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Thick Cover-Free Sequences of Sets and the Circuit Size of Threshold Functions

A sequence F of sets is r -cover-free for thickness b if, for each set $S \in F$, there is no subsequence of F of size r whose multiset union contains the elements of S at least b times. In the special case of $b = 1$, these correspond to r -cover-free families, which have been used to prove bounds for: non-adaptive group testing, the time complexity of neighbour discovery in wireless networks, and the circuit size of (n, k) -threshold functions. An (n, k) -threshold function takes n binary inputs and outputs 1 if at least k inputs are 1, and outputs 0 otherwise. In this talk, we will discuss results that are obtained by considering more general values for b . In the case of threshold functions, we are able to prove a lower bound on the size of circuits that compute (n, k) -threshold functions when each gate in the circuit can itself compute a simpler (n, k') -threshold function.