Restricted involutions and Motzkin paths

Marilena Barnabei
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Abstract

We show how a bijection due to Biane between involutions and labelled Motzkin paths yields bijections between Motzkin paths and two families of restricted involutions that are counted by Motzkin numbers, namely, involutions avoiding 4321 and 3412. As a consequence, we derive characterizations of Motzkin paths corresponding to involutions avoiding either 4321 or 3412 together with any pattern of length 3. Furthermore, we exploit the described bijection to study some notable subsets of the set of restricted involutions, namely, fixed point free and centrosymmetric restricted involutions.

Modular lattices and regular rings

Friedrich Wehrung
Caen University, France

Abstract

The purpose if this talk is to give an overview of the following matters.

A *projective geometry* consists of a set of points and a set of lines related by an incidence relation subject to certain axioms. The set of all subspaces of a projective geometry, endowed with containment, is a lattice. This lattice has very special properties: for example, it is complete, modular, and complemented. Certain geometric configurations, such as the classical Desargues configuration, can be translated by lattice-theoretical identities. The classical Coordinatization Theorem of projective geometry states that every projective geometry is a disjoint union of projective lines, nonarguesian projective planes, and projective geometries of dimension at least three over division rings. In the thirties, von Neumann extended these ideas to a purely lattice-theoretical context, "without points", and he proved that every complemented modular lattice with "enough geometry" is isomorphic to the principal right ideal lattice of a (von Neumann) regular ring. This result got improved (by weakening the assumptions) by Jónsson in 1960.

A central idea of von Neumann's proof lies in "enough geometry"—that is, the notion of *frame*. A frame in a lattice consists of an independent set of pairwise perspective elements. It makes sense even in non-complemented lattices, and it gave rise to huge progress in lattice theory, such as: determining whether an identity that holds in all finite modular lattices also holds in all modular lattices (Freese); the complexity of the word problem in modular lattices (Freese, Herrmann); study of finitely generated varieties of modular lattices. It also makes it possible to tackle ring-theoretical questions by lattice-theoretical methods, for example in nonstable K-theory of regular rings.

The logic of independence algebras I

Mário Edmundo
CMAF and Universidade Aberta, Portugal

Abstract

The goal of this talk is to survey some applications of the classification of independence algebras to questions in logic about categoricity in power of varieties and quasi-varieties.

Eigenvalue perturbation inequalities

Rajendra Bhatia
Indian Statistical Institute, New Delhi, India

Abstract

In 1912 Hermann Weyl showed that the distance between the eigenvalues of two hermitian matrices A and B is bounded by $||A - B||$. Since then many results have been proved with Weyl's inequality as the model. These deal with different classes of matrices and with different notions of distance. We will give a survey of such inequalities.

Reference: R. Bhatia, Perturbation Bounds for Matrix Eigenvalues, Longman 1987, expanded edition SIAM 2007.

The logic of independence algebras II

Alexander Usvyatsov
CMAF, Portugal

Abstract

The goal of this talk is to survey some applications of results in logic about the classification of locally modular combinatorial geometries to the classification of independence algebras.

Distributivity, modularity and cancellativity in skew lattices

Michael Kinyon
University of Denver, USA

Abstract

Skew lattices are noncommutative generalizations of lattices which arise in ring theory and logic. In commutative lattices, the notions of distributivity and cancellativity are equivalent and are contained in the notion of modularity. The situation is much more complicated for skew lattices. Because of their occurrence in examples, there are noncommutative notions of distributivity and cancellativity which are generally agreed to be "correct", but these are not equivalent to each other, nor to other possible generalizations. Even worse, until recently it has not been clear what the correct noncommutative idea of modularity should be.