Explicit Binary Tree Codes with Polylogarithmic Size Alphabet

Abstract:

This paper makes progress on the problem of explicitly constructing a binary tree code with constant distance and constant alphabet size. For every constant $\delta < 1$ we give an explicit binary tree code with distance $\delta$ and alphabet size $\text{poly}(\log n)$, where $n$ is the depth of the tree. This is the first improvement over a two-decade-old construction that has an exponentially larger alphabet of size $\text{poly}(n)$.

As part of the analysis, we prove a bound on the number of positive integer roots a real polynomial can have in terms of its sparsity with respect to the Newton basis—a result of independent interest.

Joint work with G. Cohen and B. Haeupler