



Mathematics & Mathematics Education Seminar



10 FEBRUARY 2026
TUESDAY – 2.30 to 3.30 pm



MATH JOURNAL ROOM
NIE7-03-16

On the Distribution of Ideal Classes in Cubic Number Fields

The study of number fields lies at the heart of number theory. A central theme in this area is to understand how arithmetic objects behave on average when number fields are organized into natural families with fixed degree. Over the past several decades, this perspective has led to the development of arithmetic statistics as a framework for uncovering large-scale patterns in algebraic number theory. The arithmetic statistics of class groups have attracted particular attention, largely due to the influential Cohen–Lenstra heuristics. These heuristics offer predictions for the distribution of the p -primary parts of class groups of number fields of fixed degree when ordered by discriminant. Despite their broad scope, results remain limited to a small number of cases, most notably when $p = 3$ for quadratic number fields and when $p = 2$ for cubic number fields. At the same time, there has been growing interest in incorporating finer geometric and arithmetic invariants into the study of number fields. One such invariant is the shape of a number field, defined via the Minkowski embedding of its ring of integers, which encodes subtle geometric information beyond the discriminant. The distribution of shapes of number fields has itself been the subject of considerable study, following foundational work of Terr, Bhargava, and Harron. In this talk, I will bring these perspectives together by investigating the average behavior of 2-torsion in the class groups and narrow class groups of cubic orders subject to prescribed shape conditions. The results suggest that the Cohen–Lenstra heuristics admit natural refinements, and that the distribution of ideal class groups in families of number rings is, to a large extent, independent of variation in their shape.

Speaker's Biography

Dr. Anwesh Ray received his PhD from Cornell University in 2020. Following this, he held postdoctoral positions at the University of British Columbia from 2020 to 2022 and at the Université de Montréal (CRM) from 2022 to 2023. He is currently an Assistant Professor in the Department of Mathematics at the Chennai Mathematical Institute. His research lies in number theory and arithmetic geometry, with a focus on both algebraic and analytic methods. He works primarily in Iwasawa theory, Galois representations, arithmetic statistics, and Drinfeld modules, with additional connections to topology, graph theory, and combinatorics. He is deeply passionate about teaching and mentoring students, and have taught a wide range of courses, from undergraduate calculus and linear algebra to advanced graduate-level topics over the past several years.



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