 August, 2022	**LMS Undergraduate Summer School**, Edinburgh, UK • Organized by the London Mathematical Society annually to introduce different topics of modern mathematics to the undergraduate students and encourage them to further study for a PhD degree in Mathematics. • Website: `http://www.lms.macs.hw.ac.uk/`
26-28 October, 2022	**Early Number Theory Researchers Workshop**, Darmstadt, Germany • Organized by TU Darmstadt, aimed at early career researchers in the field of number theory. Talks on topics about Elliptic Curves and Modular Forms. • Website: `https://www.mathematik.tu-darmstadt.de/algebra/forschung_algebra/forschungsseminare/grad_seminars/entr_workshop.en.jsp`
30 Sept - 1 October, 2023	**Maine-Quebec Number Theory Conference**, Maine, US • Organized by University of Maine. Presented my paper on counting prime ideals of fixed degree. • Website: `https://mainequebecnt.github.io`
18-21 June, 2024	**Modular Forms, L-functions, and Eigenvarieties**, Paris, France • Organized by ENS Paris. Presented a poster on my paper on counting prime ideals of fixed degree. • Website: `https://www.eventcreate.com/e/bellaiche/`
8-12 July, 2024	**The Mordell conjecture 100 years later**, *MIT*, Massachusetts, US • Website: `https://mordell.org`

Talks/Posters

2023	Talk: Maine-Quebec Number Theory Conference. Title: Counting prime ideals of a given degree in number fields
2024	Talk: Student Seminar at Columbia University: Sieving Techniques in Number Theory. Title: Small gaps between primes
2024	Poster: Modular Forms, L-functions, and Eigenvarieties Conference at ENS Paris. Title: Counting Prime Ideals of a given degree in Number Fields

Awards

2018	Bronze for Third Rank, Mathematical Talent Reward Programme - organized by students of Indian Statistical Institute, Kolkata
2021	Scholar of Oriel College, Oxford - based on Part A results
2022	Scholar of Oriel College, Oxford - based on Part B results

Teaching

2023-24	Help Room Tutor at Columbia - Calculus I to III
2023-24	Mentor for Directed Reading Program at Columbia - supervised two undergraduates to learn the theory of Elliptic Curves and Modular Forms