

Matrix Multiplication via Wavelets

by

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A Master's Thesis Defense

12 noon March 25, 2004

Conference Room (206), Computer Science Building

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Some of the most important questions in computer science are how quickly can a computation be performed and how accurate are the results. This thesis addresses these issues using Wavelets for Matrix Multiplication. Matrix multiplication itself is one of the more fundamental operations known to linear algebra, and computational scientist have been trying to shave the efficiency of matrix multiply from its defining algorithm's $O(N^3)$ to something closer to $O(N^2)$. Both sparse and non-sparse means have been tried in an effort to reduce computations.

This thesis utilizes the Haar Wavelet Transform for Matrix Multiplication to precondition dense matrices. Then they can be approximated with sparse matrices and quickly multiplied together. This thesis shows how this transformation can be performed, and how accurate it is, and how precise the result is even with the lower energy elements discarded.