Abstract:

**Mark Rudelson (UMich)**

**Title:** Invertibility of the adjacency matrices of random graphs.

**Abstract:** Consider an adjacency matrix of a bipartite, directed, or undirected Erdős-Rényi random graph. If the average degree of a vertex is large enough, then such matrix is invertible with high probability. As the average degree decreases, the probability of the matrix being singular increases, and for a sufficiently small average degree, it becomes singular with probability close to 1. We will discuss when this transition occurs, and what the main reason for the singularity of the adjacency matrix is.

This is a joint work with Anirban Basak.

**Yinon Spinka (TAU)**

**Title:** Finitary codings of Markov random fields

**Abstract:** Let $X$ be a stationary $\mathbb{Z}^d$-process. We say that $X$ can be coded by an i.i.d. process if there is a deterministic and translation-invariant way to construct a realization of $X$ from i.i.d. variables associated to the sites of $\mathbb{Z}^d$. That is, if there is an i.i.d. process $Y$ and a measurable map $F$ from the underlying space of $Y$ to that of $X$, which commutes with translations of $\mathbb{Z}^d$ and satisfies that $F(Y) = X$ in distribution. Such a coding is called finitary if, in order to determine the value of $X$ at a given site, one only needs to look at a finite (but random) region of $Y$.

It is known that a phase transition (existence of multiple Gibbs states) is an obstruction for the existence of such a finitary coding. On the other hand, we show that when $X$ is a Markov random field satisfying certain spatial mixing conditions, then $X$ can be coded by an i.i.d. process in a finitary manner. Moreover, the coding radius has exponential tails, so that typically the value of $X$ at a given site is determined by a small region of $Y$.

We give applications to models such as the Potts model, proper colorings and the hard-core model.