An FPTAS for the Volume Computationof 0-1 Knapsack Polytopes

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In this talk, we consider how to compute the volume of the 0-1 knapsack polytope in n-dimensional space. Actually, computing high dimensional volumes is a hard problem, even for approximation. We first see the exsisting work for the volume computation. Several randomized approximation techniques for $\#P$-hard problems have been developed in the three decades, while some deterministic approximation algorithms are recently developed only for a few $\#P$-hard problems. Then we see a new technique based on approximate convolutions for a deterministic approximation of volume computations, and provides a fully polynomial-time approximation scheme (FPTAS) for the volume computation of 0-1 knapsack polytopes. We also give an extension of the result to multiply constrained knapsack polytopes with a constant number of constraints.