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A New Selection Operator for the Discrete Empirical Interpolation Method

Z. Drmač[1] and S. Gugercin[2]

[1]University of Zagreb, Zagreb, Croatia
[2]Virginia Tech, Blacksburg, VA, US

This paper introduces a new framework for constructing the Discrete Empirical Interpolation Method (DEIM) projection operator. The interpolation nodes selection procedure is formulated using a QR factorization with column pivoting. This selection strategy leads to a sharper error bound for the DEIM projection error and works on a given orthonormal frame U as a point on the Stiefel manifold, i.e., the selection operator does not change if U is replaced by $\mathsf{U}Q$ with arbitrary unitary matrix Q. The new approach allows modifications that, in the case of gargantuan dimensions, use only randomly sampled rows of U but are capable of producing equally good approximations.