Problem with Perceptron

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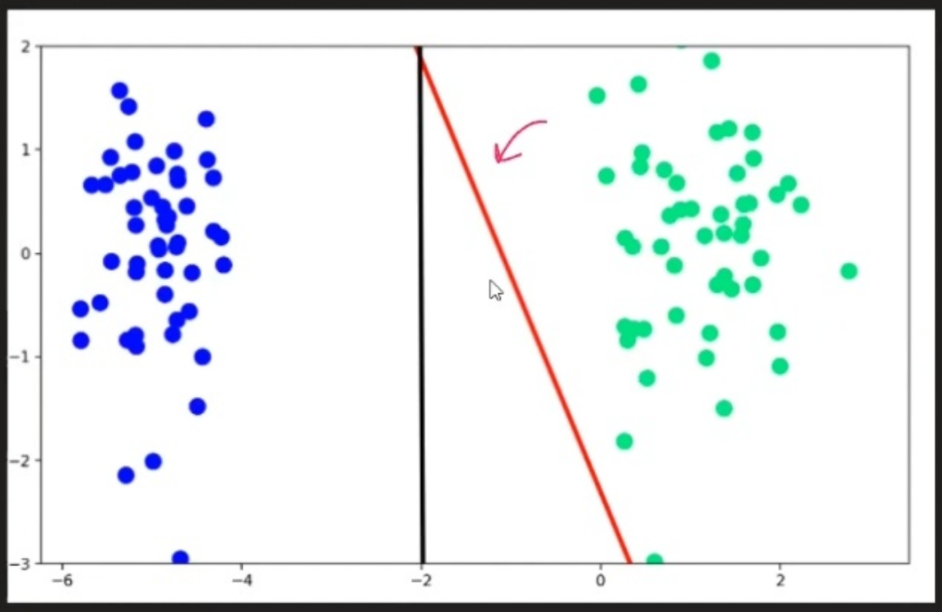


→ The Problem with the Perceptron is:

→ It will give us a model but the model is not optimal solution.

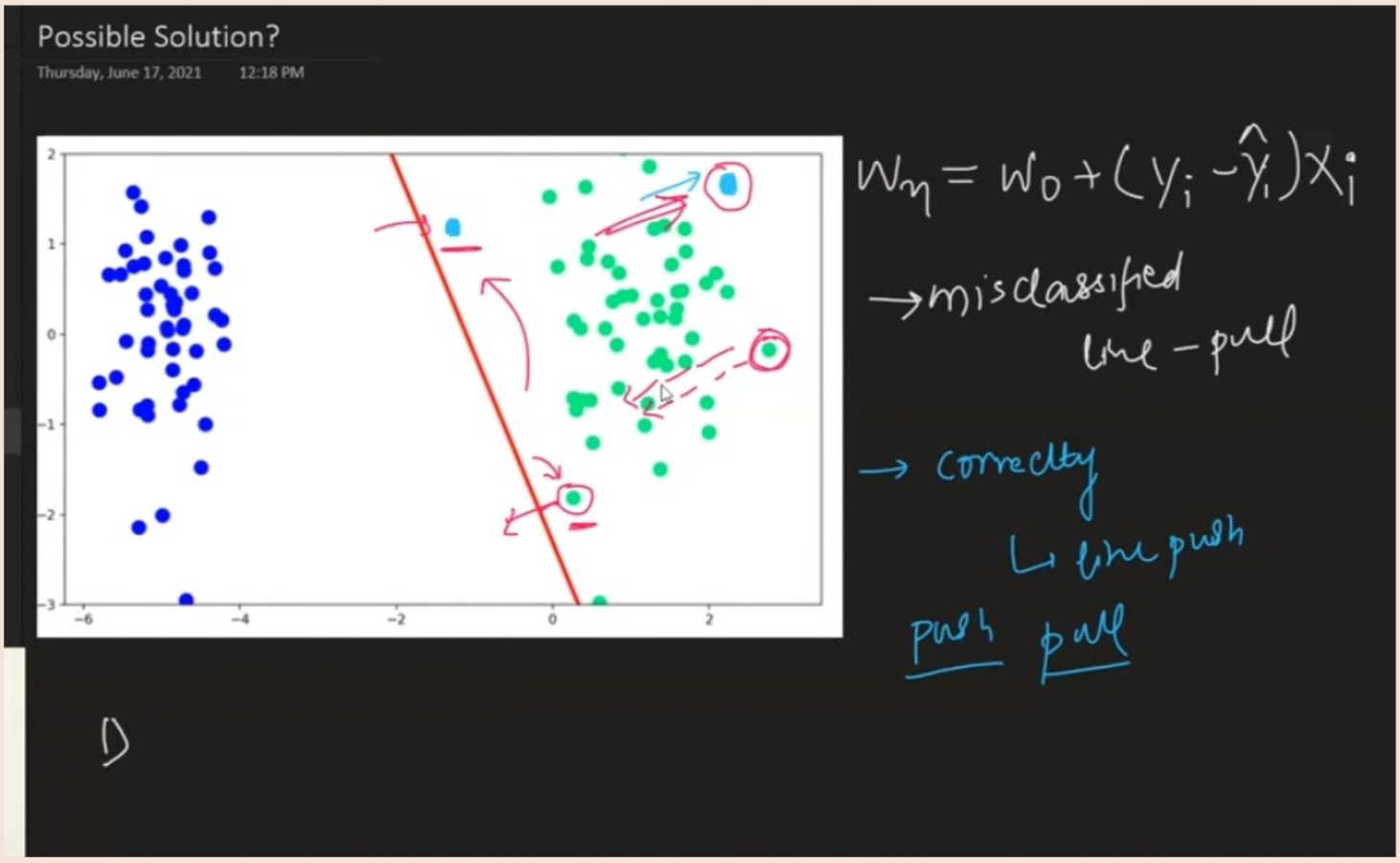
→ The model won't perform well on test data.

→ Here we can see on the picture, the black one is the optimal solution. and red one is perceptron trick.

→ when the model see that all points are on the correct region then

it will stop. And that is the Problem.

→ It is not searching for the optimal solution.



→ Now we need to make change on the algorithm.

→ On the perceptron we pull the the line toward miss classified points.

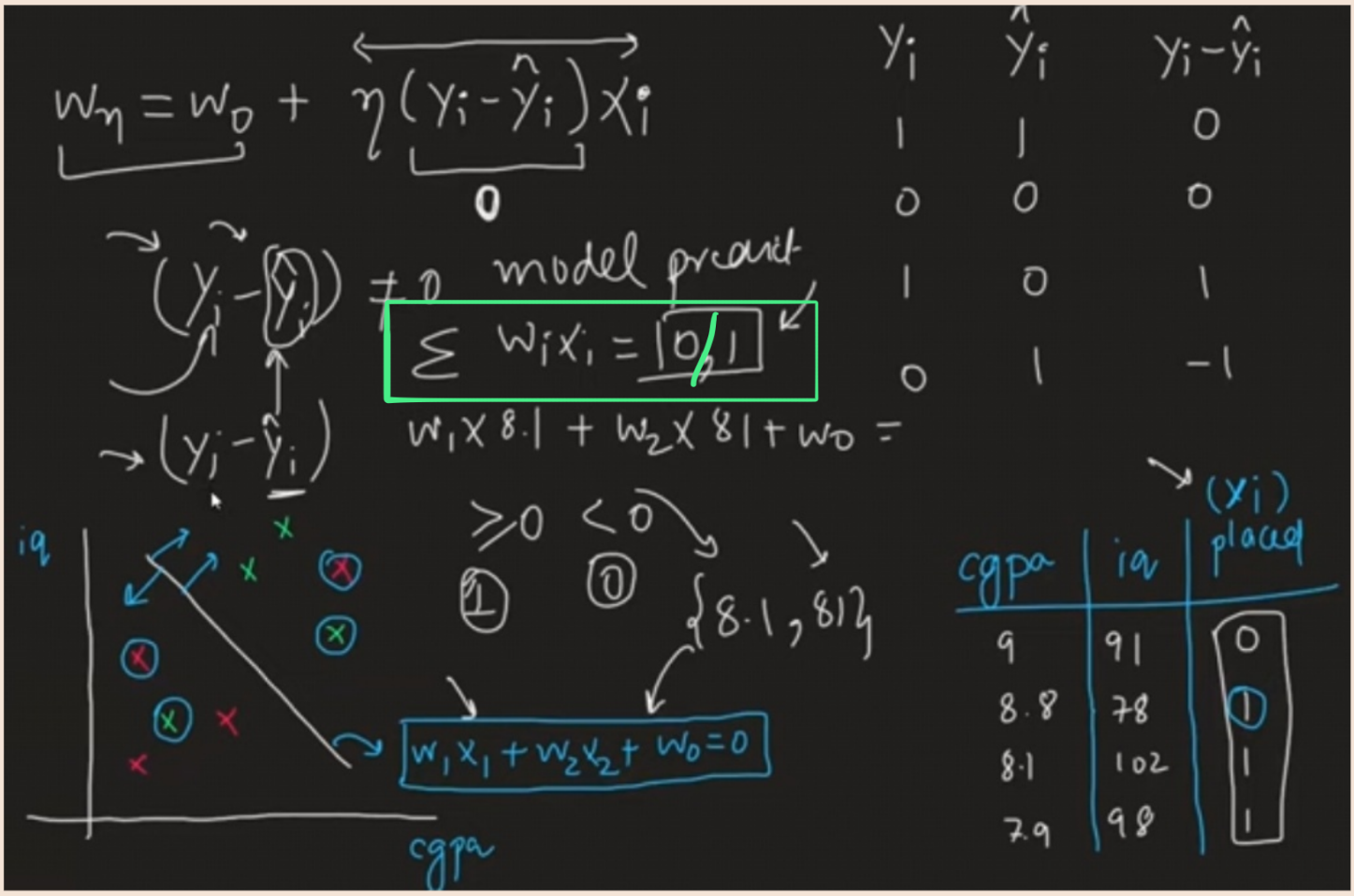
→ Now we will pull as well as

we will push for the correctly classified points.

→ But there is a twist.

→ The far miss classified point pull the line more than nearest one

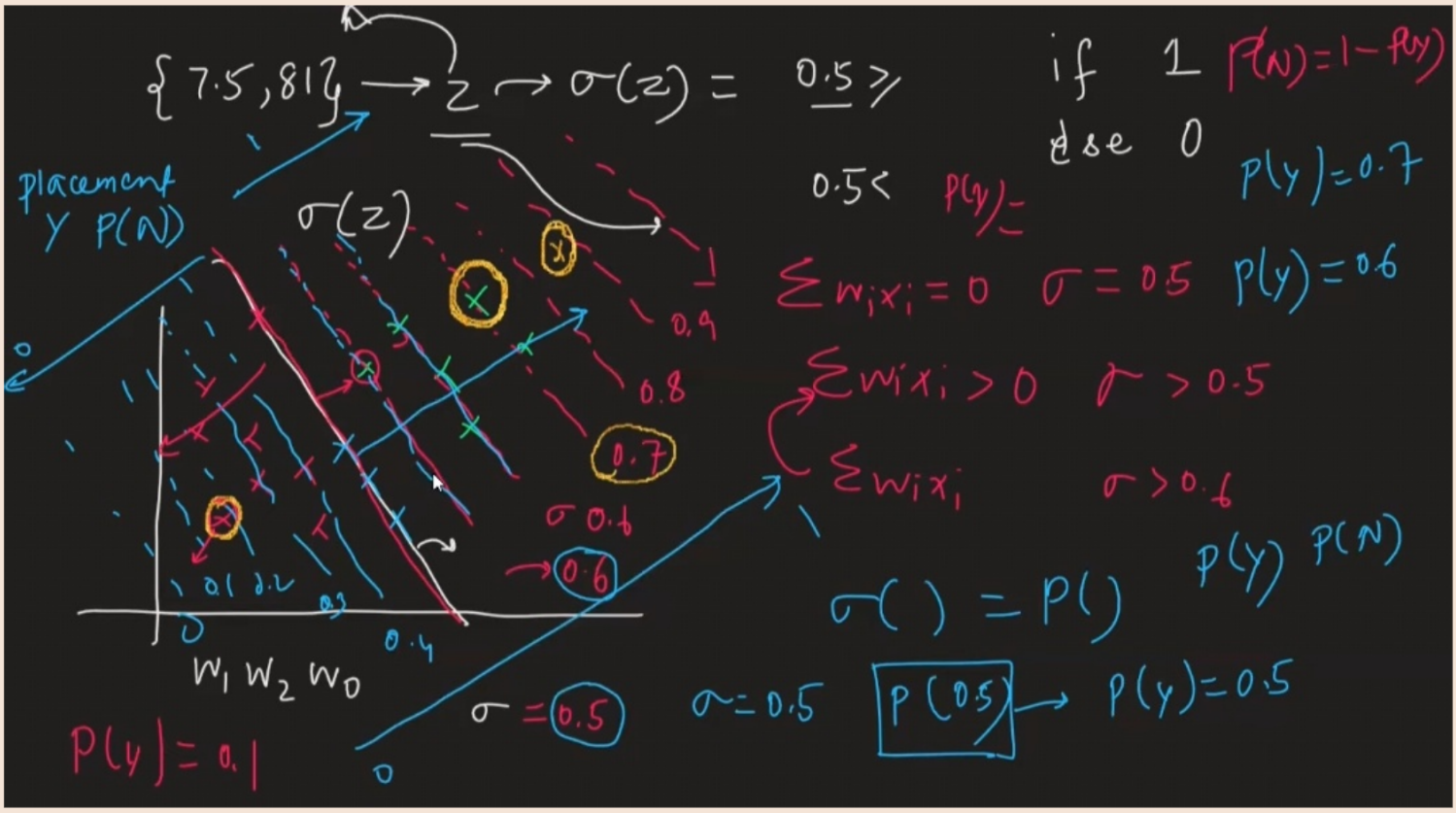
→ And the nearest classified point will push harder than the farther one.



→ In the perceptron algo we used step function, that returns 0/1 and based on that we move the line.

→ Now we need to change that logic to implement our new algo.

→ To implement we will use sigmoid function for $\hat{y}_i$



→ The sigmoid function:

$$\sigma(x) = \frac{1}{1 + e^{-(mx+c)}}$$

will tell us the probability of any point being 1.

→ So, we will get the probability of every point according to our model.

→ Then we will compare it with the actual Y_i, then we can move the line.

→ So, Here how it is works.

Impact of Sigmoid

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$$w_\eta = w_0 + \eta(y_i - \hat{y}_i)\,x_i$$

$$\hat{y}_i = \sigma(z)$$

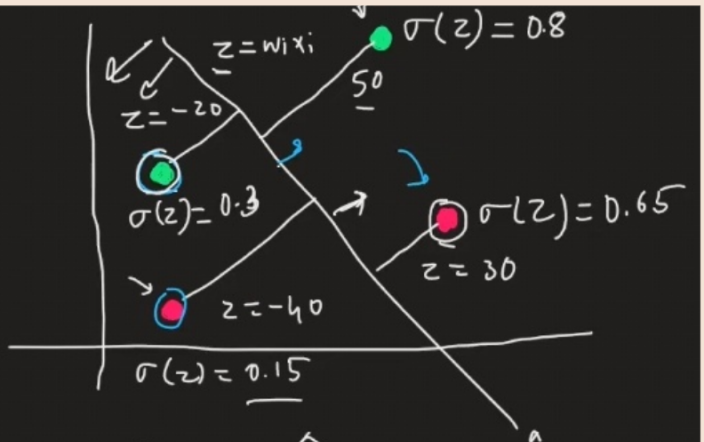
where $z = \sum w_i x_i$

$$w_\eta = w_0 + \eta \times 0.2 \times x_i$$

$$w_\eta = w_0 - \eta * 0.65 * x_i$$

$$w_\eta = w_0 + \eta * 0.7 * x_i$$

$$w_\eta = w_0 - \eta * 0.15 * x_i$$



y_i	$\hat{y}_i$	$y_i - \hat{y}_i$
1	0.8	0.2
0	0.65	-0.65
1	0.3	0.7
0	0.15	-0.15

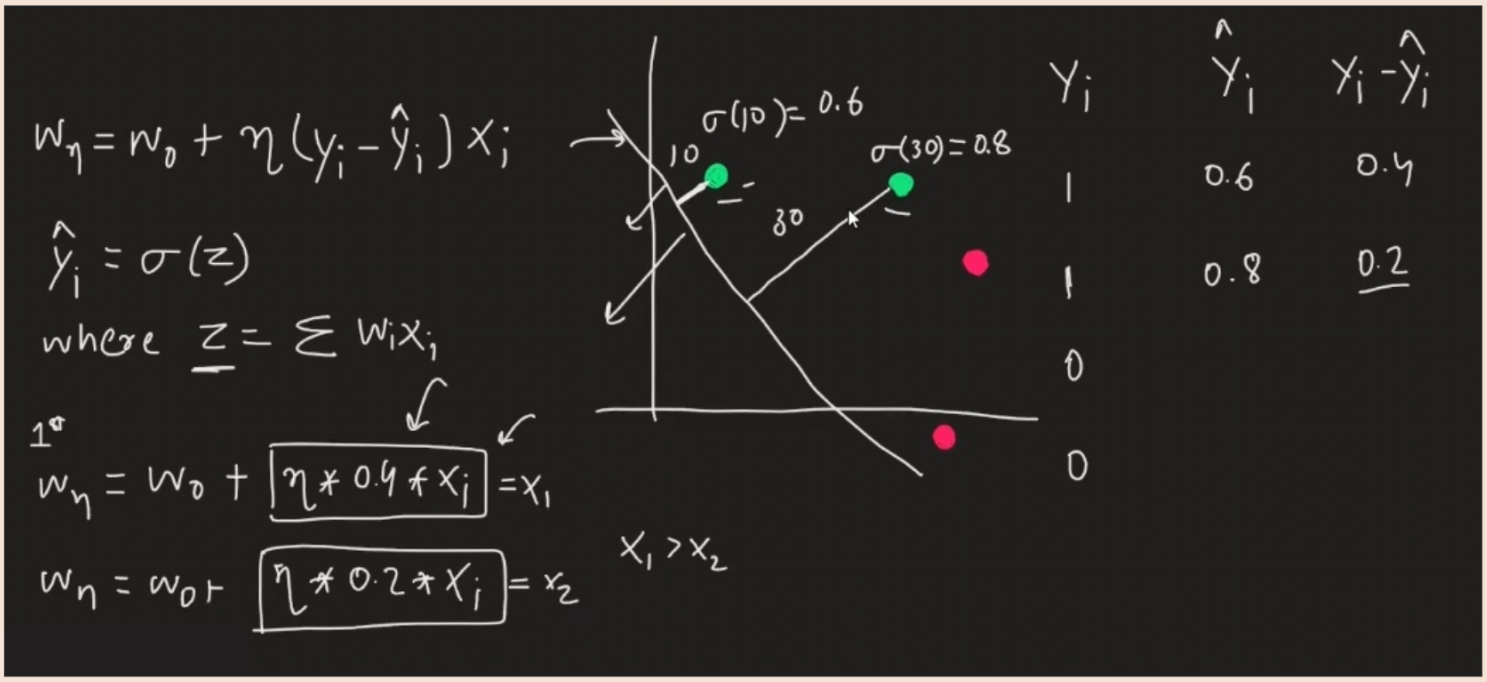
→ We will calculate the Probability for our model.

→ And when we perform $(y_i - \hat{y}_i)$ it will give us positive and negative number.

→ Then we perform w_0 + something or w_0 − something

→ w_0 + something means we pull it downward.

→ w_0 − something means we push the line upward.



→ It shows, how farther point and nearest point effect differently to the line.