



Machine Learning

Logistic Regression

Cost function

Training
set:

$$\{(x^{(1)}, y^{(1)}), (x^{(2)}, y^{(2)}), \dots, (x^{(m)}, y^{(m)})\}$$

m examples

$$x \in \begin{bmatrix} x_0 \\ x_1 \\ \dots \\ x_n \end{bmatrix}$$

\mathbb{R}^{n+1}

$$\underline{x_0 = 1}, \underline{y \in \{0, 1\}}$$

$$h_{\theta}(x) = \frac{1}{1 + e^{-\underline{\theta^T x}}}$$

How to choose parameters θ ?

Cost function

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formula seria n
convexo logo teria
varos minios
locais

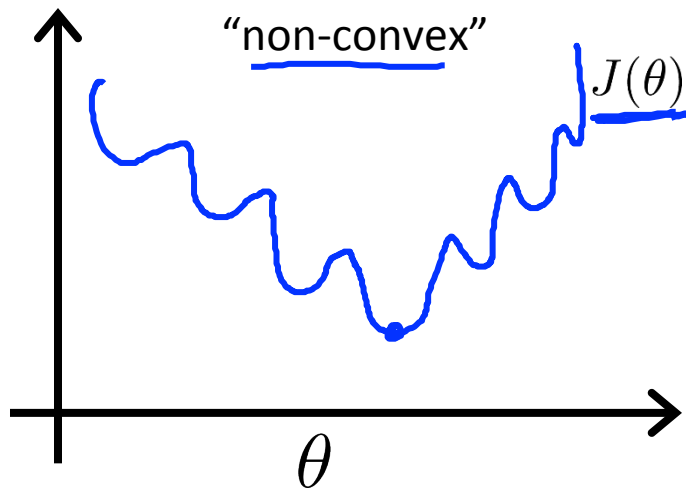
→ Linear regression:
logistic

$$J(\theta) = \frac{1}{m} \sum_{i=1}^m \frac{1}{2} (h_{\theta}(x^{(i)}) - y^{(i)})^2$$

cost($h_{\theta}(x^{(i)})$, y)

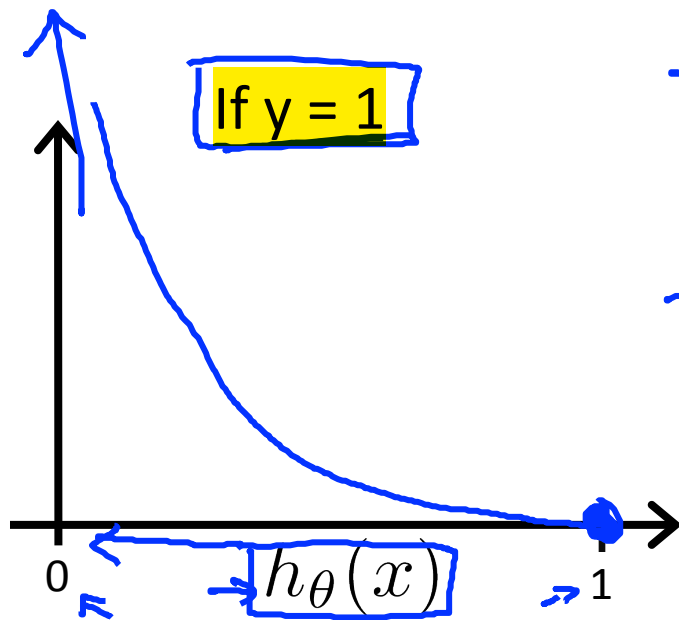
$$\text{Cost}(h_{\theta}(x), y) = \frac{1}{2} (h_{\theta}(x) - y)^2$$

$$\frac{1}{1 + e^{-\theta^T v}}$$



Logistic regression cost function

$$\text{Cost}(\underline{h_\theta(x)}, y) = \begin{cases} \underline{-\log(h_\theta(x))} & \text{if } y = 1 \\ \underline{-\log(1 - h_\theta(x))} & \text{if } y = 0 \end{cases}$$



→ Cost = 0 if $y = 1, h_\theta(x) = 1$
But as $h_\theta(x) \rightarrow 0$
 $\text{Cost} \rightarrow \infty$

→ Captures intuition that if $h_\theta(x) = 0$,
(predict $P(y = 1|x; \theta) = 0$), but $y = 1$,
we'll penalize learning algorithm by a very
large cost.

Logistic regression cost function

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