lecture 9:

X for $\mathbb{X}$

realization (n, p)

$P(X; n, p)$

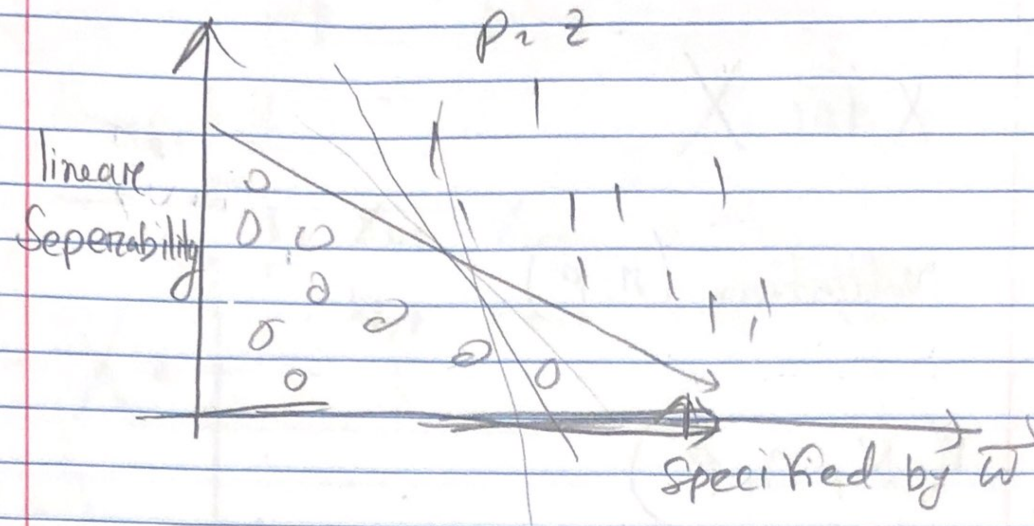
$F(X; n, p)$

$Q[X, q; n, p]$

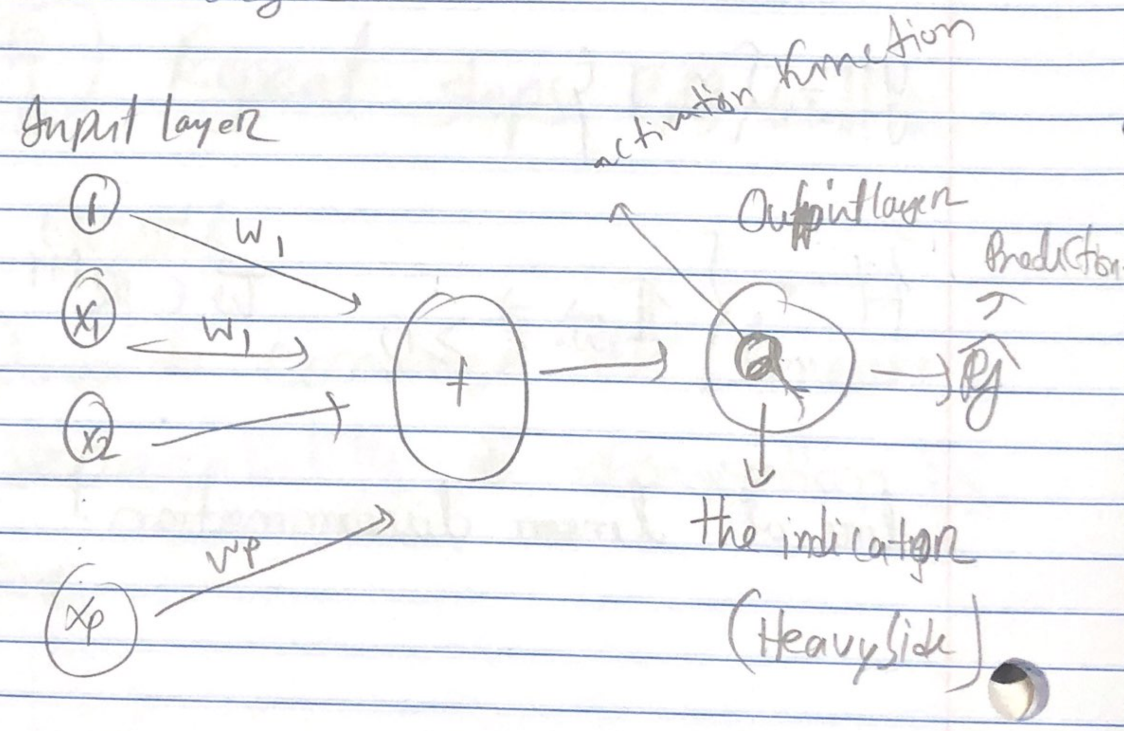
$y = \{0, 1\}$

$\mathcal{H} = \left\{ \mathbb{1}_{\vec{w} \cdot \vec{x} \geq 0} : \vec{w} \in \mathbb{R}^{p+1} \right\}$

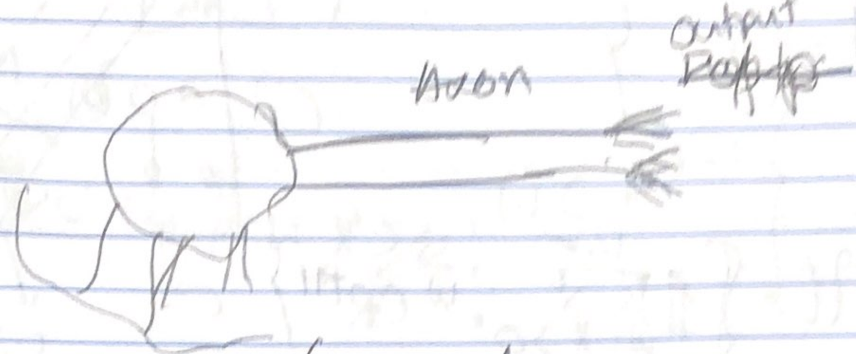
line of linear discrimination.



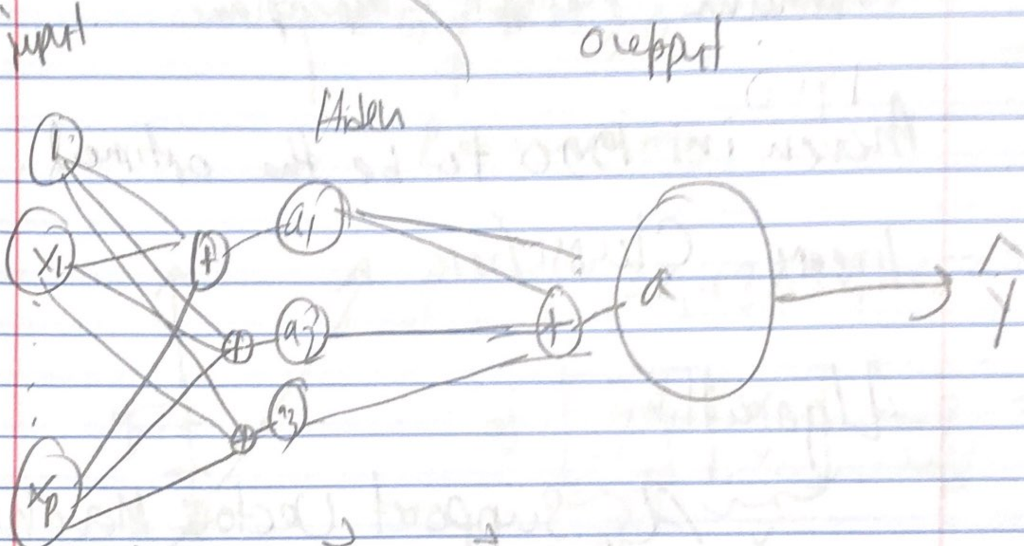
if data is linearly Seperable, the perception algorithm is ganateed to converge



"Looks like" a neuron



Dendrives(inputs from other neuron)

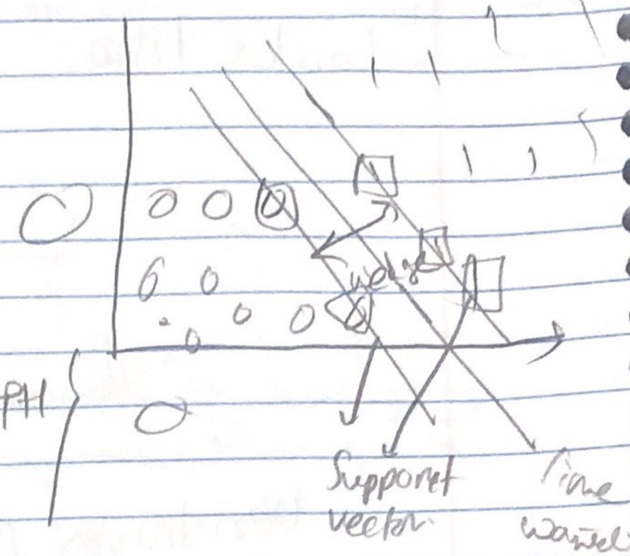


$\vec{w}_{11}, w_{21}, \vec{w}_{31}, \vec{w}_{12}$

Parameters: $3p+3$

More complicated
$\mathcal{H}$

$y = \{0, 1\}$



$\mathcal{H} = \{ \mathbb{1}[\underbrace{\vec{w}\cdot\vec{x}}_{\text{linear}} \geq 0] : \vec{w} \in \mathbb{R}^{d+1} \}$

"Maximum margin Hyperplane"

Proven in 1990 to be the optimal linear classifier

Algorithm

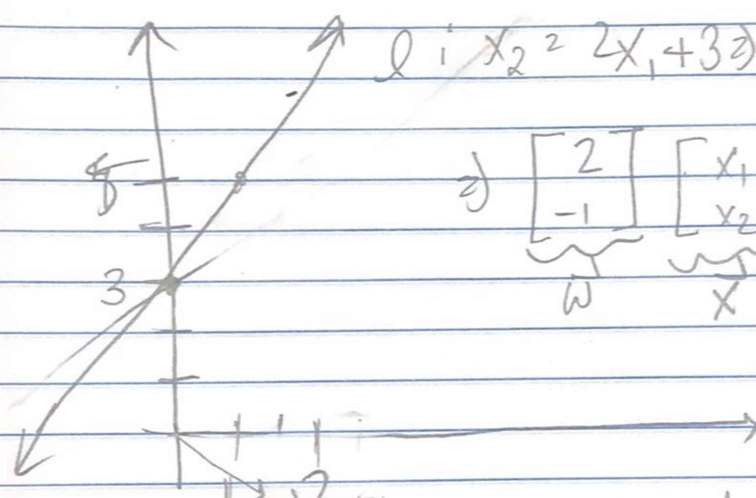
A: Support Vector Machine (SVM)

$$\vec{W} = \begin{bmatrix} \vec{W}_1 \\ \vdots \\ \vec{W}_P \end{bmatrix}, \; W_0 = b$$

$$\mathcal{H} = \left\{ \mathbb{1}_{\vec{w}\cdot\vec{x} \geq 0} : \vec{w} \in \mathbb{R}^{P+1} \right\}$$

$$= \left\{ \mathbb{1}_{\vec{w}\cdot\vec{x} + b \geq 0} : \vec{w} \in \mathbb{R}^{P}, b \in \mathbb{R} \right\}$$

P measurements



$$l : x_2 = 2x_1 + 3 \Rightarrow 2x_1 - x_2 + 3 = 0$$

$$\Rightarrow \underbrace{\begin{bmatrix} 2 \\ -1 \end{bmatrix}}_{\vec{w}} \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_{x} - \underbrace{-3}_{b} = 0$$

$\vec{w}$ is the normal vector if is $\perp$ to l

Hesse normal form

$$(\vec{w} \cdot \vec{x} - b = 0)$$