Computer Algebra Challenges for Constructing Skew Cyclic Codes

Nuh Aydin
Kenyon College, Gambier, OH, USA
aydinn@kenyon.edu

Abstract

One of the challenging problems of coding theory is to construct codes with best possible parameters. Computers and computer algebra systems are often used in achieving this goal. Since the computation of the minimum distance of a linear code is computationally intractable (NP-hard), it is necessary to focus on certain promising classes of codes with rich algebraic structures. Cyclic codes and their various generalizations, such as constacyclic, quasi-cyclic, and quasi-twisted codes have been subject to much research, both theoretical and computational, for decades. As a result, a large number of best-known codes come from these families. More recently, a new generalization of cyclic codes, called theta-cyclic codes or skew cyclic codes, have been introduced. The algebraic study of skew cyclic codes requires one to work in a non-commutative ring called skew polynomial ring. This introduces new computational challenges for computer algebra systems when it comes to implementing search algorithms for constructing skew cyclic and related codes over rings or fields. In this talk, we will describe some of these challenges.

Keywords

skew cyclic codes, best-known codes, skew polynomial ring, computer algebra systems