

Fourier transforms of polytopes, and discrete volumes of polytopes

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Resumo/Abstract:

There are infinitely many possible discretizations of the notion of a volume of an object. One of the classical discretizations of the volume of a polytope P is the Ehrhart polynomial of P . Another discretization of the volume of P is the solid angle sum of P . We show how to unify all of these discretizations using Fourier transforms of polytopes, Poisson summation, and other Fourier and analytic techniques, including Stokes' formula for manifolds. The computations take place in the 'frequency' domain of the Fourier transform, where surprising cancellations often take place. Some applications include the tiling (and multi-tiling) of Euclidean space by translations of a convex polytope.