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Field: Number theory

Keyword: Arithmetic Geometry

Summary of current research:

I study algebraic varieties defined over algebraic number field using cohomological methods. To study them, it is a routine to do it via reductions at primes. Among them, there are finitely many special primes for each variety where the reduction is bad. Characteristic properties of the variety are well reflected to those reductions. My field is the study of this phenomena using Galois representation defined as etale cohomology. In recent years, I am particularly interested in the ramification of l-adic etale sheaves on schemes of higher dimension.

Requests to students:

Arithmetic geometry has been developed greatly in the second half of the last century and there are huge amount of accumulation of knowledge to study the field. It is getting difficult to reach the cutting edge and to obtain an own result within the two years in the master course. However, a bigger difficulty can give us greater pleasure of achievement. This is reserved to those willing to study mathematics.

Before entering the master course, it is necessary to thoroughly understand the standard subjects in algebra including, groups, rings, fields, modules, etc. as in undergraduate courses. Further, one has to keep going on with number theory and algebraic geometry: p-adic fields, algebraic curves to start with and class field theory, schemes etc. etc. For these subjects, there are good textbooks such as

J.-P. Serre ``Corps Locaux'',

J. Silverman ``The arithmetic of elliptic curves'',

Q. Liu ``Algebraic Geometry and arithmetic curves''.

Before mastering these basic theories, one can't start to study recent research articles.

Etale cohomology is a fundamental tool in modern arithmetic geometry. To understand it, it is necessary to have a good background on cohomology of sheaves, Galois theory, schemes, etc. Those willing to study arithmetic geometry using etale cohomology in graduate school are required to have mastered these subjects.