Hrishabh Mishra

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Education

Université Paris Cité — Paris, France
M2 de Mathématiques Fondamentales — *Sep 2024 – present*

Chennai Mathematical Institute — Chennai, India
M.Sc. Mathematics First Year — *Aug 2023 – May 2024*

Chennai Mathematical Institute — Chennai, India
B.Sc.(Honours) in Mathematics and Computer Science — *Dec 2020 – May 2023*

Projects

Integral Hasse principle for cubic surfaces — June 2024 – Aug 2024
Institute of Science and Technology — *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`). 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 — Oct 2022 – May 2024
Chennai Mathematical Institute — *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 — May 2023 – July 2023
Institut de Mathématiques de Marseille — *Marseille, France*

- Conducted research under the guidance of **Prof. Sary Drappeau**. 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. Drappeau'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 Drappeau-Topacogullari 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 — Oct 2023
Chennai Mathematical Institute — *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 Oct 2023 – Nov 2023
Preliminary Arizona winter school *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

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, accepted for publication in ***Nagoya Math. Journal*** *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

Most odd-degree binary forms fail to primitively represent a square Vienna, Austria
Browning group, Institute of Science and Technology *June 2024*

Frobenius distributions of Drinfeld modules Chennai, India
Chennai Mathematical Institute *Nov 2023*

Malle's conjecture for wreath products Chennai, India
CMI-IMSc Number theory seminar *Oct 2023*

Conferences and Workshops

Circle Method and Related Topics Bengaluru, India
ICTS-TIFR *Nov 2024*

Graz-ISTA Number Theory Days Vienna, Austria
TU Wien *June 2024*

New directions in rational points Chennai, India
Chennai Mathematical Institute *Jan 2024*

Hida theory and Iwasawa main conjecture over $\mathbb{Q}$ Chennai, India
Chennai Mathematical Institute *Dec 2023*

Arithmetic Statistics Luminy, France
The Centre International de Rencontres Mathématiques *May 2023*

Chennai-Tirupati number theory conference Chennai, India
Chennai Mathematical Institute *Feb 2023*

Online learning seminar on work of Alexander Smith Online
Organized by Alexander Smith *Sep 2022*

Distinctions and Awards

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

Algebra I Chennai, India
Chennai Mathematical Institute *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

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