Multiplication of matrices over lattices

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Matrices over the two-element lattice correspond to binary relations. There are many results about the semigroup of binary relations, in this talk we recall a few of them. We give a description of idempotent elements by interpreting the graph corresponding to a matrix as a transportation network.

Multiplication of matrices over a lattice L is associative if and only if L is a distributive lattice. Matrices over distributive lattices can be viewed as multiple-valued analogues of binary relations. We describe idempotent and nilpotent matrices in some special cases. We show that matrix multiplication over nondistributive lattices is antiassociative.

References

[1] K. Kátai-Urbán, T. Waldhauser. *Multiplication of matrices over lattices*, J. Mult.-Valued Logic Soft Comput. **39** 111--134 (2022)