Toward a unified algebraic framework for Reed–Solomon–type codes over skew and linearized polynomial rings

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Reed–Solomon (RS) codes, Gabidulin codes, Linearized Reed–Solomon (LRS) codes, and Skew Reed–Solomon (Skew RS) codes form a family of algebraic error-correcting codes that generalize the classical RS paradigm across different algebraic and metric domains. While various connections between these code families have been identified—such as isomorphisms between linearized and skew polynomial representations—their relationships are not yet fully understood in a unified theoretical framework.

This project aims to develop such a framework by situating these code families within the broader structure of skew polynomial rings and their linearized analogs. As a first step, we will establish a systematic overview of which core results—such as distance bounds, duality properties, and decoding algorithms—are known for each family. We will then investigate which of these results can be translated from one code class to another via algebraic isomorphisms or structural analogies, and where such translations break down due to metric, structural, or evaluation differences. We this approach we want to clarify the underlying algebraic principles that connect these closely related code families and to identify both the limits and opportunities for transferring techniques and insights across them.