

Contoh : SVM

Now for the moment you've all been waiting for

Okay, say we were given a set of 3D input data, and we need to apply the SVM learning algorithm to it to achieve an optimal decision plane of:

$$H(x) = x_1 + 2x_2 + 2x_3 + 3$$

And we were also given three examples in the training set and we need to say whether or not if they are support vectors. These examples are:

- A: (-1, -1, -2) with label -1
- B: (2, -2, -1) with label -1
- C: (-2, -2, 2) with label 1

The first thing that we need to do is get the weights. This part is fairly simple, look over at the $H(x)$ equation, the set of weights are the values next to the 'x's, so we have the set of weights as:

w: (1, 2, 2)

as well as a bias value of +3.

Margin

Now we need to calculate the margin. And remembering from above that the weights are related to the margin, we get the margin value of:

$$M = 2 / [\sqrt{1^2 + 2^2 + 2^2}] = 2 / [\sqrt{9}] = 2/3$$

Support Vectors

Remembering again from above the way that we calculate the way to see if a data point is a support vector, we substitute all the values given into the equation. (hint: its the one where we check to see if we get a value equal to 1

Also, i best point out, that 'y' in the equation is equal to the value of the labels for each data point, so for example 'y' is equal to '-1' for data point A.

For the data point A we get:

$$(-1) * [1*(-1) + 2*(-1) + 2*(-2) + 3] = 4$$

For the data point B we get:

$$(-1) * [1*2 + 2*(-2) + 2*(-1) + 3] = 1$$

For the data point C we get:

$$1 * [1*(-2) + 2*(-2) + 2*2 + 3] = 1$$

So as we can see, data points B and C are support vectors, whereas A is not.