

# Demo

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## 1 Bounded Quadratic Programming

Consider SVM model:

$$\min_{\mathbf{w}} \frac{1}{2} \|\mathbf{w}\|_2^2 + c \sum_{i=1}^n (1 - y_i \mathbf{w}^T \mathbf{x}_i)_+^p \quad (1)$$

where  $(\cdot)_+ = \max(0, \cdot)$ . Given  $p = 1, 2$ , the above problem can be converted into

$$\tilde{\boldsymbol{\alpha}} = \arg \min_{\boldsymbol{\alpha}} f(\boldsymbol{\alpha}) = \frac{1}{2} \boldsymbol{\alpha}^T \mathbf{Q} \boldsymbol{\alpha} + \mathbf{h}^T \boldsymbol{\alpha}, \quad \text{s.t. } 0 \leq \alpha_i \leq c. \quad (2)$$

where  $f(\boldsymbol{\alpha})$  denotes the objective function. The solution of problem (1) is given by

$$\mathbf{w} = \sum_{i=1}^n y_i \tilde{\alpha}_i \mathbf{x}_i. \quad (3)$$

## 2 Bounded Quadratic Programming

More descriptions...