

COLLOQUIUM

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~Make It Bigger: Leveraging Symmetry in the Search for Relation Algebra Representations

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Refreshments following in math library.

Title:

Make It Bigger: Leveraging Symmetry in the Search for Relation Algebra Representations

Abstract:

Relation algebras are abstract algebraic models of the familiar operations on binary relations: union, complement, converse, and composition. One natural source of concrete algebras of binary relations comes from permutation groups: If a group $G \leq S_n$ acts on $[n]$, then its induced action on pairs partitions $[n] \times [n]$ into orbitals, and unions of these orbitals form a relation algebra.

The general representation problem is, Given an abstract finite relation algebra, can it be realized as an algebra of actual binary relations? If so, can it be realized over a finite set? In this talk I will describe a strategy that has proved useful in resolving several longstanding conjectures. Rather than trying to represent an algebra directly, sometimes we can embed it into a larger relation algebra having substantially more symmetry. That symmetry makes a representation of the larger algebra easier to construct from a group action, and once a representation of the larger algebra is found, a representation of the original algebra is obtained by passing to a subalgebra.