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.