

## Using geometry for computing $q$ -series

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**Abstract:** Computing generating functions of objects defined by linear constraints (e.g., the majority of integer partition families) is an old but interesting game. Many counting generating functions have nice representations as  $q$ -series and all kinds of amazing identities or relations emerge. On the other hand, the full (multivariate) generating function contains more information, but it rarely gives rise to nice relations. Using polyhedral geometry, we can express the rational generating function for a set of combinatorial objects (e.g., solid partitions on a cube) as a sum of symbolic cones. Symbolic cones are a "multivariate" representation that does not suffer from the usual combinatorial explosion during computation, thus can be used for computing  $q$ -series.

In this talk, we will present the notion of symbolic cone, why it is computationally and conceptually preferable over rational functions and how to obtain  $q$ -series using Polyhedral Omega.