

Dan Klain (University of Massachusetts Lowell)

Volume Bounds for Shadow Covering

Abstract for the Combinatorics Seminar 2012 May 8

Suppose that K and L are compact convex subsets of n -dimensional Euclidean space, and suppose that every $(n-1)$ -dimensional orthogonal projection (that is to say, every shadow) of L onto a subspace contains a translate of the corresponding projection of K to that same subspace.

This covering condition does not imply that L contains a translate of K . In fact, we will see that it is even possible for L to have strictly smaller volume! This leads to several questions:

1. When does shadow covering imply that L contains a translate of K ?
2. What does shadow covering imply more generally about covering relations between K and L ?
3. When does shadow covering imply that $\text{Vol}(K) \leq \text{Vol}(L)$?
4. What does shadow covering imply more generally about the ratio of $\text{Vol}(K)$ to $\text{Vol}(L)$?

The talk will address recent results concerning each of these questions, as well as analogous results for projections onto subspaces of some other fixed intermediate dimension. Open questions and conjectures will also be posed.

Some of these results arise from joint work with Christina Chen and Tanya Khovanova.

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