Locally testable and locally correctable codes approaching the Gilbert-Varshamov bound

Abstract:

We show that there exist binary locally testable codes (for all rates) and locally correctable codes (for low rates) with rate and distance approaching the Gilbert-Varshamov bound (which is the best rate-distance tradeoff known for general binary error-correcting codes). Our constructions use a number of ingredients: Thomassen's random concatenation technique, the Guruswami-Sudan-Indyk strategy for list-decoding concatenated codes, the Alon-Edmonds-Luby distance amplification method, and the local list-decodability and local testability of Reed-Muller codes. Interestingly, this seems to be the first time that local testability is used in the construction of locally correctable codes.

Joint work with Sivakanth Gopi, Rafael Oliveira, Noga Ron-Zewi and Shubhangi Saraf