

1047-26-298

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Optimizing Polynomials via Low Dimensional Restrictions. Preliminary report.

Let p be a homogeneous polynomial in n variables of degree d . We will discuss approximating various quantities associated with p , such as its average and largest absolute value on the unit sphere by restricting p to low dimensional subspaces; the dimension of subspaces should be typically logarithmic in n . We will show that the average value of p over a subspace concentrates around the average value of p and we will discuss our progress in showing the same concentration for the maximum absolute value.

We will also discuss a class of polynomials we call "needle-like" polynomials where the computation of the maximum absolute value should be possible by optimizing over a low dimensional subspace and then rescaling properly. (Received January 31, 2009)