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Best and Random Approximation of convex bodies by polytopes. The role of affine surface areas.

How well can a convex body be approximated by a polytope? This is a fundamental question in convex geometry, also in view of applications in many other areas of mathematics and related fields. It often involves side conditions like a prescribed number of vertices or facets and a requirement that the body contains the polytope or vice versa. Various metrics are used to measure accuracy of the approximation. We will concentrate on two: the volume deviation and the surface deviation and in the first talk, will present several results about these issues.

It turns out that affine surface area plays a crucial role in approximation of convex bodies by polytopes. In the second talk we introduce affine surface area and $L_p$ affine surface areas for convex bodies and describe some of their properties. The affine isoperimetric inequalities related to those quantities are especially important. We show that a limit of normalized $L_p$-affine surface areas leads to the relative entropy of the cone measure of a convex body and its polar.

Log concave functions can be thought of a generalization of convex bodies. We extend the concepts of relative entropy, Renyi entropy and $L_p$ affine surface areas to such functions. Time permitting, we will describe recent geometric descriptions of these notions via floating functions.