PERCEPTRON TRICK

The perceptron trick is a simple algorithm used for training a binary classifier, which updates the weights incrementally based on the classification errors made on the training data.

We have this eqn,

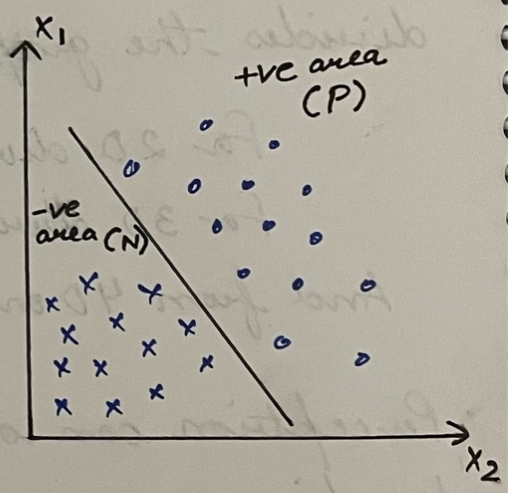
$$Ax + By + C = 0$$

Replacing coefficients with the weights

$$W_1X_1 + W_2X_2 \ldots W_nX_n + W_0X_0 = 0$$

where W_0 is bias
and $X_0 = 1$ always

$$\Rightarrow \sum_{i=0}^{n} W_iX_i$$



ALGORITHM :-

Take random values of epochs and learning rate

epoch = 1000, $\eta = 0.01$

for i in range (epochs)
select any random point from the data

- if that random point is x in actual but perceptron model is predicting °

then, $\boxed{W_{new} = W_{old} - \eta X_i}$

where W and X are the matrices of points & weights

- if that random point is ° in actual but perceptron model is predicting x

then, $W_{new} = W_{old} + \eta x_i$

- if the random point selected is classified correctly

  then, no change

Simplifying the Algorithm in concise format

if $x_i \in N$ and $\sum w_i x_i \geq 0$

$$w_n = w_{old} - \eta x_i$$

if $x_i \in P$ and $\sum w_i x_i \leq 0$

$$w_n = w_{old} + \eta x_i$$

where, N is represents -ve
and P represents +ve

Representing above equations in one equation

$$W_n = W_{old} + \eta (y_i - \hat{y}_i) x_i$$

where, y_i = actual value

$\hat{y}_i$ = predicted value

- if actual value is 0 & predicted is 1

$$W_n = W_{old} + \eta (0 - 1) x_i$$

$$W_n = W_{old} - \eta x_i$$

- if actual value is 1 & predicted is 0

$$W_n = W_{old} + \eta (1 - 0) x_i$$

$$W_n = W_{old} + \eta x_i$$