

# Hrishabh Mishra

Université Paris Cité

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## EDUCATION

### Université Paris Cité

M2 de Mathématiques Fondamentales

Paris, France

Sep 2024 – present

### Chennai Mathematical Institute

M.Sc. Mathematics First Year

Chennai, India

Aug 2023 – May 2024

### Chennai Mathematical Institute

B.Sc.(Honours) in Mathematics and Computer Science

Chennai, India

Dec 2020 – May 2023

## PROJECTS

### Integral Hasse principle for cubic surfaces

Institute of Science and Technology

June 2024 – Aug 2024

Vienna, Austria

- I conducted research in **the Browning Group** under the guidance of **Prof. Tim Browning** and **Victor Y. Wang**. My project focused on the integral Hasse principle for **Markoff type cubic surfaces**.
- My work led to **the paper** *Integral Hasse principle for Markoff type cubic surfaces* (appendix by Victor Y. Wang, submitted for publication, [arXiv:2408.06846](https://arxiv.org/abs/2408.06846)). It provides new insights and applications to sparse sequences of log K3 surfaces. I established an asymptotic upper bound on the number of failures of the integral Hasse principle for this family of cubic surfaces, building on and improving the result of Ghosh and Sarnak.
- The proof provides a stronger lower bound for the number of orbits of a specific action on integral points. These methods can be adapted to more restricted cases, such as fixing a variable to be prime, and can also be extended to more general cubic surfaces.

### Distribution of number fields

Chennai Mathematical Institute

Oct 2022 – May 2024

Chennai, India

- Worked under the guidance of **Prof. Anwesh Ray**. Our work primarily focused on **Malle's conjecture** and related themes, leading to the co-authorship of **four papers**.
- Two papers establish bounds for counting number fields by Galois group. We derive a lower bound for fields with Galois groups as wreath products of symmetric groups (ordered by norm of relative discriminant) and an upper bound, conditional on non-vanishing discriminants, for fields with prescribed Galois groups. This builds on work by Ellenberg–Venkatesh, Lemke Oliver–Landesman–Thorne, and Odoni (in arithmetic dynamics).
- One paper proves the strong form of Malle's conjecture for the product of symmetric groups  $S_n$  and finite nilpotent groups for  $n = 3, 4, 5$ , under specific constraints on the nilpotent groups. This work builds on Jiuya Wang's results on abelian groups.

### Explicit formulas in the shifted convolution problem

Institut de Mathématiques de Marseille

May 2023 – July 2023

Marseille, France

- Conducted research under the guidance of **Prof. Sary Drapeau**. Derived an explicit formula for the **Titchmarsh divisor problem**. Utilizing this formula, established asymptotics for the short interval version of the problem.
- Building on Prof. Drapeau's methods, I derived an explicit formula for the Titchmarsh divisor problem. By applying Siegel's Theorem, Page's Theorem, a log-free zero-density estimate, and the Vinogradov-Korobov zero-free region for Dirichlet  $L$ -functions, I established the short interval version.
- I extended my study to the work of Drapeau-Topalogullari and Fouvry-Tenenbaum, aiming to apply similar methods to a class of multiplicative functions. The proof is still being finalized.

### Frobenius distributions of Drinfeld modules

Chennai Mathematical Institute

Oct 2023

Chennai, India

- As part of the assessment for the Function field arithmetic elective course I studied the paper *Frobenius distributions of Drinfeld modules of any rank* by **C. David**.
- I also delivered a talk based on my reading. A short write-up can be found on my homepage.

## Abelian varieties over finite fields

Preliminary Arizona winter school

Oct 2023 – Nov 2023

Online

- I was a selected participant for preliminary Arizona winter school on Abelian varieties over finite fields taught by Lassina Dembele.
- Weekly problem-solving sessions were organized by teaching assistants where students discussed and presented their solutions.

## PREPRINTS AND PUBLICATIONS

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### Integral Hasse principle for Markoff type cubic surfaces

appendix by Victor Y. Wang, submitted for publication

arXiv:2408.06846

### On Malle's conjecture for the product of a symmetric and a nilpotent groups

joint with Anwesh Ray, submitted for publication

arXiv:2402.01189

### Upper bounds for the number of number fields with prescribed Galois group

joint with Anwesh Ray, submitted for publication

arXiv:2310.00601

### Counting number fields whose Galois group is a wreath product of symmetric groups

joint with Anwesh Ray, submitted for publication

arXiv:2306.15411

### On the number of subrings of $\mathbb{Z}^n$ of prime power index

joint with Anwesh Ray, submitted for publication

arXiv:2211.16595

## TALKS AND PRESENTATIONS

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### Most odd-degree binary forms fail to primitively represent a square

Browning group, Institute of Science and Technology

Vienna, Austria

June 2024

### Frobenius distributions of Drinfeld modules

Chennai Mathematical Institute

Chennai, India

Nov 2023

### Malle's conjecture for wreath products

CMI-IMSc Number theory seminar

Chennai, India

Oct 2023

## CONFERENCES AND WORKSHOPS

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### Circle Method and Related Topics

ICTS-TIFR

Bengaluru, India

Nov 2024

### Graz-ISTA Number Theory Days

TU Wien

Vienna, Austria

June 2024

### New directions in rational points

Chennai Mathematical Institute

Chennai, India

Jan 2024

### Hida theory and Iwasawa main conjecture over $\mathbb{Q}$

Chennai Mathematical Institute

Chennai, India

Dec 2023

### Arithmetic Statistics

The Centre International de Rencontres Mathématiques

Luminy, France

May 2023

### Chennai-Tirupati number theory conference

Chennai Mathematical Institute

Chennai, India

Feb 2023

### Online learning seminar on work of Alexander Smith

Organized by Alexander Smith

Online

Sep 2022

## DISTINCTIONS AND AWARDS

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### Paris Graduate School for Mathematical Sciences (PGSM) fellow

*FSMP, fully funded M2 de Mathématiques Fondamentales in Paris.*

2024

### Scientific internship at IST, Austria

*Funded research project at IST, Austria.*

2024

### Infosys Scholarship

*Infosys, a disbursement after every semester for books and related expenses.*

2023-24

### M.Sc. Scholarship

*CMI, tuition fee waiver and monthly stipend for M.Sc. at CMI.*

2023-24

### ReLaX Labs funded research project in France

*Providing comprehensive support including travel expenses and accommodation.*

2023

### Future research talent award

*ANU, a grant of A\$ 7000 for research under supervision at ANU, Australia.*

2023

### SRIRAM Scholarship

*CMI, tuition fee waiver and monthly stipend for undergraduate studies at CMI.*

2020-2023

## TEACHING EXPERIENCE

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### Algebra I

*Chennai Mathematical Institute*

Chennai, India

*Fall 2021*

- I was one of the **teaching assistants** for the Algebra I (Linear Algebra) core course for first years at CMI. The course instructor was **Prof. T. R. Ramadas**. Teaching assistants were responsible for taking tutorials, grading quizzes, and exams.

## MISCELLANEAOUS

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- Languages:** Python, Haskell, Java, JavaScript, HTML & CSS, PHP.
- Tools:**  $\text{\LaTeX}$ , SageMath, PARI/GP.