

Sparse Interpolation in Chebyshev Basis: Early Termination and Georg Heinig's Toeplitz Solver

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Ideas by Kaltofen and Yang [ISSAC 2024] for error-correcting interpolation of polynomials that are a sparse linear combination of Chebyshev polynomials have led to a new early termination algorithm for computing the sparsity.

Kaltofen and Lee [JSC 2003] in their early termination algorithms used thresholds to skip over sporadic probabilistic errors. For early termination in sparse Chebyshev interpolation, thresholds need an algorithm to step from a sequence of singular leading principal submatrices of a Toeplitz matrix to the next non-singular leading principal submatrix. For Prony sparse interpolation, the problem is solved by the 1969 Berlekamp-Massey algorithm, and for Chebyshev sparse interpolation by Georg Heinig's 1983 Toeplitz algorithm.

In my talk, I will describe our new early termination algorithm and Heinig's Toeplitz solver from a Berlekamp-Massey algorithmic viewpoint. Heinig's algorithm, which generalizes the classical Toeplitz solvers by Levinson and Durbin, takes quadratic time and requires linear space.

This is joint work with Zhi-Hong Yang at Central South University, China.