Ehrhart-Hilbert polynomials arising from combinatorial Hopf monoids

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Abstract

The chromatic polynomial of a graph, and the order polynomial of a poset are wonderful invariants. They arise in the study of combinatorial Hopf algebras, Ehrhart theory, and commutative algebra. We will review work of Aguiar, Bergeron, and Sottile, who showed that every combinatorial Hopf algebra comes equipped with a 'nice' homomorphism to the polynomial ring, generalizing these examples. I will discuss how, under certain conditions, these same polynomials arise as Ehrhart-Hilbert polynomials of certain simplicial complexes, and discuss ongoing work regarding the combinatorics of these complexes.