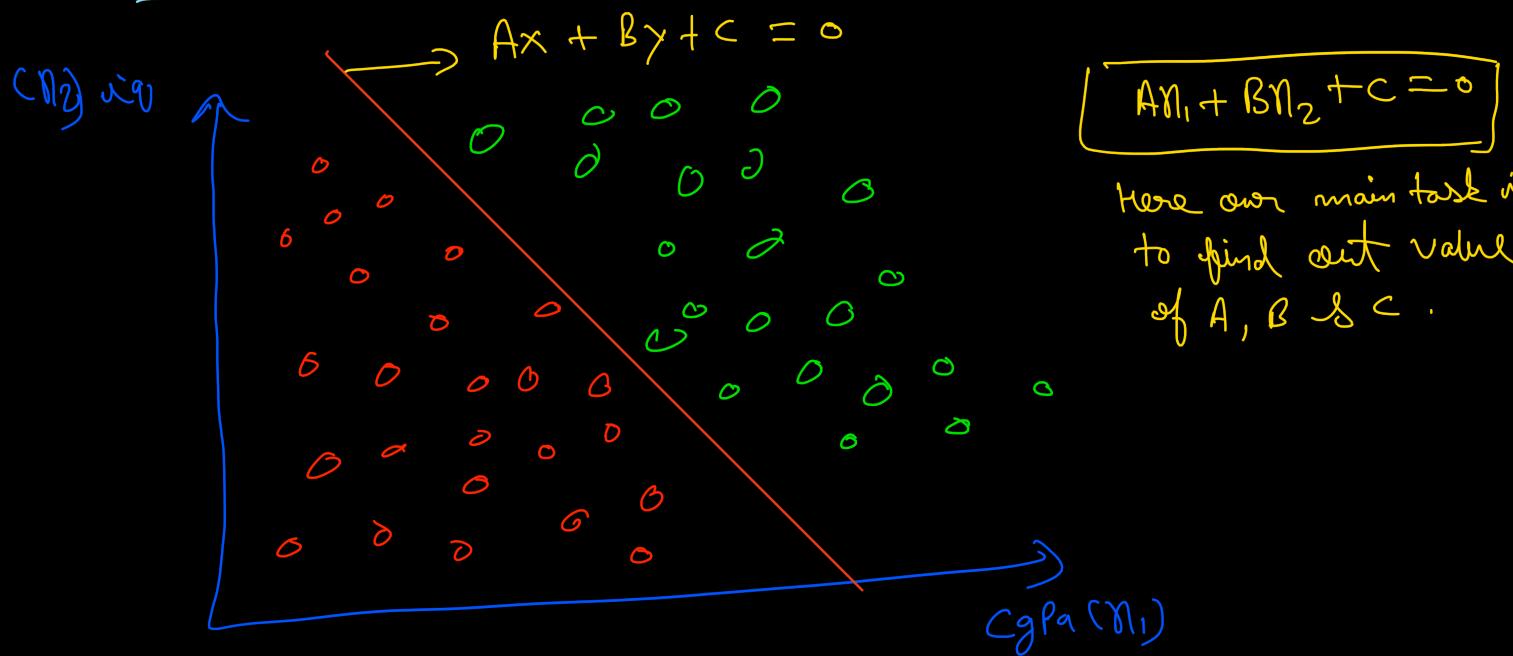


Perception Trick | How to train a Perception

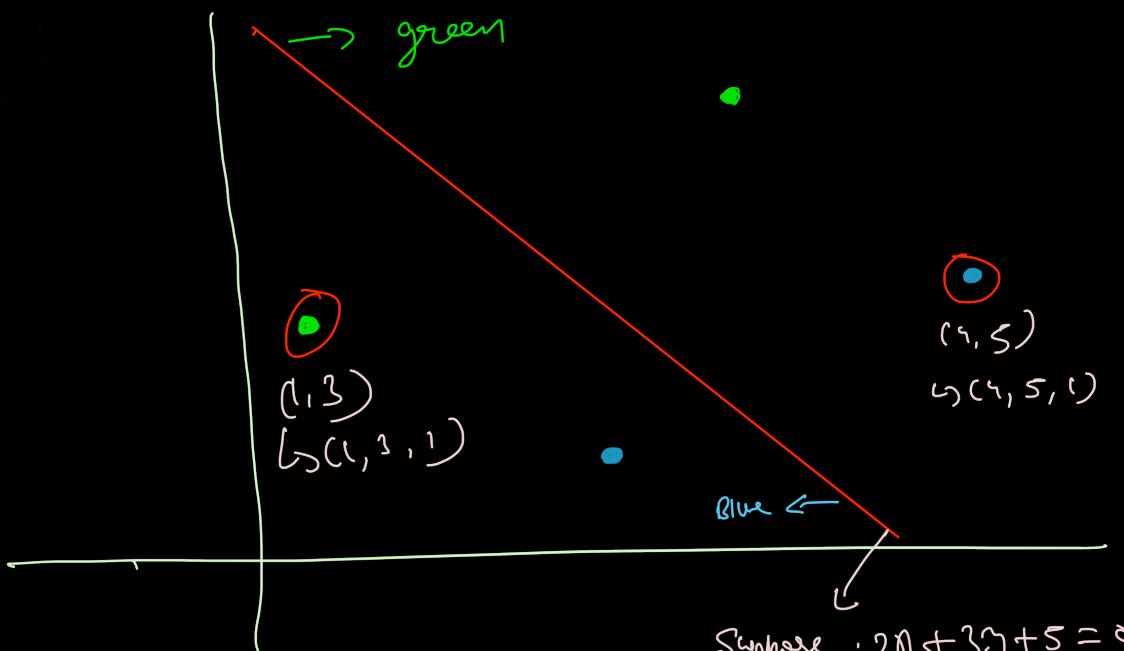
Perception trick



- (i) first start with random line (Random value of A, B & C)
- (ii) Then we run a loop and in every loop we select a random point and check whether line is correct or not according to that point if yes then go to another point and if not then we change or transform value of A, B & C in such way that new line classifies that point correctly.
- (iii) Run loop for 1000 times or till it converges.
(Converges means no misclassification of point)

Transformations

- * Add one to its coordinate and do the following ↓



$$\begin{array}{r}
 2 & 3 & 5 \\
 -4 & & 1 \\
 \hline
 -2 & -2 & 1
 \end{array}$$

new line :

$$-2x - 2y + 1 = 0$$

$$\text{Suppose: } 2x + 3y + 5 = 0$$

$$\begin{array}{ccccccccc}
 2 & 3 & 5 & & & & & & \\
 + & & 3 & 6 & & & & & \\
 \hline
 & & 6 & 6 & & & & & \\
 \text{new line: } & 3x + 6y + 6 & = & 0
 \end{array}$$

* When you move line towards -ve direction : + (Add)

* When you move line towards +ve direction : - (Subtract)

- * In Machine Learning we at one go never do big changes in value of A, B, & C.
- * we make use of learning rate (hyperparameter)

Suppose
 $\Delta r = 0.01$

$$\begin{array}{r}
 2 & 3 & 5 \\
 + 0.01x_1 & 0.01x_2 & 0.01x_3 \\
 \hline
 \end{array}$$

formula \rightarrow New Coef = Coef - η Coordinate

Algorithm

$$Ax + By + C = 0$$

x_0	CgPa	iq	Placed
1	7.5	81	1
1	8.9	109	1
1	7.0	81	0

$$\boxed{w_0 + w_1 x_1 + w_2 x_2 = 0}$$

$w_0 = C$ (bias), $w_1 = A$,
 $w_2 = B$

$$w_0 x_0 + w_1 x_1 + w_2 x_2 = 0$$

$$x_0 = 1$$

$$\sum_{i=1}^2 w_i x_i = 0$$

Prediction

Suppose we have value
of $[w_0, w_1, w_2]$ then
for any given CgPa & iq :

$$\text{CgPa} = 7.5 \text{ & iq} = 81 \text{ then}$$

$$\boxed{w_0 x_0 + w_1 x 7.5 + w_2 x 81}$$

$$\text{if } > 0 \rightarrow 1$$

$$< 0 \rightarrow 0$$

$$\text{Epochs} \rightarrow 1000, \eta = 0.01$$

for i in orange (epochs):

randomly select a student

if $x_i \in \text{Negative region}$ and $\sum_{i=0}^2 w_i x_i \geq 0$ (Model is giving +ve)

then we update w_s

$$w_{\text{new}} = w_{\text{old}} - \eta x_i$$

if $x_i \in \text{positive}$ and $\sum_{i=0}^2 w_i x_i < 0$ (Model is giving -ve)

$$w_{\text{new}} = w_{\text{old}} + \eta x_i$$

Simplified Algo

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

$$w_{\text{new}} = w_{\text{old}} + \eta x_i$$

if $x_i \in P$ and $\sum w_i x_i < 0$:

$$w_{\text{new}} = w_{\text{old}} - \eta x_i$$

for i in orange (1000):

$$w_{\text{new}} = w_{\text{old}} + \eta (y_i - \hat{y}_i) x_i$$

y_i	\hat{y}_i	$y_i - \hat{y}_i$		$w_{\text{new}} = w_{\text{old}}$
1	1	0	→	$w_{\text{new}} = w_{\text{old}}$
0	0	0	→	$w_{\text{new}} = w_{\text{old}}$
1	0	1	→	$w_{\text{new}} = w_{\text{old}} + \eta x_i$
0	1	-1	→	$w_{\text{new}} = w_{\text{old}} - \eta x_i$

for i in orange (epochs):

Select a random student (i)

$$w_{\text{new}} = w_{\text{old}} + \eta (y_i - \hat{y}_i) x_i$$

Simplified algorithm

updated code

