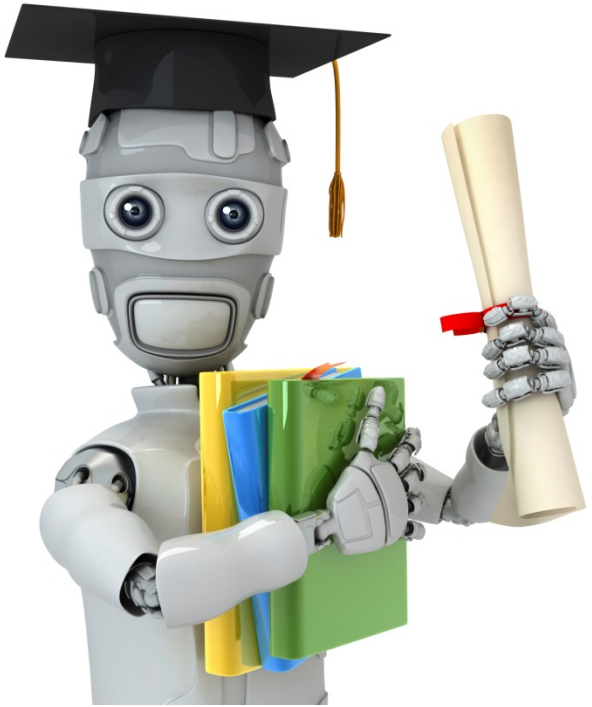


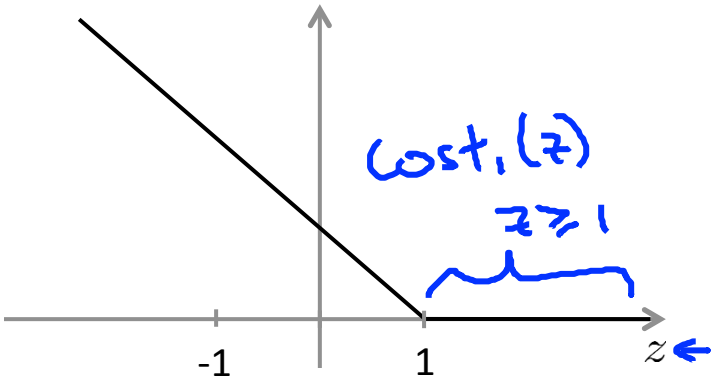
Machine Learning

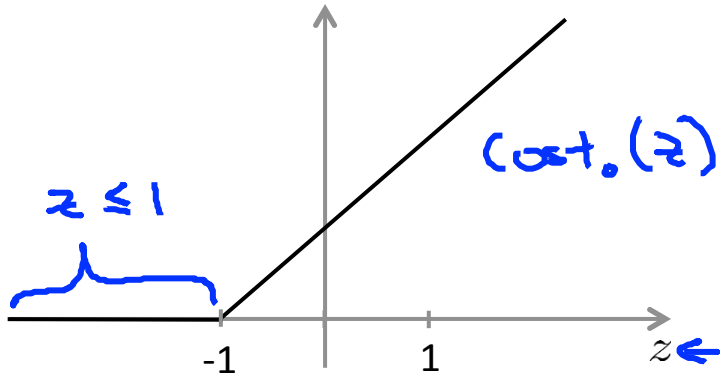
Support Vector Machines

Large Margin Intuition

Support Vector Machine

$$\min_\theta C \sum_{i=1}^{m} \left[y^{(i)} cost_1(\theta^T x^{(i)}) + (1 - y^{(i)}) cost_0(\theta^T x^{(i)}) \right] + \frac{1}{2} \sum_{i=1}^{n} \theta_j^2$$





- If $y = 1$, we want $\theta^T x \geq 1$ (not just ≥ 0)
- If $y = 0$, we want $\theta^T x \leq -1$ (not just < 0)

$\theta^T x \geqslant 1$

$\theta^T x \leqslant -1$

$C = 100{,}000$

SVM Decision Boundary

minimization objective

este 1.º termo =0

$$\min_\theta C\sum_{i=1}^{m}\left[y^{(i)}cost_1(\theta^T x^{(i)}) + (1-y^{(i)})cost_0(\theta^T x^{(i)})\right] + \frac{1}{2}\sum_{i=1}^{n}\theta_j^2$$

$= 0$

Whenever $y^{(i)} = 1$:

$\theta^T x^{(i)} \geq 1$

$\min_\theta \frac{1}{2}\sum_{j=1}^{n}\theta_j^2$

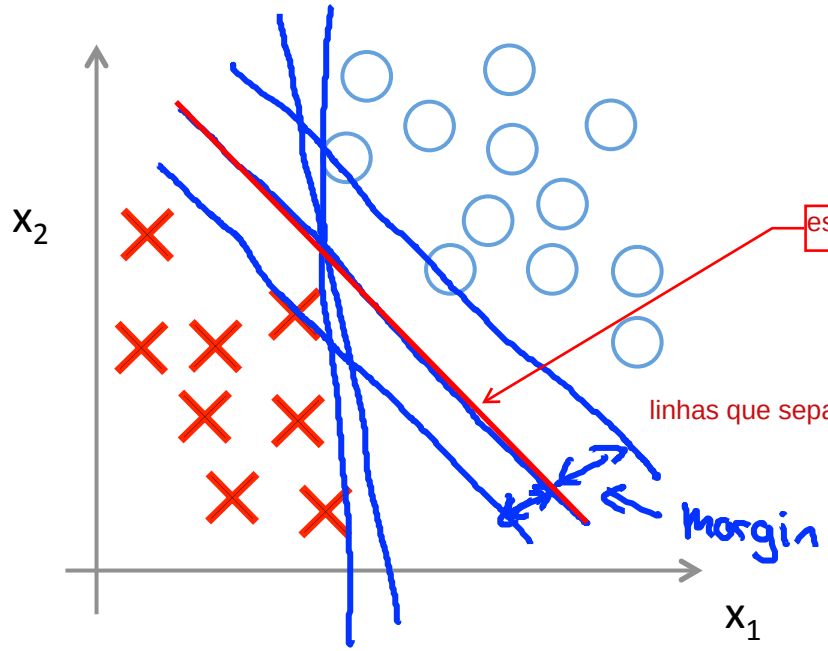
s.t. $\theta^T x^{(i)} \geq 1$ if $y^{(i)} = 1$

$\theta^T x^{(i)} \leq -1$ if $y^{(i)} = 0$

Whenever $y^{(i)} = 0$:

$\theta^T x^{(i)} \leq -1$

SVM Decision Boundary: Linearly separable case



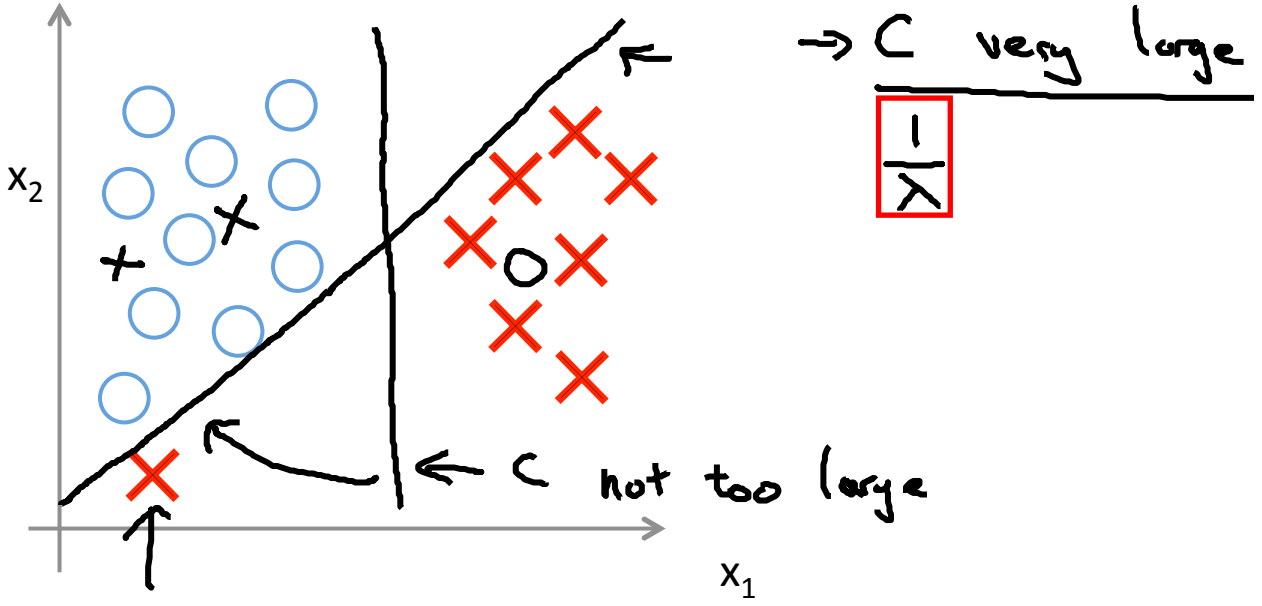
este linha temdistancia chamada margin

linhas que separam + dos -

a linha da ao SVM uma robustez pois tenta separar os dados com maior margem possivel

Large margin classifier

Large margin classifier in presence of outliers



se C for grande mudamos linha decision boundary