Efficient computation of the metric projection

Bachelor thesis topic

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Denote by ℓ_p^n the space $\mathbb{R}^n$ equipped with the p-norm and let $C \subset \ell_p^n$ be a closed and convex set. The metric projection onto C is defined as the mapping

$$P_C \colon \ell_p^n \to \ell_p^n, \qquad x \mapsto \operatorname{argmin}\{\|x - z\|_p \colon z \in C\}.$$

Since the norm is a convex function, the computation of P_C requires the solution of a constrained convex minimization problem.

The aim of this thesis is to compare different optimization methods for the computation of the metric projection onto closed linear subspaces and onto closed and convex sets. These optimization methods should be implemented in `Python` and their performance should be compared on a set of test problems.