1046-15-1520   **Carla D Martin*** (`carlam@math.jmu.edu`), Department of Mathematics and Statistics, James Madison University, MSC 1911, Harrisonburg, VA 22807, and **Misha E Kilmer** and **Lisa Perrone**. *A Higher-order Generalization of the Matrix SVD as a Product of Higher-order Tensors.* Preliminary report.

Traditionally, extending the Singular Value Decomposition (SVD) to higher-order tensors (multiway arrays) has involved a representation using the outer product of vectors. These outer products can be written in terms of the n-mode product, which can also be used to describe a type of multiplication between two tensors. We present a different type of higher-order generalization of the SVD where an order-p tensor is instead decomposed as a product of order-p tensors. In order to define this new notion, we define tensor-tensor multiplication in such a way so that it is closed under this operation. This results in new definitions for tensors such as the tensor transpose, inverse, and identity. A major motivation for considering this new type of tensor multiplication is to devise new types of factorizations for tensor which could then be used in applications such as data compression. We therefore present two strategies for compressing tensors which make use of our new tensor SVD and give some numerical comparisons to existing algorithms on synthetic data. (Received September 15, 2008)