Boğaziçi
MATH COLLOQUIUM

Circular Fence Posets and Associated Polytopes with Unexpected Symmetry

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Abstract:

Circular fence posets are a natural class of posets that arise in enumerative combinatorics, cluster algebras and quiver representations. In recent work joint with Ezgi Kantarcı Oğuz, we showed that the order ideals of circular fence posets admit a surprising and non-trivial symmetry.

In this talk, I will talk about a natural class of polytopes (that we call "Chain-Link polytopes") associated to circular fence posets, which naturally lead to infinite families of pairs of polytopes which are non-isomorphic but which have the same Ehrhart polynomial.

A famous example of such a phenomenon is Stanley's theorem which says that two natural (non-isomorphic) polytopes associated to a poset, the so called Order and Chain polytopes have the same Ehrhart polynomial. Stanley proved this by exhibiting unimodular triangulations of both polytopes and constructing a piecewise unimodular linear map between the two.

In our case however, the equality of the Ehrhart polynomial seems to be of a different nature. Our proof proceeds by first coming up with a combinatorial reinterpretation of this fact and proving this using linear algebraic techniques.

Subsequent to describing this, I will discuss the connection between these polytopes and the Alcoved polytopes of Postnikov and Lam and conjecture some possible extensions.

This is joint work with Ezgi Kantarcı Oğuz at Galatasaray University and Cem Yalım Özer, a graduate student at Boğaziçi University.

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