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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.