SUPPORT VECTOR MACHINES

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About Me

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Outline

- Linear Classifiers and Motivation
- Large Margin Intuition
- Objective Function
- Applications

Linear Classifiers

- Simple Example
  - AND gate

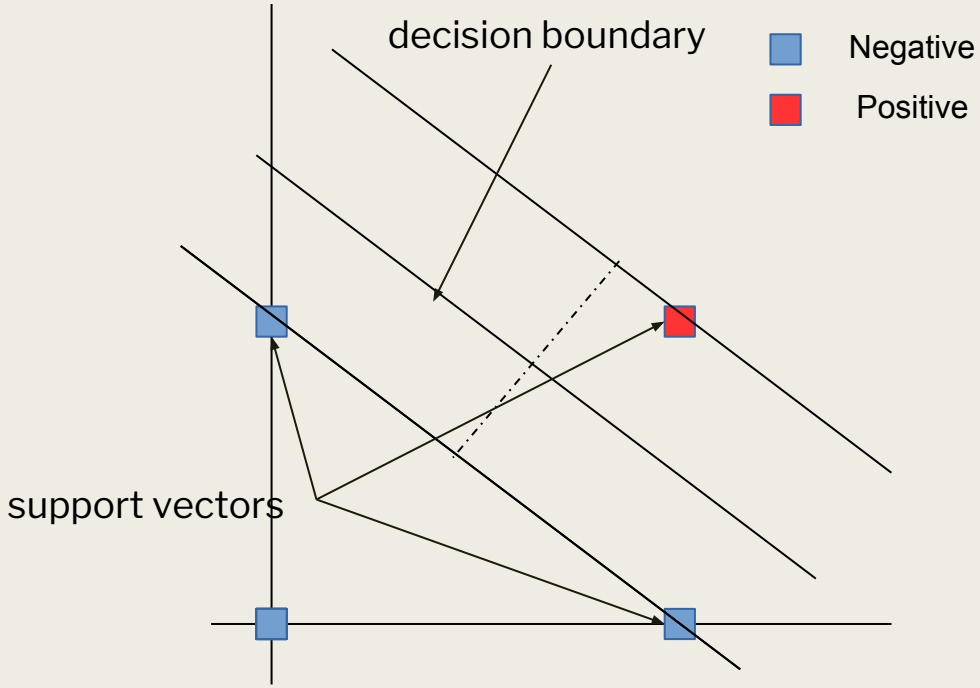
x1	x2	y
0	0	0
0	1	0
1	0	0
1	1	1

Which one to choose?

- Optimization
  - $Y = F(X) = W^T * X + b$
    - Initialize W and b to a random number and try to fit a line that separates positive and negative samples.

Large Margin Intuition

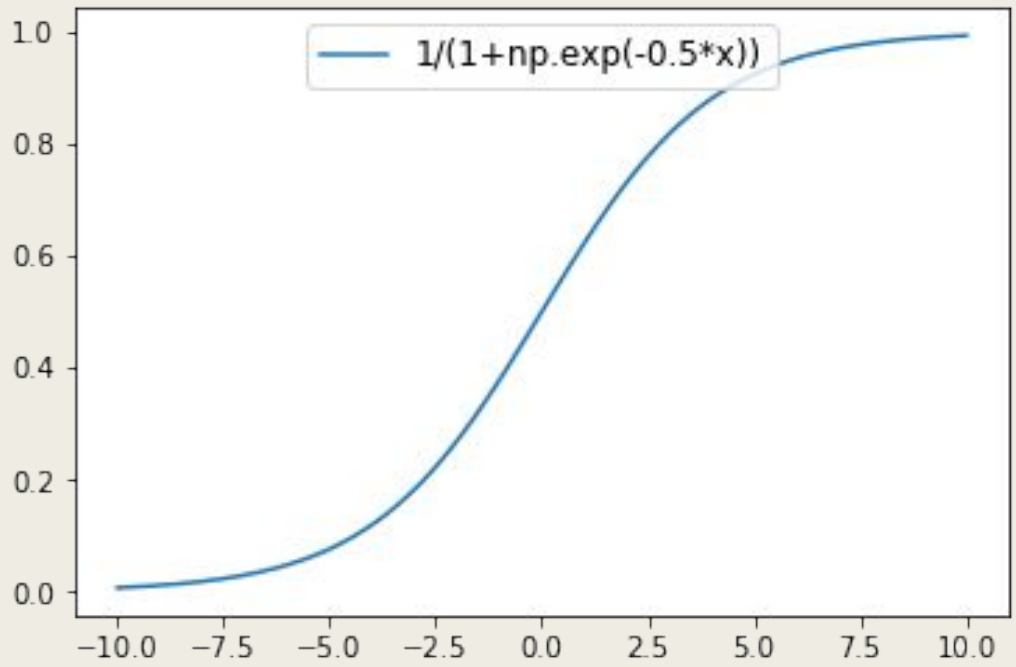
The best possible decision boundary is the one which classifies the positive and negative samples with the largest “margin” between them.



Objective Function Logistic Regression

$$J = \frac{-1}{m}\sum_{i=1}^{m}\left[y * log\left(h(x)\right) + (1-y) * \log(1-h(x))\right]$$

Where, $h(x) = {}^{1}/_{(1+e^{-\theta t}*x)}$



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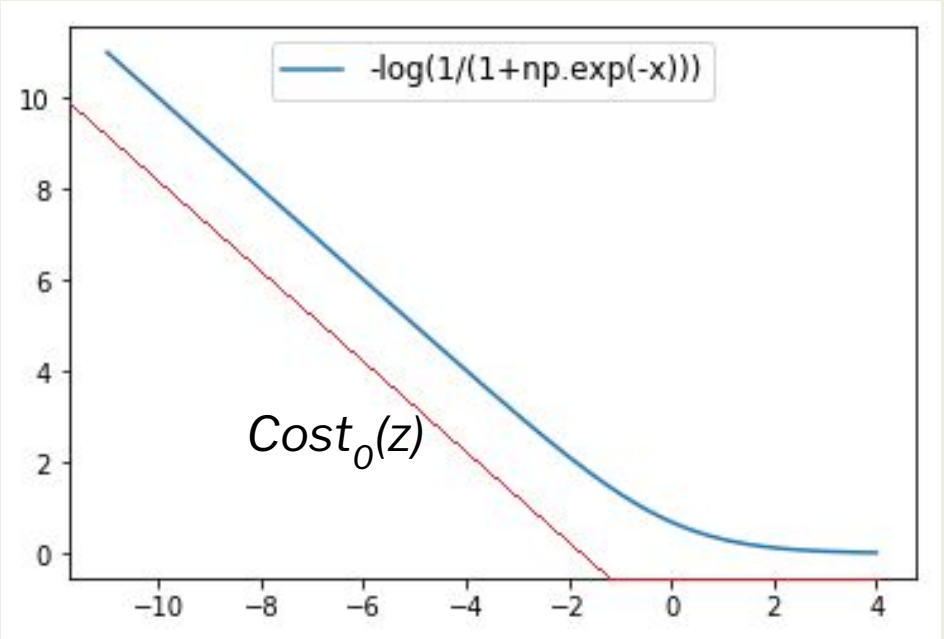

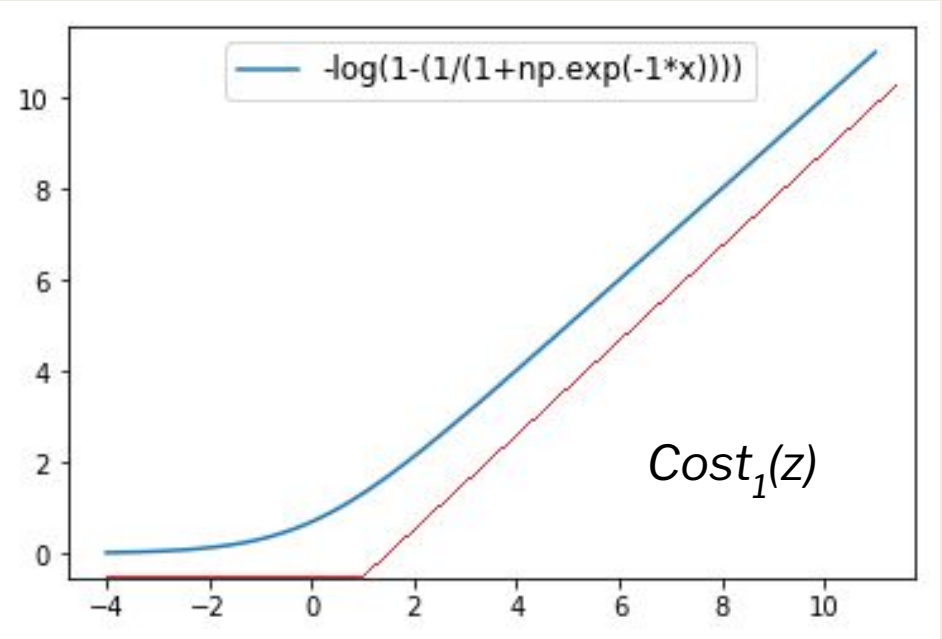

Modified Objective Function

$$J = \frac{-1}{m}\sum_{i=1}^{m}[y * Cost_1(\theta^t * x) + (1-y) * Cost_0(\theta^t * x)]$$

We want when y = 1, $\theta^t * x >= 1$

and when y = 0, $\theta^t * x <= -1$

- Find the theta for which this cost function is the minimum which can be found by solving this constrained optimization using the “method of Lagrange’s multipliers”.

References

- Dataset : http://archive.ics.uci.edu/ml/datasets/Sentiment+Labelled+Sentences
- Library used for training : https://sklearn.org/
- Explanation of Constrained Optimisation : https://www.khanacademy.org/math/multivariable-calculus/applications-of-multivariable-derivatives/lagrange-multipliers-and-constrained-optimization/v/constrained-optimization-introduction