

# An Algorithm for Polytope Decomposition and Exact Computation of Multiple Integrals

## Abstract

We design a method of decomposing convex polytopes into simpler polytopes. This decomposition yields an alternative way for calculating exactly the volume of the polytope, or, more generally, multiple integrals over the polytope. Moreover, this allows us to find algorithmically an analytic expression for the distribution function of a random variable of the form  $\sum_{i=1}^d c_i X_i$ , where  $(X_1, X_2, \dots, X_d)$  is a random vector, uniformly distributed in a polytope.