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A question of Erdős on extremal matrices

In a celebrated paper of Marcus and Ree, it was shown that if $A = [a_{ij}]$ is an $n \times n$ doubly stochastic matrix, then there is a permutation $\sigma \in S_n$ such that $\sum_{i,j=1}^{n} a_{ij}^2 \leq \sum_{i=1}^{n} a_{i,\sigma(i)}$. Erdős asked for which doubly stochastic matrices the inequality is saturated. Although Marcus and Ree provided some insight for the set of solutions, the question appears to have fallen into oblivion. Our goal in this talk is to present recent progress on the problem since 2023.