New efficiently decodable rank metric codes

Rakhi Pratihar*[1]

[1]INRIA LIX – INRIA Saclay Ile-de-France – France

Résumé

In 2021, Augot, Couvreur, Lavauzelle and Neri proposed a construction of rank metric analogues of Reed–Muller codes from twisted group algebras associated with an abelian Galois extension. These codes are multivariate version of Gabidulin codes which are defined for cyclic Galois extensions.
In this talk, I will present a probabilistic decoding for binary rank metric Reed-Muller codes that corrects errors of rank up to half minimum distance. It rests on a recursive structure of the binary Reed–Muller codes that can be considered as a rank analogue of the recursive Plotkin "(u - u+v)" structure for Hamming metric binary Reed–Muller codes. Furthermore, I will discuss how we can adapt this recursive decoder to construct new efficiently decodable matrix rank metric codes over finite field extensions. This is based on a work with Alain Couvreur.

References:
(1) D. Augot, A. Couvreur, J. Lavauzelle, and A. Neri, Rank metric codes over arbitrary Galois extensions and rank analogues of Reed-Muller codes, SIAM journal of applied algebra and geometry, vol. 5 (2), 2021.
(2) A. Couvreur, R. Pratihar, Recursive decoding of binary rank Reed-Muller codes and Plotkin construction for matrix codes, ISIT 2025, https://inria.hal.science/hal-04915230.

*Intervenant