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"A Block Householder Based Algorithm for the QR Decomposition of Hierarchical Matrices"

Hierarchical Matrices are dense but data-sparse matrices that utilise low-rank factorisations of suitable submatrices to allow for storage with linear-polylogarithmic complexity. Furthermore, efficient approximations of usual matrix operations like matrix-vector and matrix-matrix multiplication, matrix inversion and LU decomposition are available. All existing QR decompositions for hierarchical matrices suffer from numerical drawbacks that limit their use in many applications. In this talk, I propose a new approach based on block Householder transformations that improves upon some of those problems. To prevent unnecessary high ranks in the resulting factors and increase speed as well as accuracy the algorithm meticulously tracks for which intermediate results low-rank factorisations are available.