

Advance Optimization Assignment

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IITH Future Wireless Communication (FWC)

ASSIGN-8

1 Problem

Find the point on the curve $x^2 = 8y$ which is nearest to the point $(2, 4)$?

2 Solution

The given problem can be expressed as

$$\min \|\mathbf{x} - \mathbf{P}\|^2 \quad (1)$$

$$\text{s.t. } \mathbf{x}^T \mathbf{V} \mathbf{x} + \mathbf{u}^T \mathbf{x} + d = 0 \quad (2)$$

where

$$\mathbf{V} = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \quad (3)$$

$$\mathbf{u} = - \begin{pmatrix} 0 \\ 8 \end{pmatrix} \quad (4)$$

$$d = 0 \quad (5)$$

$$\min (\mathbf{x} - \mathbf{P})^T (\mathbf{x} - \mathbf{P}) \quad (6)$$

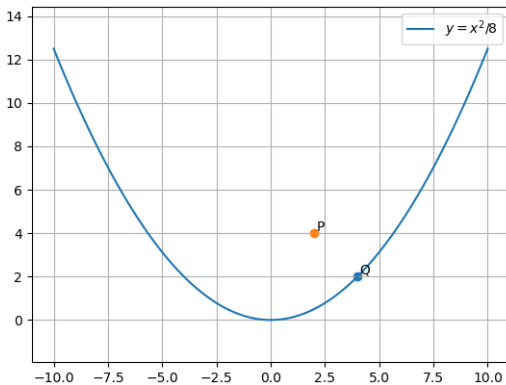
$$\text{s.t. } \mathbf{x}^T \mathbf{V} \mathbf{x} + \mathbf{u}^T \mathbf{x} \leq 0 \quad (7)$$

The following code yields the minimum distance as 2.069 and the nearest point on the curve as

$$\mathbf{Q} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} \quad (8)$$

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codes/opt/qp_cvx.py
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3 Construction



<https://github.com/gowripriya-2002/FWC/blob/main/Optimization/Advance/code/aop.py>