MLBP 2019 - Quiz 4

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(1) (1.0 pt.) In the hard-margin SVM we have the constraints $y_i \mathbf{w}^T \mathbf{x}_i \geq 1$ for all $i = 1, \dots, m$. For a pair, $(y, \mathbf{x})$, of a new sample example we have $y_i \mathbf{w}^T \mathbf{x}_i < 1$ but $y_i \mathbf{w}^T \mathbf{x}_i > 0$. What does it mean?

1- This example is wrongly classified.

2- This example is classified correctly but it is within the margin.

3. We can not decide on which class contains this example.

(2) (1.0 pt.) In the soft-margin SVM we have the constraints $y_i \mathbf{w}^T \mathbf{x}_i \geq 1 - \xi_i$ for all $i = 1, \dots, m$. If a pair, $(y, \mathbf{x})$, of a new sample example is classified correctly what could be the value of the corresponding slack variable ξ?

1- $0 \leq \xi < 1$

2- $\xi = 0$

3. $\xi < 0$

(3) (3.0 pt.) What happens if all labels are positive in an SVM problem? It is called as one-class classification problem. What does the SVM do in this case?

Hint: Think about what the constraints could force in this case.

1- It separates all the examples from the origin.

2- The result has no any meaning.

3. All slacks will be 0.

(4) (5.0 pt.)

Let 6 points be given in the plane, $X = \{(0,1), (2,1), (2,-1), (0,-1), (-2,-1), (-2,1)\}$, and the corresponding labels in the same order $y = \{1, 1, 1, -1, -1, -1\}$. Compute $\mathbf{w}$ by the algorithm given by Slide 20 of Lecture 7 by taking the examples in the given fix order instead of randomly drawing them. Let $\lambda = 1$, and the learning speed $\eta = 0.1$. Which of these coordinates can give the solution for $\mathbf{w}$? Round the numbers up to 2 decimals, and take the closest one.

1- (0.54, -0.07)

2. (0.66, 0.12)

3- (-0.66, -0.12)