1077-65-2124 **Daniel Peach*** (dpeach@bates.edu), 704 Bates College, Lewiston, ME 04240, and **Ilse Ipsen**, **Thomas Wentworth** and **Colin Gray**. *Matrix Multiplication Approximation Using Orthogonalized Outer Products.* Preliminary report.

We present a prototype algorithm for approximating matrix multiplication for low-rank matrices. Inspired by algorithms introduced by Drineas et al. (2007), we view the multiplication of two arbitrary matrices A and B as the sum of outer products. For our algorithm, we reduce computation time by using only a small subset of these outer products: we approximate the true product AB using a linear combination of this subset. We determine the optimal linear weights for our chosen outer products by projecting the true product AB onto the vector space spanned by the outer products; we use the Frobenius inner product and the Gram-Schmidt process to orthogonalize our outer products and then project AB onto this new basis. For $n \times n$ matrices, our algorithm cannot be computed exactly in less than $O(n^3)$ time. However, we introduce a randomized pseudo-inner product which models the Frobenius inner product: our pseudo-inner product substantially reduces our computation time but does not jeopardize the accuracy of our algorithm. Finally, we discuss optimal methods of choosing outer products. (Received September 21, 2011)