

MATH3027: Optimization 2022

Week 12: Computer Lab 9

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This is the final computer lab for this module.

Projecting to a polytope

Build an R function that, given a polytope

$$S = \{\mathbf{x} \in \mathbb{R}^n : \mathbf{Ax} \leq \mathbf{b}\},$$

computes the orthogonal projection of a point \mathbf{y} .

- Use a duality argument.
- Solve the dual with projected gradient descent.
- Consider a polytope defined by

$$A = \begin{pmatrix} 1 & 1 \\ -1 & 0 \\ 0 & -1 \end{pmatrix}, \quad \mathbf{b} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

and project $\mathbf{y} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

