A Journey Through Numerical Linear Algebra Algorithms with Variable Accuracy Storage

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Abstract

In this talk, we explore the numerical behavior of widely used linear algebra methods when the errors introduced by the underlying hardware and arithmetic are decoupled from those arising from the data representation of mathematical objects - primarily matrices and vectors - used within the algorithms. We refer to this concept as variable accuracy storage. We present experimental results in fundamental contexts, including basis orthogonalization using variants of the Modified Gram-Schmidt process and the solution of linear systems with GMRES. In addition, we examine the numerical quality of the computed results under variable accuracy storage and relate our findings to well-established results in finite-precision arithmetic.

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