Recent progress on codes for worst-case deletions.
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This talk will discuss recent progress on code constructions for recovery from worst-case bit deletions.

The first part will consider the case of a large fraction of deletions, where we construct a family of binary codes of positive rate to recover from a fraction 0.414 of deletions. Previously, even non-constructively the largest deletion fraction known to be correctable with positive rate was around 0.17. For alphabet size k, we are able to correct a deletion fraction exceeding (k-1)/(k+1), with (k-1)/k being a trivial upper limit. Whether a deletion fraction approaching 1/2 is correctable by binary codes remains a tantalizing open question.

This is a joint work with Boris Bukh and Johan Hastad.

The second part will consider the other noise regime, of correcting from a small fixed number k of deletions. The single deletion case is well understood since 1965, and an asymptotically optimal explicit construction with \(\sim 2^n/n\) codewords of length n, i.e., at most \(\log n\) bits of redundancy, is known. However, even for the case of two deletions, there was no known explicit construction with redundancy less than \(n^{\Omega(1)}\). For any fixed k, we construct binary codes with \(O(k^2 \log k \log n)\) redundancy for efficient recovery from k deletions. The optimal, non-constructive bound is \(\Theta(k \log n)\) bits of redundancy.

This is a joint work with Joshua Brakensiek and Samuel Zbarsky.