RESEARCH INTERESTS

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The domain of my research can be broadly identified with Lie theory, the associated representation theory, cohomology, and combinatorics.

Hecke algebras. A q-Hecke algebra $\mathcal{H}_q$ of finite type (W, S) can be imagined as a deformation of the group algebra of the corresponding Coxeter group W. For arbitrary Coxeter groups, in [3, 4] we prove that there is a connection between its growth series (= Poincaré series), which is a combinatorial object associated to (W, S), and a suitably defined cohomological object associated with $\mathcal{H}_q$: the Euler characteristic.

Growth of Coxeter groups. The growth of infinite, finitely generated groups is an incredibly interesting (and wild!) topic. Thus, one may look for a subclass to investigate, and my choice was "Coxeter groups".

They constitute a rich and interesting class of groups, and, at the same time, have some properties (e.g., automaticity, rigidity results) which make investigations on questions about growth easier, cf. [2, 3].

Buildings. Coxeter groups also appear as fundamental ingredients in buildings.

I became first interested in buildings mainly in connection with Hecke algebras, since the latter arise as algebras of averaging operators over the algebra of functions supported on (the set of chambers of) regular buildings.

Later, I was introduced to the world of crystals, and representations of Lie algebras and quantum groups. At present, a combinatorial model (equivalent to MV-polytopes) involving retractions from a sector of an affine building, is under investigation, cf. [1].

Euler algebras. We call an algebra "Euler" if it has the same behaviour described for Hecke algebras, i.e., if it has an Euler characteristic χ. It would be interesting to investigate whether there exist other algebras for which an identity involving χ and some combinatorial data holds.

In particular "in type A" it would be interesting to give interpretations of the mentioned identities.

Right-angled algebras. To a right-angled Coxeter graph Γ one may associate an infinite-dimensional associative algebra A_Γ; it may be interesting to understand the connections between the (unitary) representation theory of A_Γ and some combinatorial properties (clique polynomial, diameter, etc.) of Γ, cf. [5].

Keywords

Coxeter groups Finiteness conditions Lie algebras Cohomology Combinatorics Kac–Moody groups Growth Associative algebras Dynamical systems Representation theory Hopf algebras Hecke algebras Derived categories Homological invariants Euler characteristic Buildings Graphs Knot polynomials Lie theory "Type A"

References

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