LDPC Codes Achieve List Decoding Capacity

Abstract:

We show that random Low-Density Parity Check (LDPC) codes achieve list decoding capacity with high probability. These are the first graph-based codes shown to have this property. This result follows from two other more general results that may be of independent interest:

1. A simple characterization of the threshold for when \( \text{local} \) combinatorial properties are likely to be satisfied by a random subspace over a finite field.
2. Any \( \text{local} \) property that is satisfied with high probability by a random linear code is also satisfied with high probability by a random LDPC code. Based on joint work with Jonathan Mosheiff, Nicolas Resch, Shashwat Silas, and Mary Wootters.