Aditya Ghosh

Curriculum Vitae

▬▬▬ Personal Details

Name	Aditya Ghosh
Date of Birth	15 June, 2001 — Kolkata, India
Nationality	Indian
Email	ag4794@columbia.edu
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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

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.

April 2022 – July 2024 **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 published in Advances in Mathematics.

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.

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 – **Part B Extended Essay**, *Supervisor: Kobi Kremnitzer*, Oxford
April 2022 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.

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.

Papers/Reports

2023 **Paper**, *Author: E Breuillard, A Ghosh*
Title: Counting prime ideals of a given degree in number fields
Preprint to be published soon

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`

Conferences/Workshops

2-13 Sept, **Summer School and Workshop on Automorphic Forms and Related Topics**
2024 **(BB6)**, *CIRM*, Marseille, France
• Website: `https://conferences.cirm-math.fr/3134.html`

8-12 July, **The Mordell conjecture 100 years later**, *MIT*, Boston, US
2024 • Website: `https://mordell.org`

18-21 June, **Modular Forms, L-functions, and Eigenvarieties**, ENS, Paris, France
2024 • Website: `https://www.eventcreate.com/e/bellaiche/`

30 Sept - 1 October, 2023	**Maine-Quebec Number Theory Conference**, University of Maine, Orono, US • Website: `https://mainequebecnt.github.io`
26-28 October, 2022	**Early Number Theory Researchers Workshop**, Darmstadt, Germany • Website: `https://www.mathematik.tu-darmstadt.de/algebra/forschung_algebra/forschungsseminare/grad_seminars/entr_workshop.en.jsp`
15-26 August, 2022	**LMS Undergraduate Summer School**, Edinburgh, UK • Website: `http://www.lms.macs.hw.ac.uk/`

Talks/Posters

2 Dec 2024	Talk: Student Seminar in Automorphic Forms, Columbia University. Title: Spectral Theory of Automorphic Forms
30 Sept 2024	Talk: Student Seminar in Automorphic Forms, Columbia University. Title: Hilbert Modular Forms, Maass Forms and Base Change
23 Sept 2024	Talk: Student Seminar in Automorphic Forms, Columbia University Title: Rankin-Selberg Method, Converse Theorems, Langlands Functoriality
16 Sept 2024	Talk: Student Seminar in Automorphic Forms, Columbia University. Title: Modular Forms, Hecke Operators and Twisting
Sept 2024	Speed Talk: Building Bridges 6: Conference on Automorphic Forms, CIRM, France. Title: Hilbert space approaches to the Riemann Hypothesis
Sept 2024	Talk: Building Bridges 6: Conference on Automorphic Forms. Title: Counting prime ideals of a given degree in number fields
June 2024	Poster: Modular Forms, L-functions, and Eigenvarieties Conference at ENS Paris. Title: Counting Prime Ideals of a given degree in Number Fields
Apr 2024	Talk: Student Seminar at Columbia University: Sieving Techniques in Number Theory. Title: Small gaps between primes
Sept 2023	Talk: Maine-Quebec Number Theory Conference. Title: Counting prime ideals of a given degree in number fields

Awards

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

Teaching/Seminars organised

Spring 2025	Learning Seminar in Automorphic Forms, Columbia University
Spring 2025	Teaching Assistant for Calculus 2
Fall 2024	Learning Seminar in Automorphic Forms, Columbia University
Fall 2024	Teaching Assistant for Modern Analysis 2 - also substituted in for 1 lecture.

2023-24   Mentor for Directed Reading Program at Columbia - supervised two undergraduates to learn the theory of Elliptic Curves and Modular Forms

2023-24   Help Room Tutor at Columbia - Calculus I to III