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On the Spread of Real Symmetric Matrices with Entries in an Interval

The spread of a matrix has extensive and practical applications in combinatorial optimization problems and cybernetics problems. There are many papers on the spread of a symmetric matrix, but restricting the entries of such $n \times n$ symmetric matrices to each lie in $[a, b]$ seems to be a new view of this problem. As a first step, we show that the entries must equal a or b in the case when the spread is maximum. Next, when the spread attains the upper bound of Mirsky's seminal result, we describe the structure of those matrices. Then we focus our study on the maximal value of the spread and the corresponding structure of the matrix that achieves the maximum spread over all real symmetric, $n \times n$ matrices, whose entries lie in a given interval. Matlab is used as a tool to aid the verification of some cases.