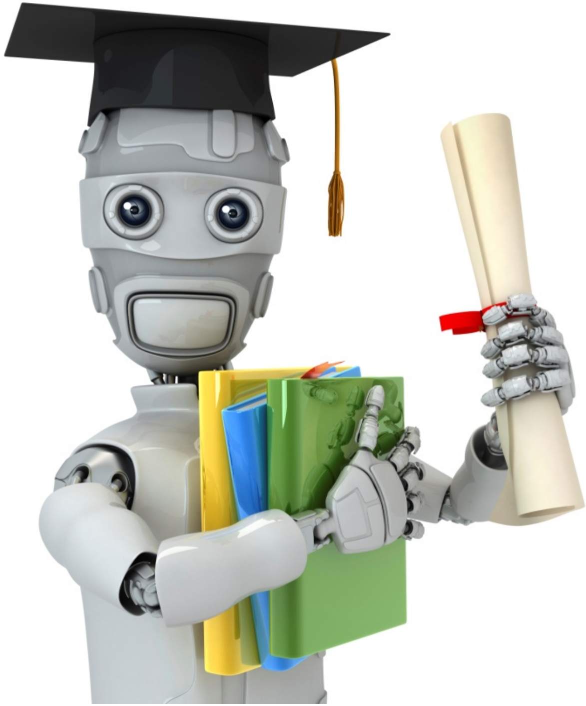


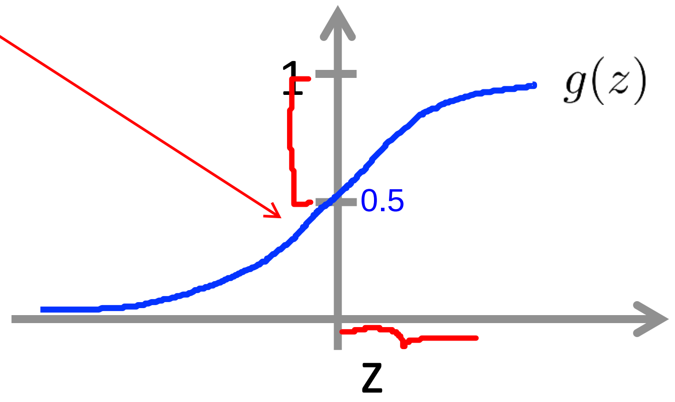
Machine Learning

Logistic Regression

Decision boundary

analisar grafico

Logistic regression



$$h_\theta(x) = g(\theta^T x) = P(y=1|x;\theta)$$

$$g(z) = \frac{1}{1+e^{-z}}$$

Suppose predict "$y = 1$" if $h_\theta(x) \geq 0.5$

$\theta^T x \geq 0$

$g(z) \geq 0.5$

when $z \geq 0$

$h_\theta(x) = g(\theta^T x) \geq 0.5$

$P(y=0)$

predict "$y = 0$" if $h_\theta(x) < 0.5$

$\theta^T x < 0$

$g(z) < 0.5$

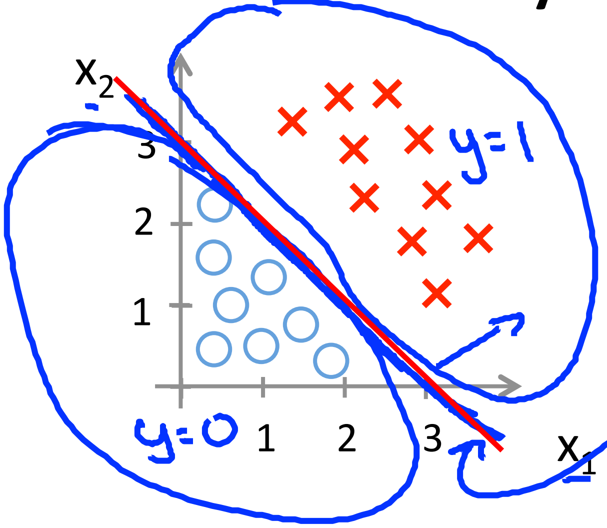
when $z < 0$

$h_\theta(x) = g(\theta^T x)$

$\theta^T x < 0$

Decision Boundary

$\theta = \begin{bmatrix} -3 \\ 1 \\ 1 \end{bmatrix}$



$$\boxed{h_\theta(x) = g(\underbrace{\theta_0}_{-3} + \underbrace{\theta_1}_{1} x_1 + \underbrace{\theta_2}_{1} x_2)}$$

Decision boundary

Predict "$y = 1$" if $\underbrace{-3 + x_1 + x_2}_{\theta^T x} \geq 0$

$x_1 + x_2 \geq 3$

x_1, x_2

$h_\theta(x) = 0.5$

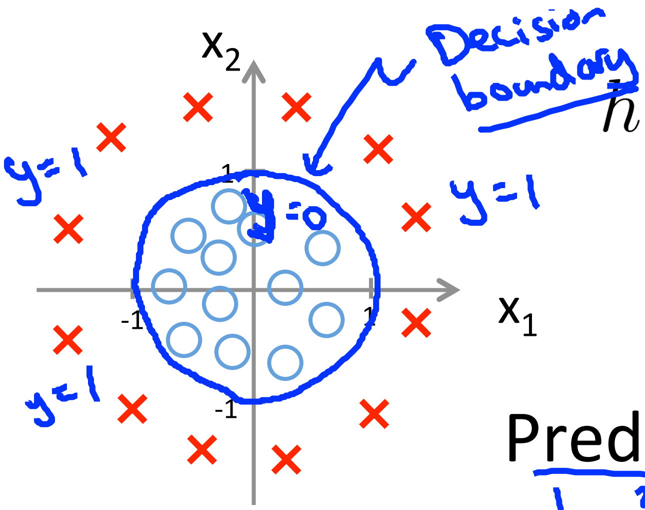
$\boxed{x_1 + x_2 = 3}$

$x_1 + x_2 < 3$

$y = 0$

Andrew Ng

Non-linear decision boundaries



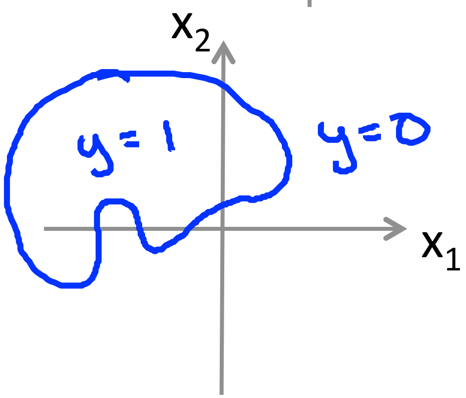
$$h_\theta(x) = g(\underset{=-1}{\theta_0} + \underset{=0}{\theta_1} x_1 + \underset{=0}{\theta_2} x_2 + \underset{=1}{\theta_3} x_1^2 + \underset{=1}{\theta_4} x_2^2)$$

$$\theta = \begin{bmatrix} -1 \\ 0 \\ 0 \\ 1 \\ 1 \end{bmatrix}$$

Predict "$y = 1$" if $\underbrace{-1 + x_1^2 + x_2^2}_{} \geq 0$

$\boxed{x_1^2 + x_2^2 = 1}$

$x_1^2 + x_2^2 \geq 1$ circunferencia de raio 1



$$h_\theta(x) = g(\theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 \underline{x_1^2} + \theta_4 \underline{x_1^2 x_2} + \theta_5 \underline{x_1^2 x_2^2} + \theta_6 \underline{x_1^3 x_2} + \dots)$$