

18.304 Final Project

Hadamard Matrices

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1 Introduction

2 Background

A Hadamard matrix is a square matrix whose entries are either +1 or -1 and whose rows are mutually orthogonal.

3 Construction

There are several ways to construct Hadamard matrices. For example, James Joseph Sylvester proposed the following: Let H be a Hadamard matrix of order

n . Then $\begin{pmatrix} H & H \\ H & -H \end{pmatrix}$ is a Hadamard matrix of order $2n$. This construction could

lead to the following sequence of Hadamard matrices: $H_1 = 1$, $H_2 = \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$,

$$H_{2^k} = \begin{pmatrix} H_{2^{k-1}} & H_{2^{k-1}} \\ H_{2^{k-1}} & -H_{2^{k-1}} \end{pmatrix}$$

4 Applications

5 Current Research

6 Conclusion