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The Enumerative Combinatorial Geometry of Coxeter Groups

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Intervals in the Bruhat order on Coxeter groups are known to have many properties in common with face lattices of convex polytopes and, more generally, regular cellular decompositions of spheres. Both are what are known as Eulerian partially ordered sets, and thus have cd-indices, which are homogeneous polynomials that enumerate chains by rank sets.

For Bruhat intervals, the cd-index has a nonhomogeneous extension, the complete cd-index, that appears to have similar sign properties to the usual cd-index for polytopes and spheres. Further, in exactly the same way that one can express the g-polynomial of a polytope in terms of its cd-index, one can obtain the Kazhdan-Lusztig polynomial of a Bruhat interval from its complete cd-index. I discuss some consequences of well-known nonnegativity conjectures for each of these polynomials. All terms will be defined.

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