1086-58-1864 **Lori Beth Ziegelmeier*** (ziegelme@math.colostate.edu), 101 Weber Building, Fort Collins, CO 80523-1874, and **Michael Kirby** and **Chris Peterson**. *Robust Geometric Structure from High Dimensional Data using Sparse LLE.*

The Locally Linear Embedding (LLE) algorithm has proven to be a useful technique for revealing geometric structures in high dimensional data. The basic algorithm reconstructs each data point by a weighted average of its nearest neighbors, and the geometry obtained by these weights captures the lower-dimensional embedding. The embedding reconstruction is highly dependent on the parameter choice of the number of nearest neighbors, i.e., the geometric structure is not robust to parameter selection. We present modifications to the LLE optimization problem that address this shortcoming of standard LLE.

We solve four modified versions of the LLE algorithm using linear and quadratic programming. This is accomplished by altering the objective function by introducing a penalization and considering the error term in the L_1, L_∞, and L_2 norms. These new formulations have proven effective at automatically determining nearest neighbors using sparsity of numerical results.

We apply these techniques to biological data sets. We show that the gene expression data from the Duke flu study can be clearly visualized in three dimensions. Further, we will present results concerning blood biomarkers and sepsis diagnosis using data from the Yale Neonate Clinic. (Received September 24, 2012)