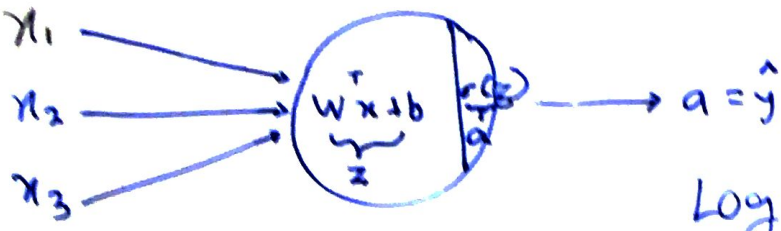
Computing a NN's output:



Log Reg.

$z = w^T x + b$
$a = \sigma(z)$
} 2 steps

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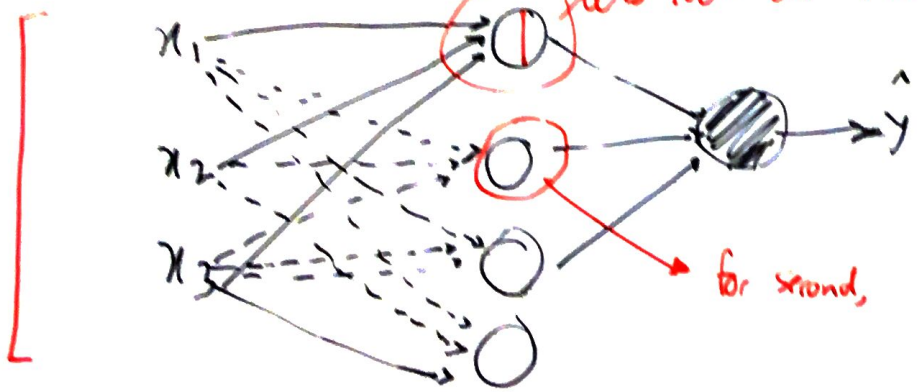
* NN just does this a no. of times

Let's look at the 1st Node:

$z_1^{[1]} = w_1^{[1]T} x + b_1^{[1]}$
$a_1^{[1]} = \sigma(z_1^{[1]})$

$a_i^{[l]}$ = i^{th} node in l^{th} layer



$z_2^{[1]} = w_2^T x + b_2^{[1]}$
$a_2^{[1]} = \sigma(z_2^{[1]})$

$$\begin{bmatrix} — w_1^{[1]T} — \\ — w_2^{[1]T} — \\ — w_3^{[1]T} — \\ — w_4^{[1]T} — \end{bmatrix} \times \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1^{[1]} \\ b_2^{[1]} \\ b_3^{[1]} \\ b_4^{[1]} \end{bmatrix} \Rightarrow \begin{bmatrix} z_1^{[1]} \\ z_2^{[1]} \\ z_3^{[1]} \\ z_4^{[1]} \end{bmatrix} = z^{[1]}$$

σ fn applied element wise

$= \begin{bmatrix} a_1^{[1]} \\ \vdots \\ a_4^{[1]} \end{bmatrix} = a$

transposed $\therefore$ row

think as follows:

→ logistic regression units
→ each unit has corresponding parameter w
→ by stacking together we get this

$W^{[1]}$ $\quad$ $b^{[1]}$

$$\underset{(4\times1)}{z^{[1]}} = \underset{(4,3)}{W^{[1]}} \underset{(3,1)}{x} + \underset{(4,1)}{b^{[1]}}$$

$$\underset{(4,1)}{a^{[1]}} = \sigma(\underset{(4,1)}{z^{[1]}})$$

$$a^{[2]} = \sigma(z^{[2]})$$

$$\underset{(1,1)}{z^{[2]}} = \underset{(1,4)}{w^{[2]}} \underset{(4,1)}{a^{[1]}} + \underset{(1,1)}{b^{[2]}}$$