

Mathematics Department Colloquium

Organizer(s): Kenneth Ribet

Thursday, 4:10–5:00pm, 60 Evans

Feb. 21 **Matthew J. Emerton**, Northwestern University
Galois representations, modular forms, and the p -adic Langlands program

A basic problem in algebraic number theory is to understand the absolute Galois group of the rational numbers, i.e., the Galois group of an algebraic closure of \mathbf{Q} over \mathbf{Q} . One way to do this is by studying representations of this group; these are the so-called Galois representations.

Applying constructions of arithmetic geometry to families of Diophantine equations, one obtains particularly nice examples of Galois representations, that one calls “geometric.” Fontaine and Mazur have conjectured that two-dimensional geometric Galois representations (satisfying certain additional technical hypotheses) can be classified in a certain precise sense by modular forms (which are objects arising in classical harmonic and complex analysis). The Fontaine–Mazur conjecture, if true, would provide a two-dimensional analogue of the celebrated Kronecker–Weber theorem of classical algebraic number theory (which classifies all abelian extension of \mathbf{Q}).

In this talk, I will describe some recent results establishing many cases of the Fontaine–Mazur conjecture. These results rely on certain ideas from p -adic representation theory and p -adic analysis which make up a part of the so-called “ p -adic Langlands program,” and in the talk I also hope to give some feeling for the nature of these methods.