Associate Professorship of Coding and Cryptography
TUM Department of Electrical and Computer Engineering
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Master's Thesis

Low-Density Cover-Metric Codes

A common assumption for the construction of error correcting codes is that errors occur independently.

However, in many applications errors are actually highly correlated.
Coding in the cover-metric considers correlated errors which occur as 2-dimensional burst errors.

Such errors can be corrected using rank-metric codes.
Originally Gabidulin codes were proposed for this.
In [1], low-rank parity check (LRPC) codes are introduced, which utilize a probabilistic decoding procedure.

The goal of the master thesis is to

- apply LRPC codes to the cover-metric
- derive expressions on the success probability of the decoding by modifying the existing results for the rank metric
- check these results using simulations

Depending on personal preference, this basic idea will be extended into different directions:

- consider interleaved scenario as in [2]
- consider a modified construction, which utilizes the additional structure of cover-metric errors compared to rank-metric errors (cf. [3])

If you are interested, please write an email, then we'll discuss the details.

[1] Aragon, Gaborit, Hauteville, Ruatta, Zemor, "Low Rank Parity Check Codes: New Decoding Algorithms and Applications to Cryptography", https://arxiv.org/abs/1904.00357

[2] Renner, Jerkovits, Bartz, "Efficient Decoding of Interleaved Low-Rank Parity-Check Codes", https://arxiv.org/abs/1908.10839

[3] Bitzer, Renner, Wachter-Zeh, Weger, "Generic Decoding in the Cover Metric", https://arxiv.org/abs/2205.12738

Prerequisites

Channel coding

Advisors

Violetta Weger, Sebastian Bitzer