

Michalek, Mateusz, Are Ehrhart polynomials related to Riemann hypothesis?

In the talk we present relations among three classical mathematical objects: graphs, polytopes and polynomials. There are known constructions that associate to a graph a lattice polytope - the symmetric edge polytope. To each lattice polytope P one associates the Ehrhart polynomial that computes the number of lattice points in dilations of P . Furthermore, the roots of Ehrhart polynomials are also an object of intensive studies. There are many graphs for which these roots have a remarkable property: they lie on a line in complex plane with real part equal to $-1/2$. One of the first positive results was the case of the complete $(1, n)$ -bipartite graphs (trees) proved independently by Kirschenhofer et al. and by Bump et al. In the latter this family of polynomials was studied in the context of the local Riemann hypothesis. We present recent results obtained jointly with Higashitani and Kummer proving several conjectures confirming when such polynomials have the correct root distribution. Our main new method relies on the use of interlacing polynomials - a technique generalizing orthogonal polynomials. Several open problems (probably easier than Riemann hypothesis) will be presented.