Minimum weights of Boolean polynomials on the spherical Hamming layers

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Abstract

Consider *m*-variate Boolean polynomials of degree r or less. Our goal is to find the minimum Hamming weights that these polynomials take on the sets of binary *m*-tuples of a given Hamming weight *b*. From the coding perspective, this setting defines a punctured binary Reed-Muller code RM(r,m) whose positions form a Hamming sphere of weight *b* in the *m*dimensional binary space. In this talk, we specify some recursive properties of this single-layer spherical construction RM(r,m,b) and define its code parameters for any values of the input parameters *m*, *r*, and *b*. We also describe coding techniques that increase minimum distances of codes RM(r,m,b) and obtain codes that meet the upper Griesmer bound.