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Geometric conditions to existence and uniqueness of projection in Hilbert spaces, and directional curvatures in finite dimensional spaces

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Abstract

Given a closed set C in a Hilbert space H, and a closed convex bounded set $F \subset H$ with the origin in its interior, we will present some (local) geometric conditions that guarantee existence and uniqueness of the projection onto C, in the sense of the Minkowski functional of F. For this we will introduce a (new) formula to calculate the curvature of F at points on its boundary. Furthermore, we will show that, when $H = \mathbb{R}^n$ and the boundary of F is given by an implicit equation, this formula is equivalent to an existing one, but is easier to apply.

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