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Research Area: Number Theory
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Current Research

My research is in number theory, specifically problems related to the arithmetic of elliptic curves and abelian varieties. Using methods such as Iwasawa theory, I investigate the relationship between the special values of L-functions and arithmetic properties described by Selmer groups or Tate–Shafarevich groups, as exemplified by the Birch and Swinnerton-Dyer (BSD) conjecture

A central theme of my research is to understand the deep structures underlying arithmetic objects from both algebraic and analytic perspectives. This involves the study of units in number fields (such as elliptic units), the structure of local units, Euler systems, and the analysis of p-adic Galois representations.

Prerequisites for Students

Number theory has an exceptionally long history, and the background knowledge required to reach the forefront of research is vast. In order to engage with advanced topics within the two-year Master's programme, steady and thorough preparation is essential.

In addition to the basic theories of groups, rings, fields, and modules, students are expected to have a level of proficiency in Galois theory that allows them to handle infinite Galois extensions and Galois representations arising from arithmetic objects.

It is also important to become familiar with both the theory and explicit calculations of elliptic curves, for example through J. H. Silverman's *The Arithmetic of Elliptic Curves*. Familiarity with the basics of class field theory, especially local class field theory, alongside Galois cohomology, is also important. These are indispensable tools for studying Selmer groups and Iwasawa theory.

Of course, I do not expect students to have mastered all of these topics from the start. What I look for is a willingness to proactively pursue the topics that interest them while building a strong foundation.