4. Linear Support Vector Machines

Homework due Feb 22, 2023 08:59 -03 Past due

In this problem, we will investigate minimizing the training objective for a Support Vecto loss).

The training objective for the Support Vector Machine (with margin loss) can be seen a between the average hinge loss over the examples and a regularization term that tries small (increase the margin). This balance is set by the regularization parameter $\lambda > 0$. the case without the offset parameter θ_0 (setting it to zero) so that the training objecti

$$\left[\frac{1}{n}\sum_{i=1}^{n} Loss_h\left(y^{(i)}\,\theta\cdot x^{(i)}\right)\right] + \frac{\lambda}{2}\|\theta\|^2 = \frac{1}{n}\sum_{i=1}^{n}\left[Loss_h\left(y^{(i)}\,\theta\cdot x^{(i)}\right) + \frac{\lambda}{2}\|\theta\|\right.$$

where the hinge loss is given by

$$\mathbf{Loss}_h\left(y\left(\theta\cdot x\right)\right) = \mathbf{max}\{0, 1 - y\left(\theta\cdot x\right)\}$$

$$\hat{\theta} = \mathbf{Argmin}_\theta\left[\mathbf{Loss}_h\left(y\,\theta\cdot x\right) + \frac{\lambda}{2}\|\theta\|^2\right]$$

Note: For all of the exercises on this page, assume that the training set has just $n = 1$ $x = x^{(1)}$ and $y = y^{(1)}$ as shorthand.

Note : Remember also that by convention in this Unit we regard every datapoint on the misclassified.

Minimizing Loss - Case 1

1 point possible (graded)

In this question, suppose that $\mathbf{Loss}_h\left(y\left(\hat{\theta}\cdot x\right)\right) > 0$. That is, the optimal weight vecto the training example. Under this hypothesis, solve the optimisation problem and expres λ.

? STANDARD NOTATION

Let , where are the first and second components of respectively

Solve for .

Hint: For the above example, show that

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Minimizing Loss - Numerical Example (2)

1 point possible (graded)

Now, let be the solution as a function of .

There exists exactly one number such that whenever , then no matter what the optimal weight will misclassify the training example. What is ?

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Discussion

The answer put geometry implies that but I still do not get it. Please help.

? Assumption

In the solution to the numerical example 1 problem, why do we directly assume Loss_h=1-(y(theta*x)) to dev

Numerical example 1 - does it say anywhere that the components of theta must be integers?

Question in title

What is the purpose of Numerical Example (2)

I am so frustrated because it costs me so much time. What is the meaning of this problem? What is it designe

please read these highlights first

hint for minimising loss case1https://discussions.edx.org/course-v1:MITx+6.86x+1T2023/topics/686x_1T202

Community TA

? Value of theta_hat(lambda) is...?

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