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**Qiang Ye\*** ([qye@ms.uky.edu](mailto:qye@ms.uky.edu)), Department of Mathematics, University of Kentucky, Lexington, KY 40506. *Computing Eigenvalues of Symmetric Diagonally Dominant Matrices to High Relative Accuracy with Application to Differential Operators.*

For a (row) diagonally dominant matrix, if all of its off-diagonal entries and its diagonally dominant parts (which are defined for each row as the absolute value of the diagonal entry subtracted by the sum of the absolute values of off-diagonal entries in that row) are known accurately, we present an algorithm that computes all the singular values with relative errors in the order of the machine precision. When the matrix is also symmetric with positive diagonals (i.e a symmetric positive semi-definite diagonally dominant matrix), the algorithm computes all eigenvalues to high relative accuracy. Implications to computing eigenvalues of differential operators will be discussed. (Received January 20, 2010)