Assume weight vector of initial decision boundary $w^T w = [1, 1]$

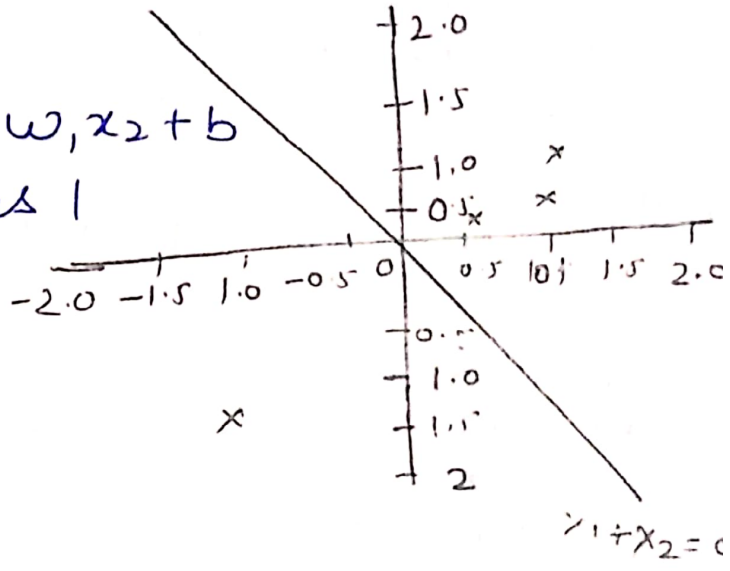
$\Rightarrow x_1 + x_2 = 0$

$b = 0$

$y_{in} = w_1^T x_i + b = w_1 x_1 + w_1 x_2 + b$

assume learning rate as 1

$$y = \begin{cases} 1 & y_{in} > 0 \\ 0 & y_{in} = 0 \\ -1 & y_{in} < 0 \end{cases}$$



$\Delta w_1 = \alpha t x_i \quad \Delta b = \alpha t$

$\Delta w_2 = \alpha t x_2$

x_1	x_2	class(t)	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
1	1	+1	2	+1	0	0	0	1	1	0
-1	-1	-1	-2	-1	0	0	0	1	1	0
0	0.5	-1	0.5	+1	0	-0.5	-1	1	0.5	-1
0.1	0.5	-1	-0.4	+1	0	-0.5	-1	1	0.5	-1
0.2	0.2	+1	-0.7	-1	0.2	0.2	1	1.2	0.7	0
0.9	0.5	+1	1.43	+1	0	0	0	1.2	0.7	0

x_1	x_2	t	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
1	1	+1	1.9	+1	0	0	0	1.2	0.7	0
-1	-1	-1	-1.9	-1	0	0	0	1.2	0.7	0
0	0.5	-1	0.30	+1	0	-0.5	-1	1.2	0.2	-1
0.1	0.5	1	-0.78	-1	0	0	0	1.2	0.2	-1
0.2	0.2	+1	-0.72	-1	0.2	0.2	1	1.4	0.4	0
0.9	0.5	+1	1.46	+1	0	0	0	1.4	0.4	0

III

x_1	x_2	t	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
								1.4	0.4	0
1	1	+1	1.0	+1	0	0	0	1.4	0.4	0
-1	-1	-1	-1.8	-1	0	0	0	1.4	-0.1	-1
0	0.5	-1	0.2	+1	0	-0.5	-1	1.4	-0.1	-1
0.1	0.5	-1	-0.81	-1	0	0	0	1.4	0.1	0
0.2	0.2	+1	-0.74	-1	0.2	0.2	1	1.6	0.1	0
0.9	0.5	+1	1.49	+1	0	0	0	1.6	0.1	0

(IV)

x_1	x_2	t	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
								1.6	0.1	0
1	1	+1	1.7	+1	0	0	0	1.6	0.1	0
-1	-1	-1	1.7	-1	0	-0.5	-1	1.6	-0.4	-1
0	0.5	-1	0.05	+1	0	0	0	1.6	-0.4	-1
0.1	0.5	+1	-1.04	-1	0.2	0.2	1	1.8	-0.2	0
0.2	0.2	+1	-0.76	-1	0	0	0	1.8	-0.2	0
0.9	0.5	+1	1.52	+1						

(V)

x_1	x_2	t	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
								1.0	-0.2	0
1	1	+1	1.6	+1	0	0	0	1.0	-0.2	0
-1	-1	-1	-1.6	-1	0	0	0	1.0	-0.2	0
0	0.5	-1	-0.1	-1						
0.1	0.5	-1		+1	-0.1	-0.5	-1	1.7	-0.7	-1
0.2	0.2	+1	0.08	-1	0.2	0.2	1	1.9	-0.5	0
0.9	0.5	+1	-0.8	+1	0	0	0	1.1	-0.5	0
			1.42							

x_1	x_2	t	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b
								1.9	-0.5	0
1	1	+1	1.4	+1	0	0	0	1.9	-0.5	0
-1	-1	-1	-1.4	-1	0	0	0	1.9	-0.5	0
0	0.5	-1	-0.25	-1	0	0	0	1.9	-0.5	0
0.1	0.5	-1	-0.06	-1	0	0	0	1.9	-0.5	0
0.2	0.2	+1	0.20	+1	0	0	0	1.9	-0.5	0
0.1	0.5	+1	1.46	+1	0					

The perceptron learning algorithm converge in 6 steps

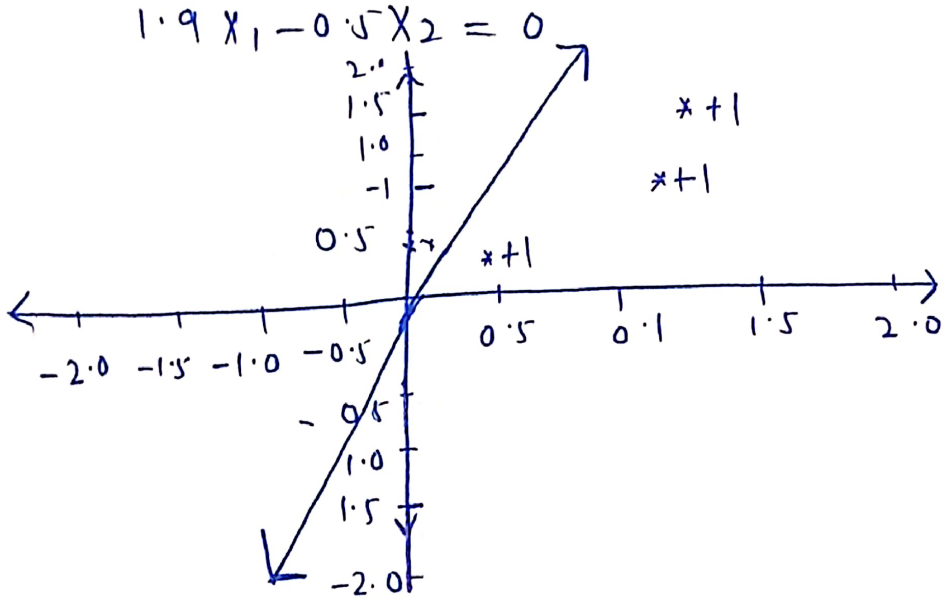
the final weight vector of the decision Boundary is

$$w = [1.9, -0.5]$$

$$1.9 X_1 + (0.5) X_2 = 0$$

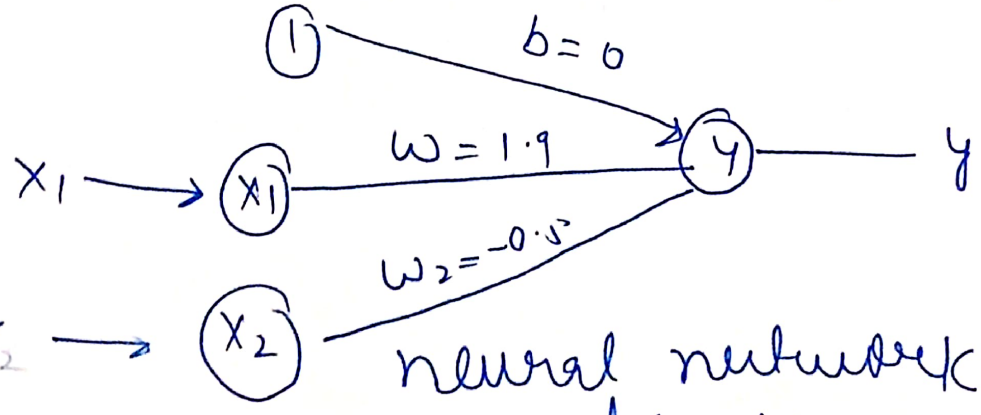
$$1.9 X_1 - 0.5 X_2 = 0$$

Lets us plot the final decision Boundary



$$1.9 X_1 - 0.5 X_2 = 0$$

final decision Boundary.



neural network corresponding to the perceptron.