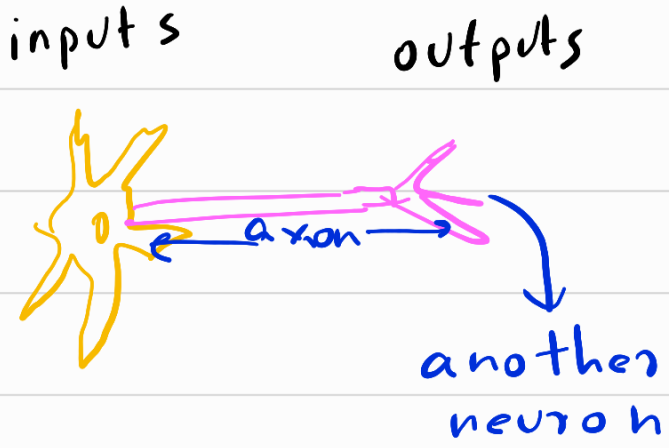
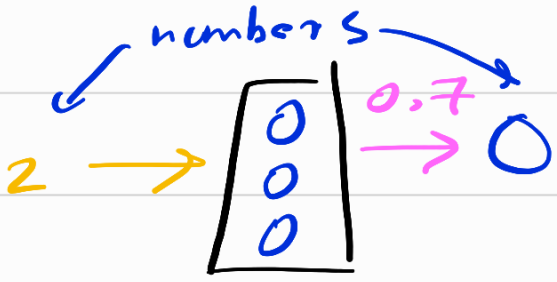
- Algorithms try to mimik brain

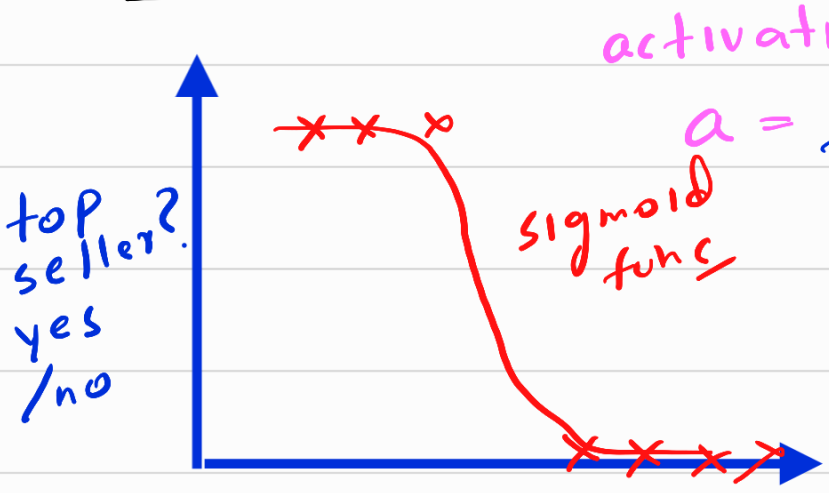
Biological



Simplified mathematical model

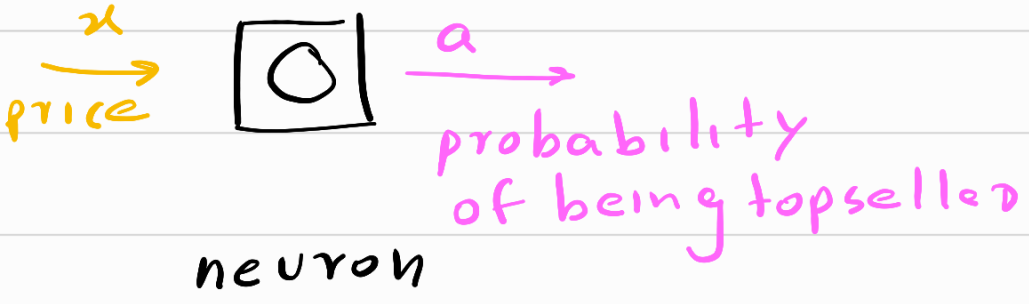


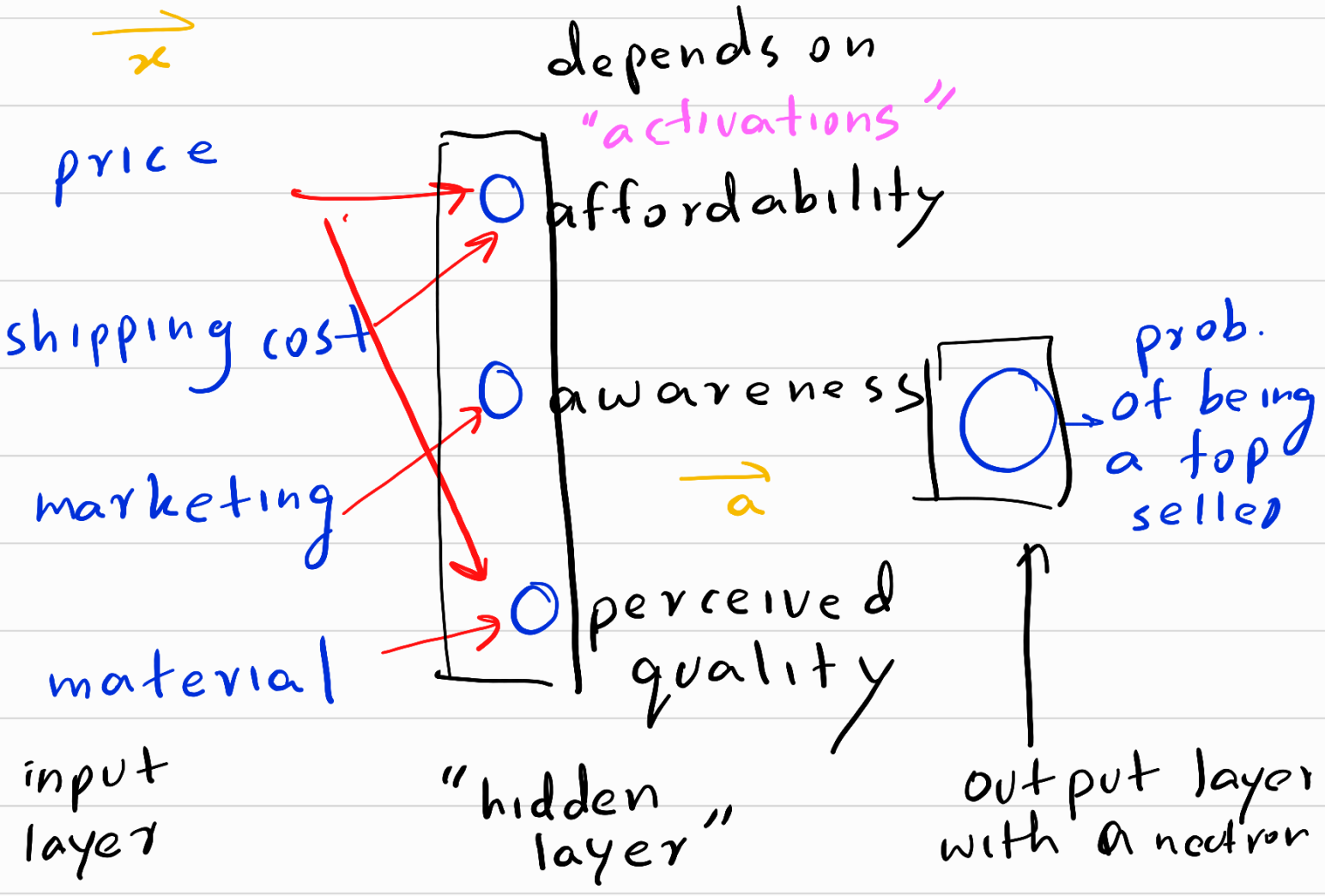
Demand Prediction



activation

$$a = f(x) = \frac{1}{1 + e^{-(wx+b)}}$$





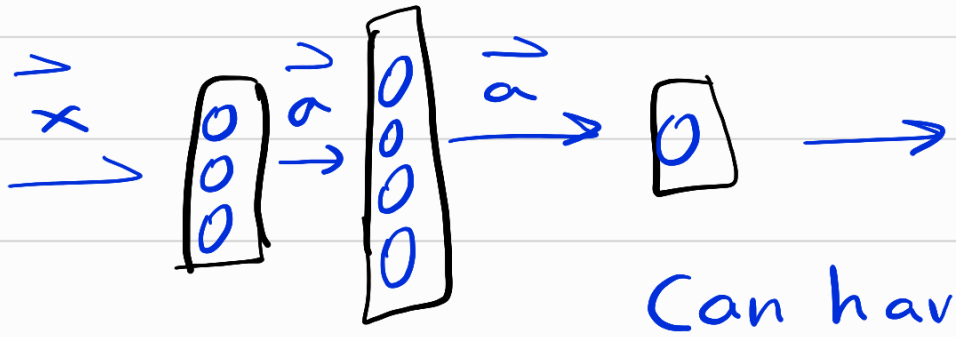
4 numbers ⟶ 3 numbers ⟶ 1 number
(activation values)

- for large feature sets difficult to manually go through which neuron takes which feature.

- So neurons have access to all prev. layer values.

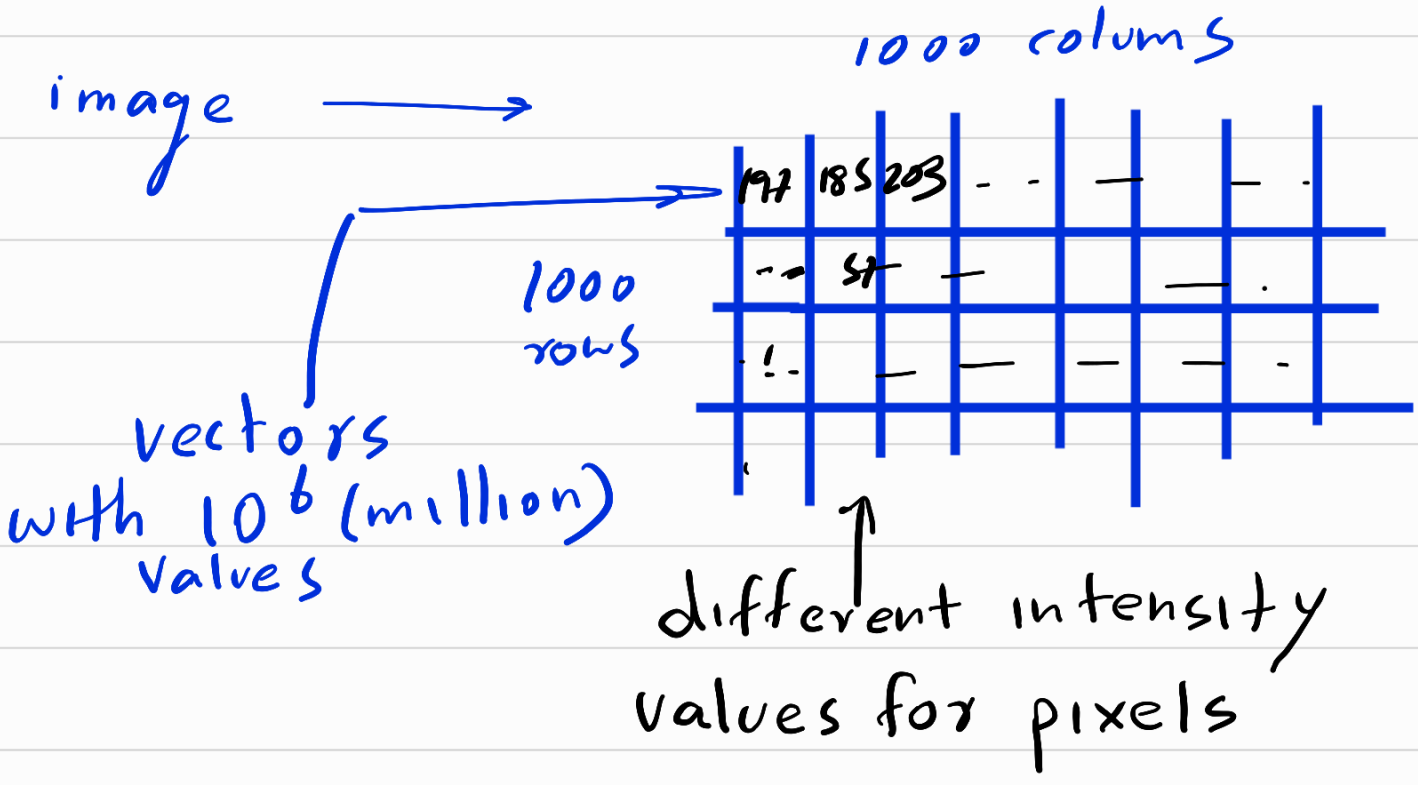
activations

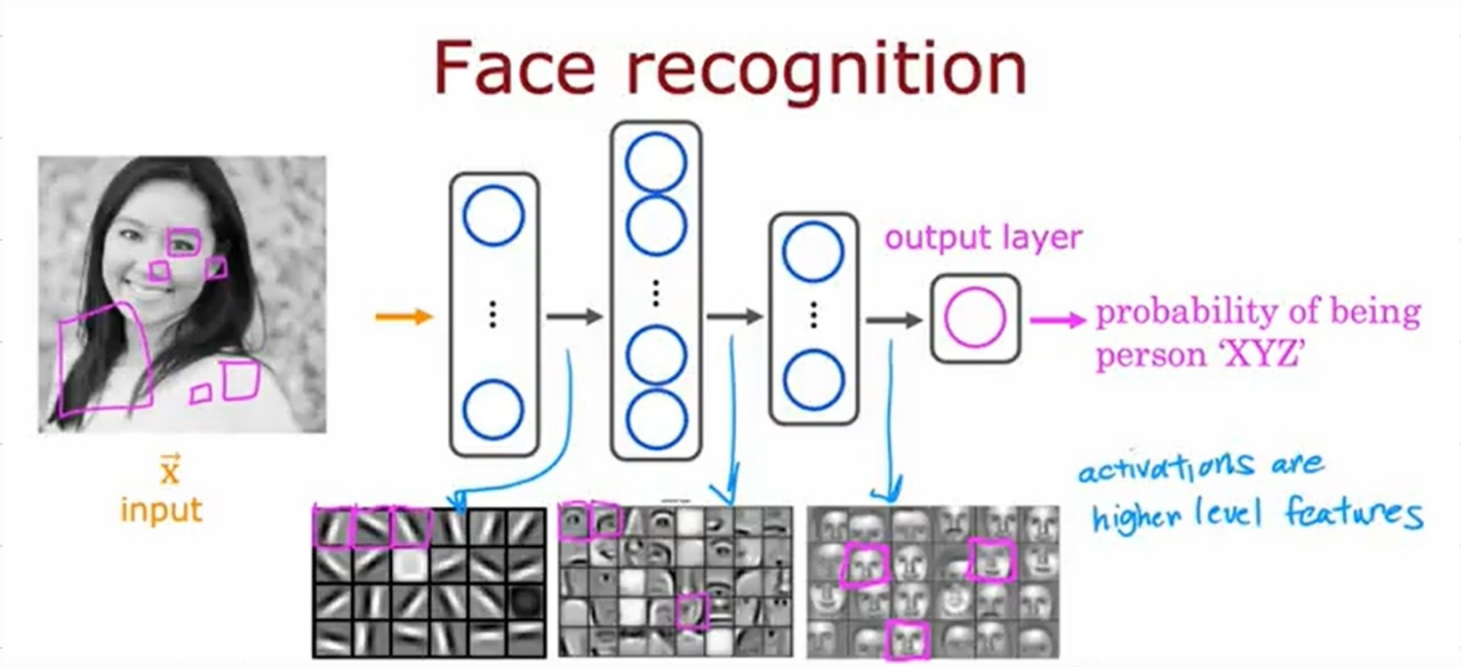
Neural net. ⟶ don't have to manually feature engineering (can create own)



Can have multiple layers of hidden networks.

Image recognition



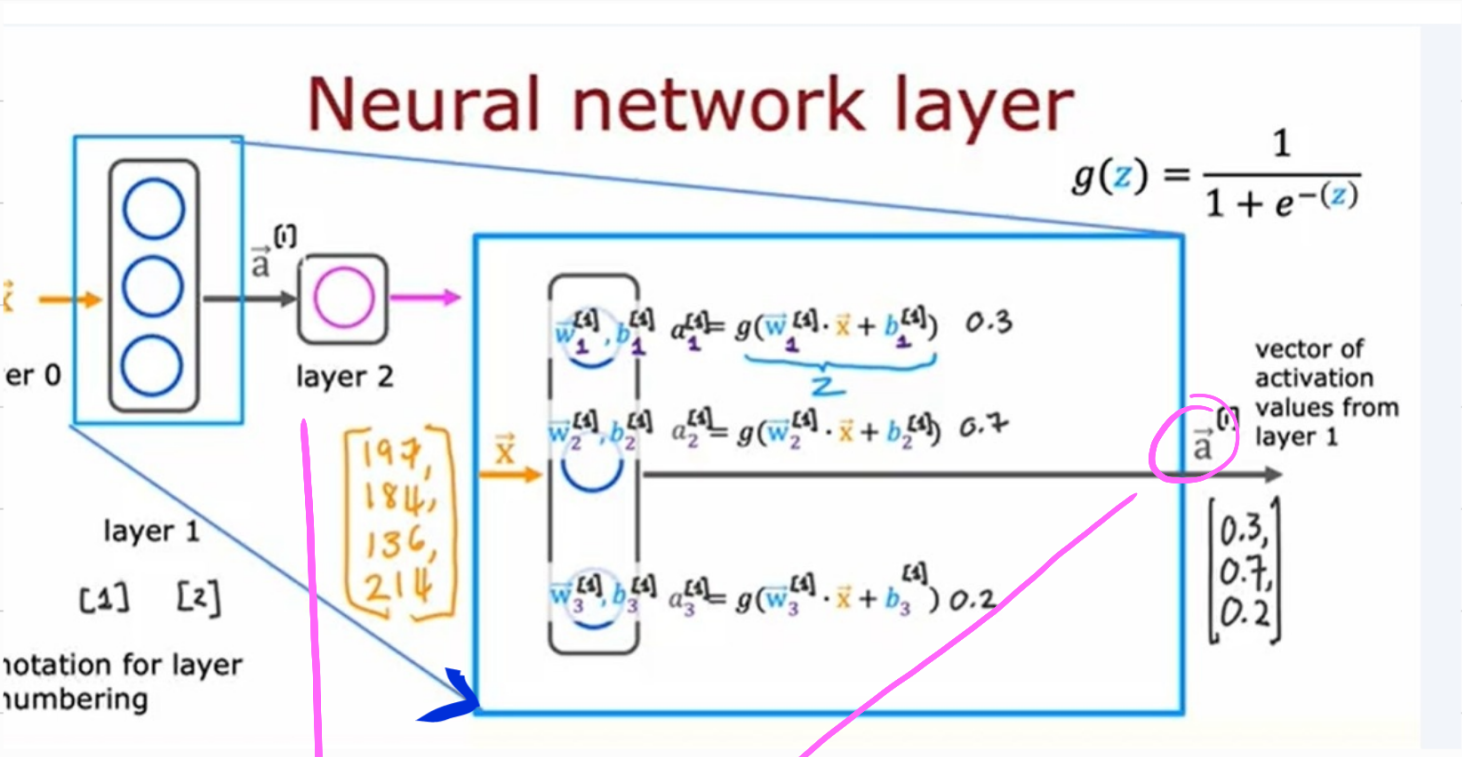


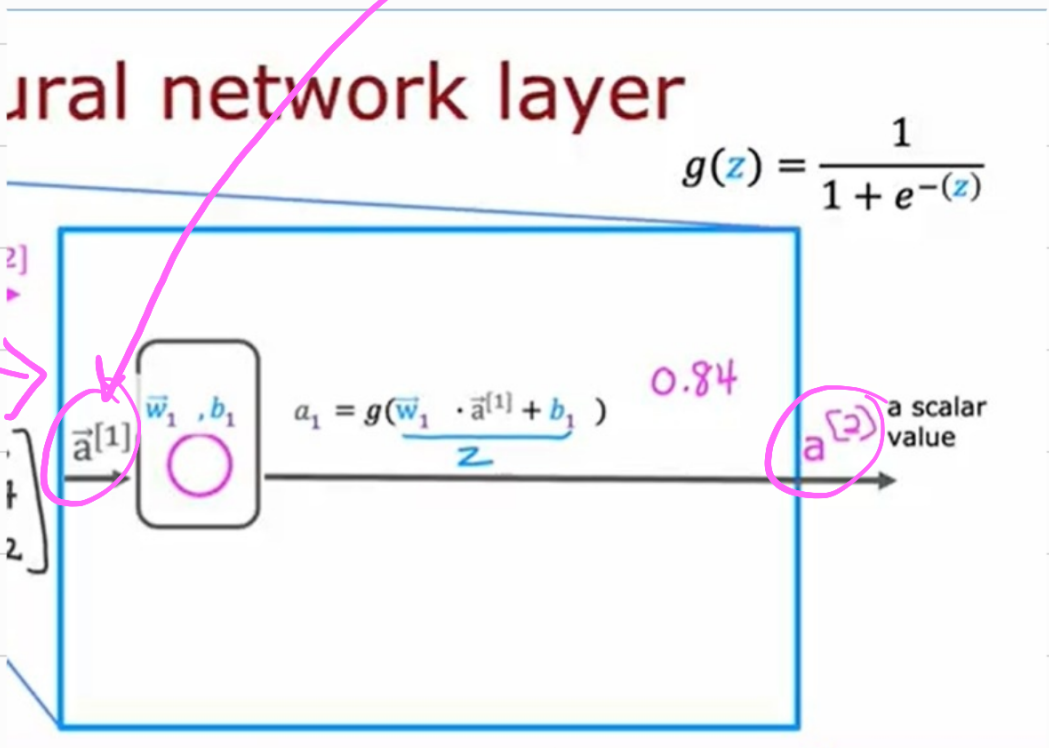
1st layer detects lines

features in face like nose / eyes

face str.

Neural Network Layer





predict category

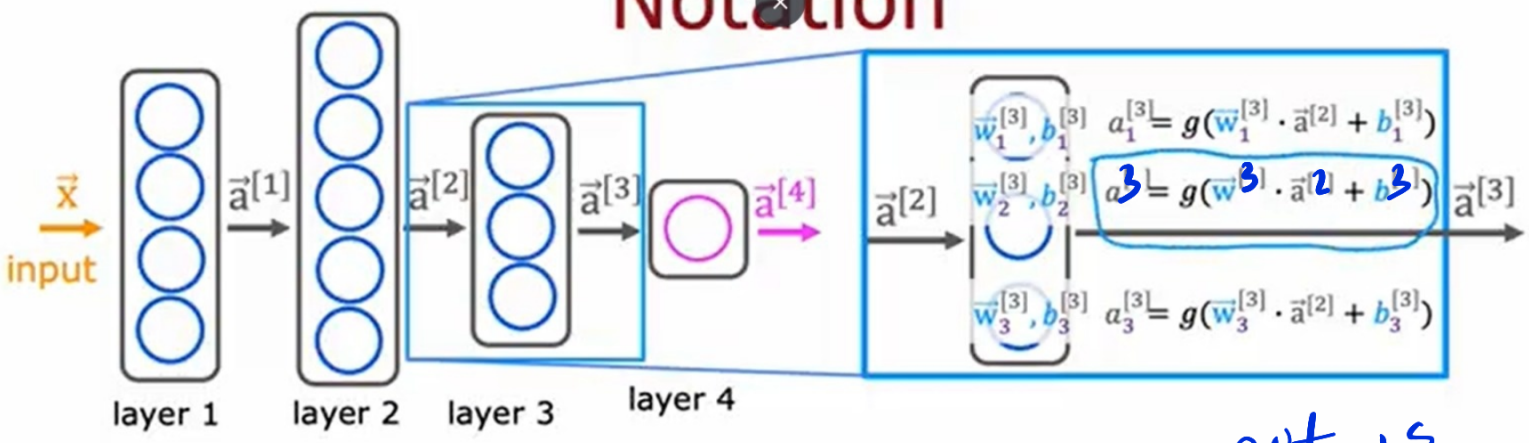
$a^{[2]}$

is $a^{[2]} \geq 0.5$?

yes → $\hat{y} = 1$

no → $\hat{y} = 0$

Notation



$$a_2^{[3]} = g(\vec{w}_2^{[3]} \cdot \vec{a}^{[2]} + b_2^{[3]})$$

input is activation of layer 2

activation of second neuron of layer 3

layer 2

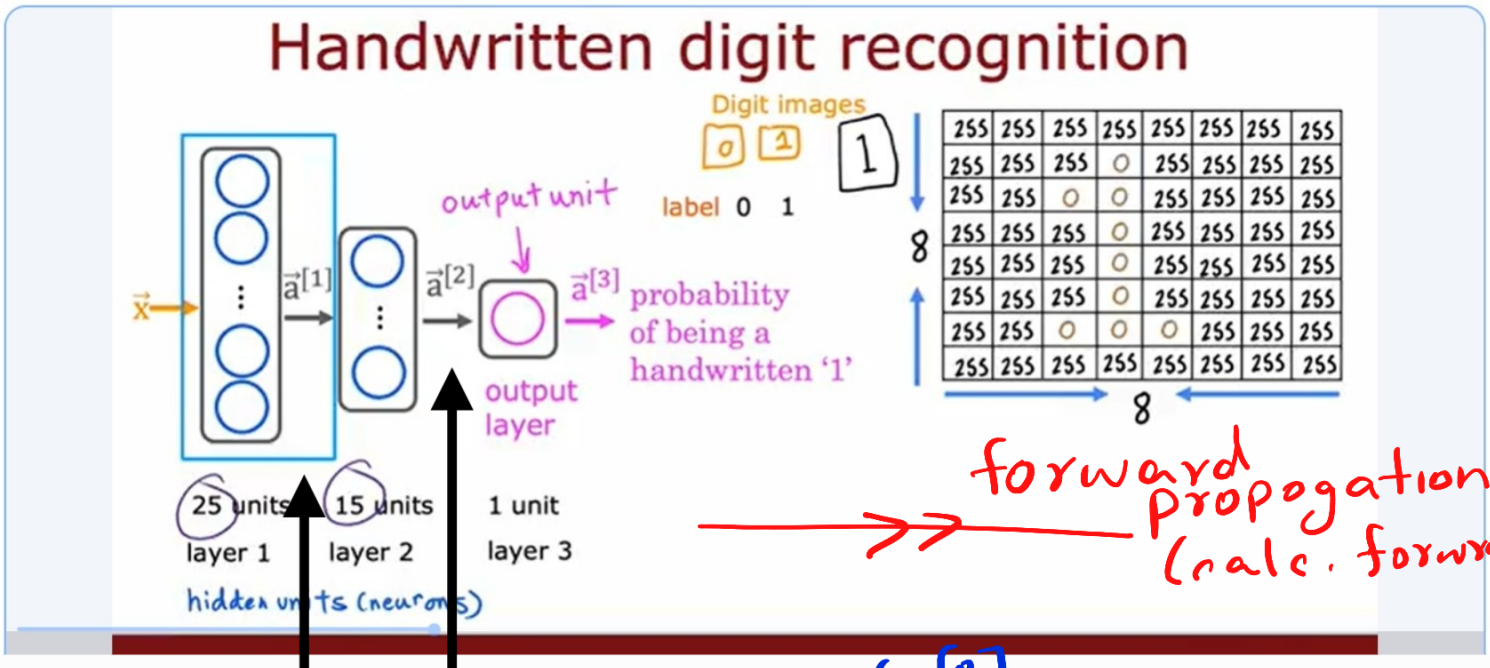
$$a_j^{[l]} = g(w_j^{[l]} \cdot \vec{a}^{[l-1]} + b_j^{[l]})$$

activation of layer l, unit (neuron) j

w & b parameters

"activation func" $= g \rightarrow$ (sigmoid here)

$a^{[0]} = \vec{x}$



$(a^{[3]})$

$$\vec{a}^{[1]} = g\begin{bmatrix} \vec{w}_1^{[1]} \vec{x} + b_1^{[1]} \\ \vdots \\ \vec{w}_{25}^{[1]} \vec{x} + b_{25}^{[1]} \end{bmatrix}$$

$$a^{[2]} = g\begin{bmatrix} w_1^{[2]} \vec{a}^{[1]} + b_2^{[1]} \\ \vdots \\ w_{15}^{[2]} \vec{a}^{[1]} + b_{25}^{[1]} \end{bmatrix}$$

$$a^{[3]} = g\left[\vec{w}_1^{[3]} \vec{a}^{[2]} + b_1^{[3]}\right]$$

output is one number bcs single neuron (between 0-1)

is $a_1^{[3]} \geq 0.5$?

yes → $\hat{y} = 1$ → image is 1

no → $\hat{y} = 0$ → image isn't 1