# Course Syllabus for Math 282y: Tamagawa Numbers via Nonabelian Poincare Duality

Course Description Let $G$ be a connected semisimple algebraic group defined over a global field $K$, and let $\mathbf{A}$ denote the adele ring of $K$. Then $G(\mathbf{A})$ is a locally compact topological group, containing $G(K)$ as a discrete subgroup. The group $G(\mathbf{A})$ is equipped with a canonical bi-invariant measure, called *Tamagawa measure*. A conjecture of Weil asserts that the Tamagawa measure of the quotient $G(K)\backslash G(\mathbf{A})$ is equal to 1. When $K$ is a number field, this conjecture was proven by Kottwitz (building on earlier work of Langlands and Lai). The goal of this course is to describe recent joint work with Dennis Gaitsgory, addressing Weil's conjecture in the case of function fields.

Course Webpage http://www.math.harvard.edu/∼lurie/282y.html

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Text Detailed course notes can be obtained from the course webpage. The course notes will also contain a few pointers to relevant literature.

Prerequisites A working knowledge of algebraic geometry and category theory will be essential. More advanced topics which play an important role in the proof (such as the theory of algebraic stacks, $\ell$-adic cohomology, and the language of higher category theory) will receive a cursory treatment in class. A high level of mathematical sophistication will be assumed.

Some Topics:

- The Siegel mass formula and Tamagawa numbers.
- Principal bundles on algebraic curves.
- Higher-categorical approaches to homological algebra.
- The Ran space of an algebraic curve.
- Chiral homology in the $\ell$-adic setting.
- Nonabelian analogues of Poincare duality.
- Koszul duality of chiral algebras and Verdier duality on the Ran space.