1031-05-107 **Eyal Lubetzky*** (EYAL@MICROSOFT.COM), Microsoft Research, Theory group, 1 Microsoft Way, Redmond, WA 98052, and **Uri Stav**. *Non-linear index coding outperforming the linear optimum.*

The following source coding problem was introduced by Birk and Kol: a sender holds an n-bit input word x, and wishes to broadcast a codeword to n receivers, $R_1, ..., R_n$. The receiver R_i is interested in x_i, and has prior *side information* comprising some subset of the n bits. This corresponds to a directed graph G on n vertices, where ij is an edge iff R_i knows the bit x_j. An *index code* for G is an encoding scheme which enables each R_i to always reconstruct x_i, given his side information. The minimal word length of an index code was studied by Bar-Yossef, Birk, Jayram and Kol (FOCS 2006). They showed that in various cases linear codes attain the optimal word length, and conjectured that linear index coding is in fact *always* optimal.

In this talk, we will show that the main conjecture of BBJK06 is false in the following strong sense: for any $\epsilon > 0$ and sufficiently large n, there is an n-vertex graph G so that every linear index code for G requires codewords of length at least $n^{1-\epsilon}$, and yet a non-linear index code for G has a word length of n^{ϵ}. This is achieved by an explicit construction, which extends Alon's variant of the celebrated Ramsey construction of Frankl and Wilson. (Received August 06, 2007)