Algebraic Attacks against Random Local Functions and Their Countermeasures

Abstract:
Suppose that you have $n$ truly random bits $X=(X_1,\ldots,X_n)$ and you wish to use them to generate $m \gg n$ pseudorandom bits $Y=(Y_1,\ldots,Y_m)$ 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.