

# Theory of Algebraic Codes

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Algebraic coding theory is a topic of combinatorics with a wide variety of applications in digital communications, such as point-to-point error correction, network coding, distributed storage and wireless communications. From the mathematical viewpoint, it has connections to finite fields, design theory, graph theory, finite geometry and lattices. An algebraic code is a vector space or module equipped with a distance function. The packing and covering properties of a code are of strong theoretical interest, as are constructions of other combinatorial objects using codes. Applications are invited to pursue a PhD project in any of the following topics.

- Network Coding
  - low-rank matrix completion, broadcast problems, index coding, coded caching, privacy
- Rank Metric Codes
  - covering radius, maximum rank distance codes, code constructions, applications
- Ring-Linear Coding
  - fundamental properties, code constructions, connections to other structures, classification problems

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## References

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- [2] E. Byrne, A. Ravagnani (2016), “Covering Radius of Matrix Codes Endowed with the Rank Metric,” [arXiv.org](https://arxiv.org/abs/1608.08755), arXiv:1608.08755.
- [3] E. Byrne, A. Sneyd (2016), “Two-Weight Codes, Graphs and Orthogonal Arrays,” *Designs, Codes and Cryptography*, May 2016, Volume 79, Issue 2, 201-217.

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