INDIAN STATISTICAL INSTITUTE

Theoretical Statistics and Mathematics Unit, Kolkata

SEMINAR

Date: September 10, 2025
Time: 04:30 PM

VENUE:

L-Infinity

(5th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

TITLE:

Weil Cohomology Theory and Weil conjectures 2

SPEAKER:

Snehinh Sen

Australian National University

ABSTRACT: Attached below.

ALL ARE CORDIALLY INVITED

Weil Cohomology Theory and Weil Conjectures

Snehinh Sen*

Abstract

The pursuit of Weil Conjectures (now proved) was perhaps one of the most influential and celebrated programs which led to the birth and development of most of what we call arithmetic geometry today. The objective of this mini talk series is to give an exposition to the conjectures accessible to a wider audience. Starting from a very simple analysis of curves and varieties, we will talk about zeta functions over varieties and observe some fascinating patterns. These patterns would lead us to the Weil Conjectures. Finally, assuming some facts from arithmetic geometry and algebra, mainly the existence of what one calls a "Weil Cohomology Theory", we will prove all but one of them - the Riemann Hypothesis. Time permitting, we will also have a glimpse of other related ideas, such as proofs of the Riemann Hypothesis, construction of étale cohomology, and the idea of motives.

Tentative Plan

This talk series would have two 90 minute talks (with break).

(i) Day 1: Introduction to Zeta Functions and the Weil Conjectures.
(ii) Day 2: Weil Cohomology Theories and a proof of (almost all of) the conjectures.

I will also be sharing two notes, namely,

(i) A recap of Algebraic Geometry (for the purpose of this talk).
(ii) A note listing the Weil Conjectures, Weil Cohomology Theory and properties of étale cohomology, algebra and schemes important for the proof. This would be used as a constant reference for the second talk.

References

Here is a set of (non-exhaustive) references:

(i) Tamás Szamuely's lecture notes.
(ii) Davide Lombardo and Andrei Maffei's lecture notes.
(iii) Pierre Deligne's original article (Weil I).
(iv) Pierre Deligne's SGA 4 $\frac{1}{2}$.
(v) James S. Milne's Étale Cohomology.
(vi) Nicholas Katz's Expository Note on Deligne's Proof of Riemann Hypothesis.

*Mathematical Sciences Institute
The Australian National University
Canberra, ACT, Australia - 2601
E-mail: snehinh.sen@anu.edu.au