1014-65-585 **Carla D. Moravitz Martin*** (carlam@math.cornell.edu), Department of Mathematics, 227 Malott Hall, Cornell University, Ithaca, NY 14853, and **Charles F. Van Loan** (cv@cs.cornell.edu), Department of Computer Science, 4130 Upson Hall, Cornell University, Ithaca, NY 14853. *Tensor Decompositions and Compression.* Preliminary report.

Tensor decompositions involve extending properties of the Singular Value Decomposition (SVD) to higher-dimensional arrays, or tensors. In the two-dimensional case, the SVD is particularly illuminating, since it reduces a matrix to diagonal form and reveals the rank. In the higher-order case, familiar linear algebra concepts such as rank, become complicated. Determining a closed-form solution for the rank of a general tensor is still an open problem.

We provide insight to the rank problem by presenting connections between the rank of a subclass of tensors and certain eigenvalue decompositions. The result is that for tensors of size $n \times n \times 2$, the rank is $n + k$ where k is the number of generalized complex conjugate eigenvalue pairs of the matrices forming the faces of the tensor cube. Our proof is constructive and leads to an efficient algorithm for computation.

We also present an algorithm to “compress” a general tensor such that the mass is concentrated in fewer entries. Our algorithm extends the Jacobi SVD algorithm for matrices. The resulting tensor decomposition reduces a tensor to a form such that the sums of squares of the diagonals of the tensor are maximized. (Received September 20, 2005)