Lattice polytopes with large diameter and many vertices

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Abstract

A lattice (d, k)-polytope is the convex hull of a set of points in dimension d whose coordinates are integers between 0 and k. In this talk, we will introduce lattice polytopes generated by the primitive vectors of bounded norm. These primitive zonotopes can be seen as a generalization of the permutahedron of type B_d. We will highlight connections between the primitive zonotopes and the largest possible diameter of lattice (d, k)-polytopes, and between the computational complexity of multicriteria matroid optimization. Tightening of the bounds for the largest possible diameter of a lattice (d, k)-polytope, complexity results, conjectures, and open questions will be discussed. Based on joint works with Nathan Chadder, George Manoussakis, Shmuel Onn, and Lionel Pournin.