

**Stanford University**  
**Departments of Mathematics and Statistics**

PROBABILITY SEMINAR

4pm, Monday, February 3, 2020  
Sequoia Hall Room 200

Refreshments served at 3:30pm in the Lounge.

**Speaker:** Sumit Mukherjee, *Columbia University*

**Title:** **Fluctuations in Mean Field Ising Models**

**Abstract:**

We study fluctuations of the magnetization (average of spins) in an Ising model on a sequence of “well-connected” approximately  $d_n$  regular graphs on  $n$  vertices. We show that if  $d_n \gg \sqrt{n}$ , then the fluctuations are universal, and the same as that of the Curie Weiss model, in the entire Ferromagnetic parameter regime. We then give a counterexample to show that  $d_n \gg \sqrt{n}$  is actually tight, in the sense that the limiting distribution changes if  $d_n \sim \sqrt{n}$  except in the high temperature regime. By refining our argument, we show that in the high temperature regime universality holds for  $d_n \gg n^{1/3}$ . As a by product of our proof technique, we prove rates of convergence, as well as exponential concentration for the sum of spins, and tight estimates for several statistics of interest.

This is based on joint work with Nabarun Deb at Columbia University.