On global hypercontractivity and optimal testing of Reed-Muller codes.

Abstract:

Reed-Muller codes are an important family of error correcting codes that play a crucial role in a number of results in theoretical computer science. For the field of size $q$ and degree $d$, it was proved [Bhattacharyya et al., Haramaty et al.] that the corresponding Reed-Muller code is testable with $S C_q \cdot q^d / \varepsilon$ queries. We give a new, more natural proof of this result that achieves a better dependency of $C_q$ on the field size $q$ -- from a tower-type bound to a polynomial bound. Our proof applies more generally to the setting of affine lifted codes, and uses the notion of global hypercontractivity, a recent generalization of classical hypercontractive inequalities.

In this talk, we will give a gentle introduction to the concept of global hypercontractivity, and explain the relation of the to the problem of optimal testing of Reed-Muller codes.

Based on a joint work with Tali Kaufman.