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Combinatorial topology and global dimension

In recent years people in algebraic combinatorics, such as Bidigare/Hanlon/Rockmore, Diaconis/Brown, Bjorner and Chung/Graham, have been interested in certain finite dimensional algebras associated to real and complex hyperplane arrangements, as well generalizations. The original motivation came from analyzing Markov chains and from the study of Solomon's descent algebra (a certain subalgebra of the group algebra of a finite Coxeter group) but the subject has since grown a life of its own.

In this talk we discuss connections between the representation theory of these algebras and combinatorial topology. For example, projective resolutions for simple modules can be obtained from the cellular chain complexes of appropriate regular CW complexes. In the converse direction, given any flag complex, we can associate a finite dimensional algebra whose global dimension is the Leray number of the complex (or equivalently, the Castelnuovo-Mumford regularity of the associated Stanley-Reisner ring).

This is joint work with Stuart Margolis and Franco Saliola.