

Nonlinear Repair Schemes of Reed-Solomon Codes

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Abstract

The problem of repairing linear codes, particularly Reed Solomon (RS) codes, has attracted a lot of attention in recent years due to its importance in distributed storage systems. In this problem, a failed code symbol (node) needs to be repaired by downloading as little information as possible from a subset of the remaining nodes. There are examples of RS codes with efficient repair schemes, and some are even optimal. However, these schemes fall short in several aspects; for example, they require a considerable field extension degree, and in particular, they do not work over prime fields. In this work, we explore the power of nonlinear repair schemes of RS codes and show that such schemes are crucial over prime fields, and in some cases, they outperform all linear schemes.

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