

## **abstract**

GEOMETRY AND CELL COMPLEXES

Topic:

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The cd-index is a noncommutative polynomial which compactly encodes the flag vector data of a polytope, and more generally, of a regular cell complex. Ehrenborg and Readdy discovered the cd-index has an inherent coalgebraic structure which facilitates computations, gives elegant proofs of old results and proves non-trivial inequalities among the face incidence data.

Intersecting a subspace arrangement with the  $n$ -sphere gives a very natural spherical subdivision. For central hyperplane arrangements Bayer and Sturmfels proved its flag  $f$ -vector can be determined by the much simpler intersection lattice. Billera, Ehrenborg and Readdy make this map explicit using coalgebraic techniques.

For a regular CW-complex whose geometric realization is a compact manifold, we prove the flag vector can be encoded by a cd-polynomial plus a correction term depending upon the Euler characteristic of the manifold. This was independently observed by Swartz. We also extend the Billera-Ehrenborg-Readdy ideas to toric arrangements. We show Zaslavsky's fundamental results on the number of bounded and unbounded regions generalize to the toric setting by evaluating the characteristic polynomial at the appropriate constant.

These results hint at a wealth of problems involving regular subdivisions of manifolds. I will indicate a few of these directions.

This is joint work with Richard Ehrenborg and Michael Slone.