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Bilinear and Quadratic Variants on the Littlewood-Offord Problem.

Let f be a polynomial dependent on a large number of independent random inputs. Two natural questions to ask are

(1) As the number of inputs increases, what is the maximum concentration that f can have on any one value, assuming all (or most) of the coefficients are non-zero?

(2) If f is a polynomial which comes close to this maximum, what can be said about the structure of the coefficients of f?

In the linear case, this is a question first investigated by Littlewood and Offord and answered by Erdős: The maximum concentration of $O(n^{-1/2})$ occurs when all of the nonzero coefficients of f are equal. Here we will give near-sharp bounds in the case where f is a bilinear or quadratic form. (Received February 03, 2009)