Abstract:

Motivated by the goal of securely searching and updating distributed data, we introduce the notion of function secret sharing (FSS), a form of “additive secret sharing” for \{f: \{0,1\}^n \to G\}, where G is an abelian group.

An m-party FSS scheme for function class F allows one to split any function f from F into m succinctly described functions f_i, such that: (1) for every input x, f(x) is equal to the sum of evaluations \sum_i f_i(x), and (2) any strict subset of "share functions" f_i hides f. FSS provides a natural generalization of distributed point functions, as introduced by (Gilboa-Ishai Eurocrypt 2014), which coincide with the special case of two parties and the class F of point functions (which evaluate to 0 at all but one point).

We present two types of results:
- We obtain efficiency improvements and extensions of the original distributed point function construction.
- We then initiate a systematic study of general FSS, providing constructions for richer function classes, and establishing relations with other cryptographic primitives.

Joint work with Niv Gilboa and Yuval Ishai.