# Tchakaloff-like polyhedral quadrature with and without tetrahedralization

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The purpose of this talk is to show how to determine cubature rules on polyhedra with a certain algebraic degree of precision, positive weights and internal nodes, following two different approaches. In the first one we adopt a classical technique, based on tetrahedralization and the application of almost-minimal rules on each tetrahedron. In the second one, we show an alternative approach without tetrahedralization based on the divergence theorem, on a result of Wilhemsen [3] and on an indomain routine over polyhedra. As soon as these rules are available, we compute the nodes and weights of a low-cardinality positive quadrature formula by means Caratheodory-Tchakaloff cubature compression via NNLS (see, e.g. [1], [2]). Finally, we present several numerical tests, in order to assess the quality of our compressed formulas.

# References

[1] A. Sommariva, M. Vianello, *Compression of multivariate discrete measures and applications*, Numer. Funct. Anal. Optim., 36 (2015), pp.1198–1223.

[2] V. Tchakaloff, *Formules de cubatures mécaniques à coefficients non négatifs*, (French) Bull. Sci. Math., 81 (1957), pp.123–134.

[3] D. R. Wilhelmsen, *A Nearest Point Algorithm for Convex Polyhedral Cones and Applications to Positive Linear approximation*, Math. Comp. 30 (1976), pp.48–57.