

Combinatorial and geometric methods in discrete random matrices

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Abstract

In this talk we discuss problems related to the singularity of random discrete matrices in various models. We survey some recent work in the area and present some combinatorial and geometric methods to tackle these problems. If time permits, we will try to illustrate how to apply these techniques to the following problems: 1. Conditional on the extended Riemann hypothesis, we show that with high probability, the characteristic polynomial of a random symmetric $\{\pm 1\}$ -matrix is irreducible. This addresses a question raised by Eberhard in recent work. 2. Motivated by problems from compressed sensing, we determine the threshold behavior of a random $n \times d$ ± 1 matrix $M_{n,d}$ with respect to the property “every s columns are linearly independent”.

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