Dual Characterizations of Three Distance Functions

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Abstract

Given a set $T \subseteq \mathbb{R}^n$ and a nonnegative function r defined on T, we consider the power of $x \in \mathbb{R}^n$ with respect to the sphere with center $t \in T$ and radius $r(t)$, that is, $p_r(x,t) := \|x-t\|^2 - r^2(t)$, with $\|\cdot\|$ denoting the Euclidean distance. The corresponding power cell of $s \in T$ is the set

$$C_T^r(s) := \{x \in \mathbb{R}^n : p(x,s) \leq p(x,t), \text{ for all } t \in T\}.$$

We study the structure of such cells and investigate the assumptions on r that allow for generalizing known results on classical Voronoi cells.

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