ANTI-CONCENTRATION INEQUALITIES FOR POLYNOMIALS

ABSTRACT. An anti-concentration inequality bounds the probability that a random variable F takes value in a fixed small interval. The first such result is the famous Erdos-Littlewood-Offord inequality. Let ξ_i be iid Rademacher random variables and c_i be real coefficients with absolute value at least 1. Consider the linear function

$$F(\xi_1, \dots, \xi_n) = c_1\xi_1 + ... + c_n\xi_n.$$

ELO inequality asserts that for any fixed interval I of length 1, the probability that F belongs to I is $O(n^{-1/2})$.

In this talk, we discuss anti-concentration inequalities of this type for the case when F is a polynomial in terms of the variables ξ_i. Our bound improves significantly earlier estimates by Costello-Tao-Vu and Razborov-Viola.

Our method allows the degree of F to increase with n. As an application, we settle (up to an iterative logarithmic term) a problem of Razborov and Viola in complexity theory.

(joint work with V. Vu)