Algebraic Attacks against Random Local Functions and Their Countermeasures

Abstract:

Suppose that you have n truly random bits $X = (X_1, ..., X_n)$ and you wish to use them to generate $m > n$ pseudorandom bits $Y = (Y_1, ..., Y_m)$ using a local mapping, i.e., each $Y_i$ should depend on at most $d = O(1)$ bits of $x$. In the polynomial regime of $m = n^s$, $s > 1$, the only known solution, originates from (Goldreich, ECCC 2000), is based on Random Local Functions: Compute $Y_i$ by applying some fixed (public) $d$-ary predicate $P$ to a random (public) tuple of distinct inputs. In this talk, we will try to understand, for any value of $s$, how the pseudorandomness of the resulting sequence depends on the choice of the underlying predicate.

Based on joint work with Shachar Lovett.