

2025 Distinguished Lecture Series Presents

# ANA CARAIANI

February 25th to 27th, 2025



## LECTURE 1 // FEB. 25 AT 3PM

### Elliptic curves and modularity

The goal of this talk is to give you a glimpse of the Langlands program, a central topic at the intersection of algebraic number theory, algebraic geometry and representation theory. I will focus on a celebrated instance of the Langlands correspondence, namely the modularity of elliptic curves. In the first part of the talk, I will give an explicit example, discuss the different meanings of modularity for rational elliptic curves, and mention applications. In the second part of the talk, I will discuss what is known about the modularity of elliptic curves over more general number fields.

## LECTURE 2 // FEB. 26 AT 3PM

### The cohomology of Shimura varieties - a survey of recent developments

Shimura varieties are highly symmetric algebraic varieties that play an important role in the Langlands program. In the first part of the talk, I will try to give you a sense of what they are like, with a focus on their different kinds of symmetries. In the second part of the talk, I will survey a recent class of results about the vanishing of the cohomology of Shimura varieties with torsion coefficients. To give you a sense of the breadth of the subject, I will mention connections both to the geometric Langlands program and to the modularity results discussed in the first lecture.

## LECTURE 3 // FEB. 27 AT 3PM

### Ordinary p-adic automorphic forms and Eichler-Shimura theory

In this talk, I will discuss a conjectural p-adic analogue of the kinds of vanishing results for the cohomology of Shimura varieties that were featured in the second lecture. This is closely related to an integral Eichler-Shimura style comparison between two different constructions of ordinary p-adic automorphic forms. Both constructions originate in the work of Hida, but the first has a more representation-theoretic flavour and uses the Betti / étale cohomology of Shimura varieties, while the second has a more geometric flavour and uses coherent cohomology. This talk is based on joint work in progress with James Newton and Juan Esteban Rodríguez Camargo that aims to compare the two constructions.

**IMPERIAL  
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### RESEARCH AREA

- Number Theory

### VISIT

- February 25 to 27, 2025

### LOCATION

- MS 6627/Zoom

College | Physical Sciences  
**UCLA Mathematics**

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