University of New Mexico

Project Proposal

CS 542 / 442: Introduction to Parallel Processing
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Efficient matrix storage and operations are of great importance in the field of parallel computing. Sparse matrices in particular represent a significant area of interest in their own right due to the many problems in which they play a role and the performance benefits they can yield over dense matrices.

Our team proposes to investigate how the performance of handling sparse matrices in MPI changes with the sparsity of the matrix. In particular, we would like to analytically verify that sparse matrices show greatest performance as the number of nonzero matrix entries of an $n \times n$ decreasingly approaches $O(n)$.

As performance metrics, we plan on using all or a subset of the following over a range of sparsity levels and matrix dimensions and comparing performance:

i) Memory required to store matrix (using COO, CSR, CSC).
ii) Time required to perform matrix-matrix multiplication.
iii) Time required to perform single matrix operation (e.g. transpose).

Through this project, we aim to improve our understanding of the potential performance benefits inherent to using sparse matrices and to develop our analysis skills in the context of MPI.