1023-62-1492   **Evgenia Rubinshtein*** (`evgeniar@uca.edu`), Department of Mathematics, University of Central Arkansas, 201 Donaghey Avenue, Conway, AR 72035, and **Anuj Srivastava**. *Linear Dimension Reduction of Images Using Geometrical Tools.* Preliminary report.

Image analysis often requires dimension reduction before statistical analysis, in order to apply sophisticated procedures. Motivated by eventual applications, a variety of criteria have been proposed: reconstruction error, class separation, non-Gaussianity using kurtosis, sparseness, mutual information, recognition of objects, and their combinations. Although some criteria have analytical solutions, the remaining ones require numerical approaches. We present geometric tools for finding linear projections that optimize a given criterion for a given data set. The main idea is to formulate a problem of optimization on a Grassmann or a Stiefel manifold, and to use differential geometry of the underlying space to construct optimization algorithms. Purely deterministic updates lead to local solutions, and addition of random components allows for stochastic gradient searches that eventually lead to global solutions. We demonstrate these results using several image datasets, including natural images and facial images. (Received September 26, 2006)