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Classification algorithms for Butson-type Hadamard matrices

A Butson-type complex Hadamard matrix H of order n is an $n \times n$ matrix whose entries are all some q -th root of unity satisfying $HH^* = nI$.

In this talk I will review the methods of orderly generation and (weak) canonical augmentation, and demonstrate how to use these tools to search for Butson-type complex Hadamard matrices of small orders.

These efforts are motivated by two long-standing open problems in harmonic analysis and quantum information theory, namely Fuglede's conjecture and the MUB-6 problem.