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Neural Networks: Representation

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Non-linear hypotheses

When number of features is large, it's difficult to calculate parameters in a short time.

Neurous and the brain

Model and representation 1

$z = \sum_{i=0} w_i x_i$
$g(z) = \frac{1}{1+e^{-z}}$
即$h_\Theta(x) = \frac{1}{1+e^{-\Theta^T x}}$

$a_i^{(j)} = g(\sum_{k=0} \Theta_{ik}^{(j-1)} x_k)$
$a^{(j)} = g(\Theta^{j-1} x)$
Θ^{j-1} is $s_j * (s_{j-1} + 1)$

Model and representation 2

$z^{(2)} = \Theta^{(1)} * a^{(1)}$
$a^{(2)} = g(z^{(2)})$
Add $a_0^{(2)} = 1.$

$z^{(3)} = \Theta^{(2)} * a^{(2)}$
$h_\Theta(x) = a^{(3)} = g(z^{(3)})$

Examples and intuitions 1

$y = x_1 \; XOR \, x_2$
$y = x_1 \; XNOR \, x_2$
$y = NOT(x_1 \; XOR \, x_2)$

Examples and intuitions 2

$y = x_1 \; AND \, x_2$
$y = x_1 \; OR \, x_2$

Multi-class classification

$h_\Theta(x) \in \mathbb{R}^n$
Training set: $(x^{(i)}, y^{(i)})$
$y_j^{(i)} = 1, \; y_{k \neq j}^{(i)} = 0$