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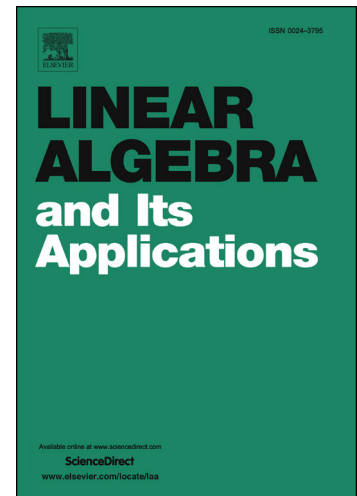
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# A matrix description of weakly bipartitive and bipartitive families

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## Abstract

The notions of weakly bipartitive and bipartitive families were introduced by Montgolfier (2003) as a general tool for studying some decomposition of graphs and other combinatorial structures. One way to construct such families comes from a result of Loewy (1986): Given an irreducible  $n \times n$  matrix  $A$  over a field, the family of partitions  $\{X, Y\}$  of  $\{1, \dots, n\}$  such that the submatrices  $A[X, Y]$  and  $A[Y, X]$  have a rank at most 1 is weakly bipartitive. In this paper, we show that this family is bipartitive when  $A$  is symmetric. In the converse direction, we prove that weakly bipartitive and bipartitive families are all obtained via the construction above.

*Keywords:* Graphs; Modular decomposition; Bipartitive families; Matrices.  
*2000 MSC:* 05C20, 15A03

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## 1. Introduction

Modular decomposition arose in various combinatorial areas for structures like graphs, tournaments, hypergraphs, matroids, etc. It is based on the notion of a module. For graphs, this notion goes back to Gallai [6, 10]. More precisely, let  $G = (V, E)$  be an undirected simple graph. A *module* of  $G$  is a set  $M \subseteq V$  such that for all  $x \in V \setminus M$  either  $N_G(x) \cap M = \emptyset$  or  $M \subseteq N_G(x)$ ,

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