Week 4.2 Neural Networks - Applications
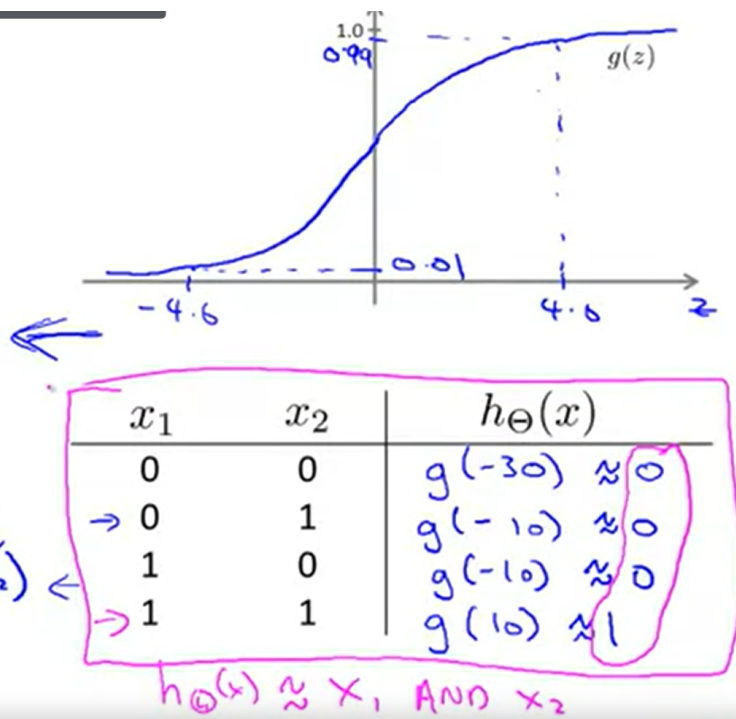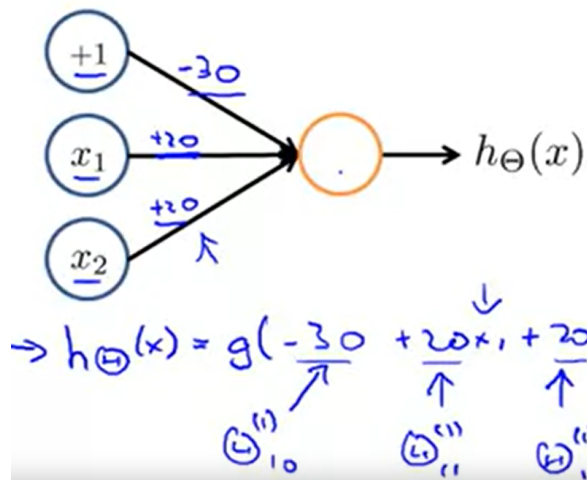
Neural network truth table
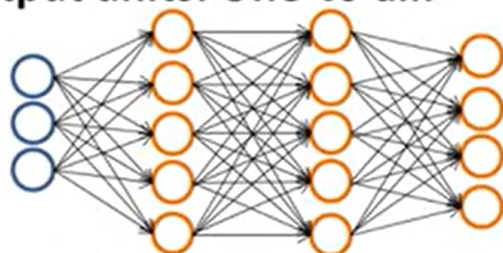
Simple example: AND

→ $x_1, x_2 \in \{0, 1\}$

→ $y = x_1 \text{ AND } x_2$

→ $h_\Theta(x) = g(-30 + 20x_1 + 20x_2)$

$\overset{(i)}{\Theta}_{10} \quad \overset{(i)}{\Theta}_{11} \quad \overset{(i)}{\Theta}_{12}$

x_1	x_2	$h_\Theta(x)$
0	0	$g(-30) \approx 0$
0	1	$g(-10) \approx 0$
1	0	$g(-10) \approx 0$
1	1	$g(10) \approx 1$

$h_\Theta(x) \approx x_1 \text{ AND } x_2$

Multiclass Classification

Multiple output units: One-vs-all.

$h_\Theta(x) \in \mathbb{R}^4$

Want $h_\Theta(x) \approx \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$, $h_\Theta(x) \approx \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$, $h_\Theta(x) \approx \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}$, etc.

when pedestrian   when car   when motorcycle

Training set: $(x^{(1)}, y^{(1)}), (x^{(2)}, y^{(2)}), \ldots, (x^{(m)}, y^{(m)})$

→ $y^{(i)}$ one of $\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$

pedestrian car motorcycle truck

Previously

$y \in \{1, 2, 3, 4\}$

$(x^{(i)}, y^{(i)})$

$h_\Theta(x^{(i)})$