Duality Forumlation of Max-Margin Classifier*

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February 28, 2011

Abstract

In this fake-paper I write a short mathematical explenation of how to formulate the Max-Margin classifier in it's dual form. I go through it step by step.

1 Primal formulation

To be written ...

2 Lagrangian function

There will be as always 3 kinds of terms, coming from either the *the objective function*,*a constraint* or *a variable constraint*.

$$L(w, b, \xi, \mu, \nu) = \frac{1}{2}||w||_2^2 + \sum_{i=1}^{n} C\xi_i - \mu_i y_i(w^T x_i - b + \xi_i - 1) - \nu_i \xi_i \tag{1}$$

Can simply be rewritten to

$$L(w, b, \xi, \mu, \nu) = \frac{1}{2}||w||_2^2 + \sum_{i=1}^{n} C\xi_i + \mu_i y_i(b + 1 - w^T x_i - \xi_i) - \nu_i \xi_i \tag{2}$$

We now derivativs for each variable-type and get an equation. There are 3 'types' of variables here, so we will get 3 equations.

2.1 Derivative with respect to w

$$\frac{dL}{dw} = 0 = w - \sum_{i=1}^{n} \mu_i y_i x_i \tag{3}$$

Here x_i means the sum of the values in the **vector** x_i.

*This is the first time I use latex

2.2 Derivative with respect to b

$$\frac{dL}{db} = 0 = \sum_{i=1}^{n} \mu_i y_i \tag{4}$$

2.3 Derivative with respect to ξ

$$\frac{dL}{db} = 0 = C - \mu_i - y_i \tag{5}$$

3 Refining the lagrangian by substitution