

Doubly stochastic matrices: old and new results

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Abstract:

An $n \times n$ real matrix is called *doubly stochastic* if it is entrywise non-negative and every row and column sum is 1; we let Ω_n denote the class of such matrices. These matrices arise in several areas, such as combinatorics, matrix theory, probability and in linear and combinatorial optimization.

The first part of the talk contains some classical results on doubly stochastic matrices, which highlight the role of this matrix class for other mathematical fields.

The second part is a presentation of some recent work on doubly stochastic matrices. We study the *diagonals* of matrices in Ω_n . (A diagonal is a set of positions with exactly one from each row and each column.) The main question considered is: which $A \in \Omega_n$ are such that the diagonals in A that avoid the zeros of A all have the same sum of their entries. We give a characterization of such matrices, and establish several classes of patterns of such matrices.

The second part of the presentation is based on the recent paper
- Brualdi, Dahl; Diagonal sums of doubly stochastic matrices, *Linear and Multilinear Algebra*, 2021.

(Joint work with Richard A. Brualdi, Department of Mathematics, University of Wisconsin, Madison, USA.)