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*Communication Bounds for Sequential and Parallel Eigenvalue Problems.*

We propose a set of divide-and-conquer eigenvalue algorithms that minimize communication (between levels of memory on a sequential computer and between processors on a parallel computer) in an asymptotic sense. The algorithms use as building blocks matrix multiplication and QR decomposition, each of which can be implemented by communication-optimal algorithms. The algorithms depend on a randomized rank-revealing QR decomposition to minimize the communication complexity while keeping the algorithms stable. (Received February 09, 2010)