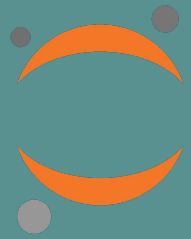
Machine Learning
- Aula 2

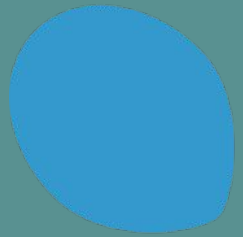
1 - Python

2 - Pacotes

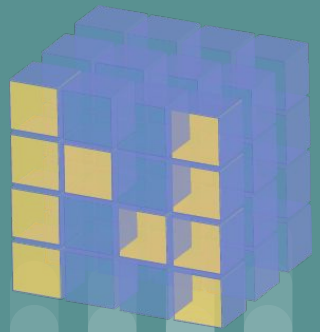


jupyter

matplotlib



scikit learn

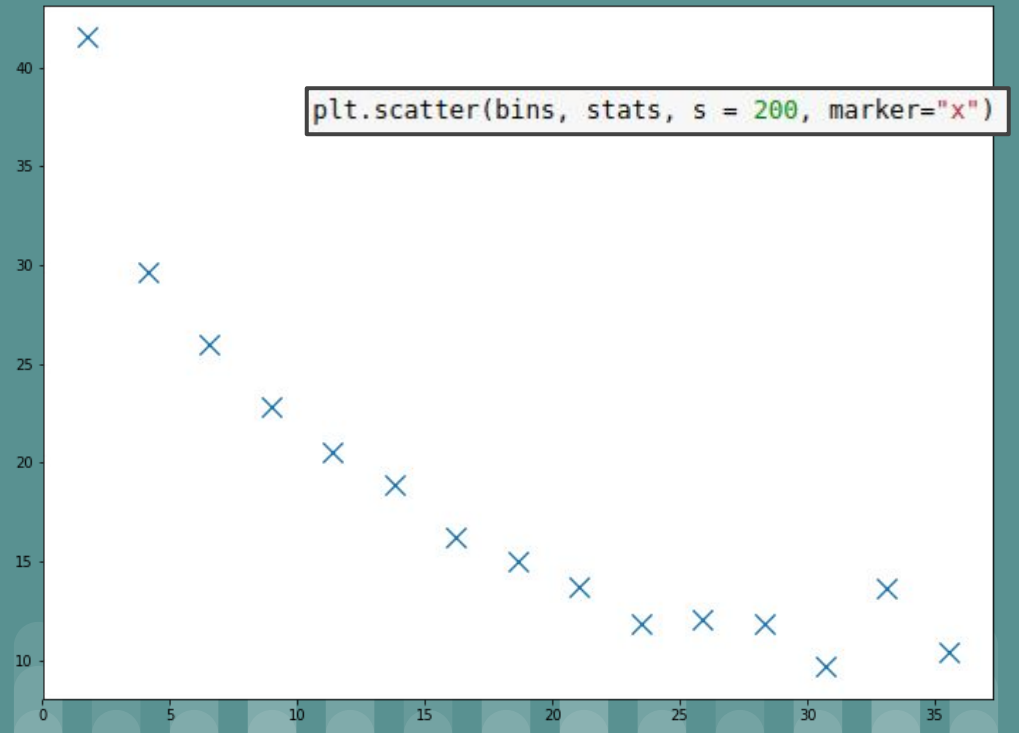


pandas

$$y_i t = \beta' x_{it} + \mu_i + \epsilon_{it}$$

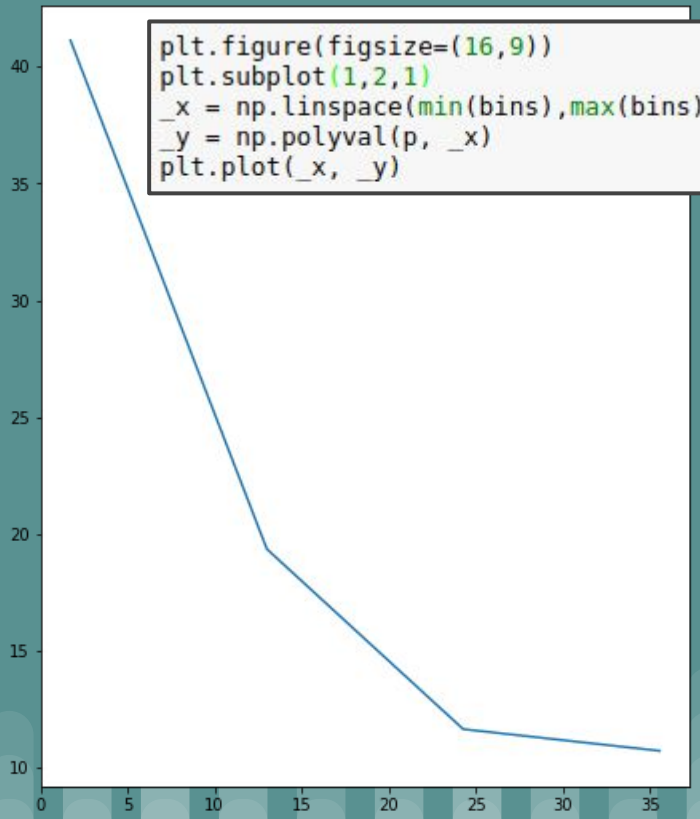
3 - *Plotagem*

Scatter plot



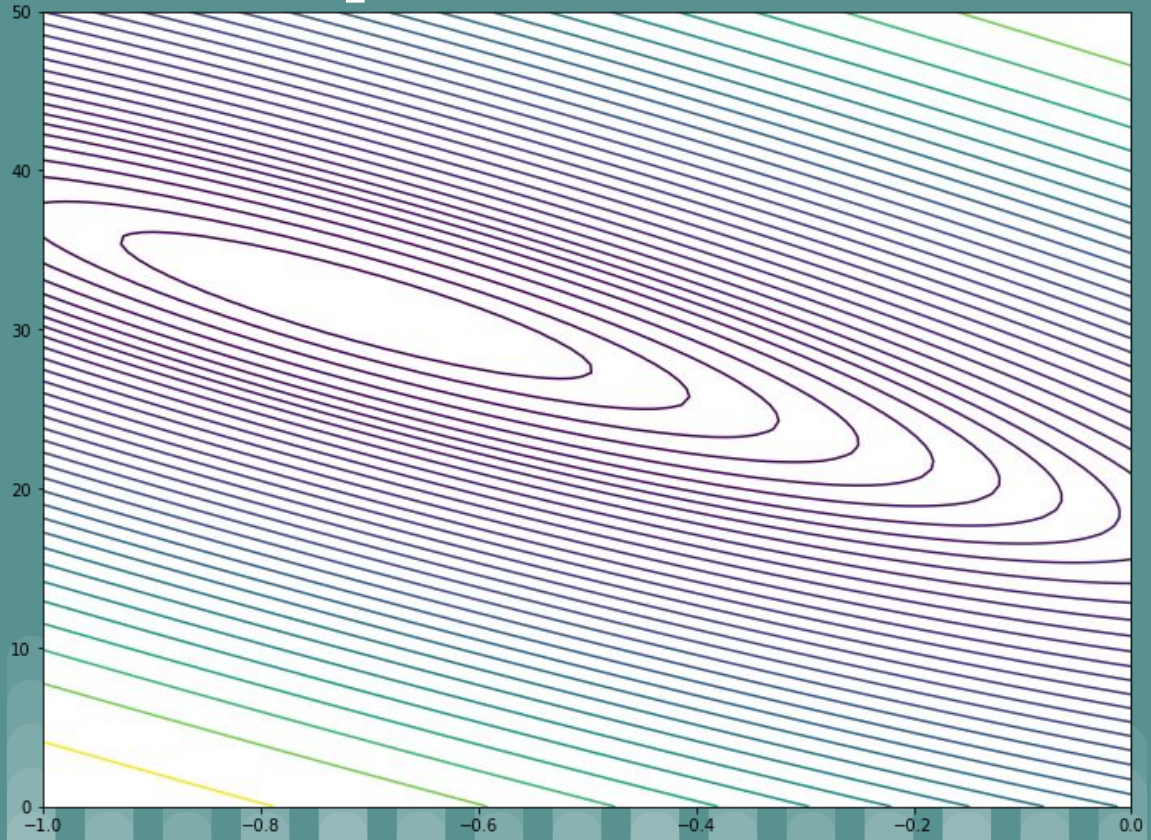
Default plot

```
plt.figure(figsize=(16,9))
plt.subplot(1,2,1)
_x = np.linspace(min(bins),max(bins), 4)
_y = np.polyval(p, _x)
plt.plot(_x, _y)
```

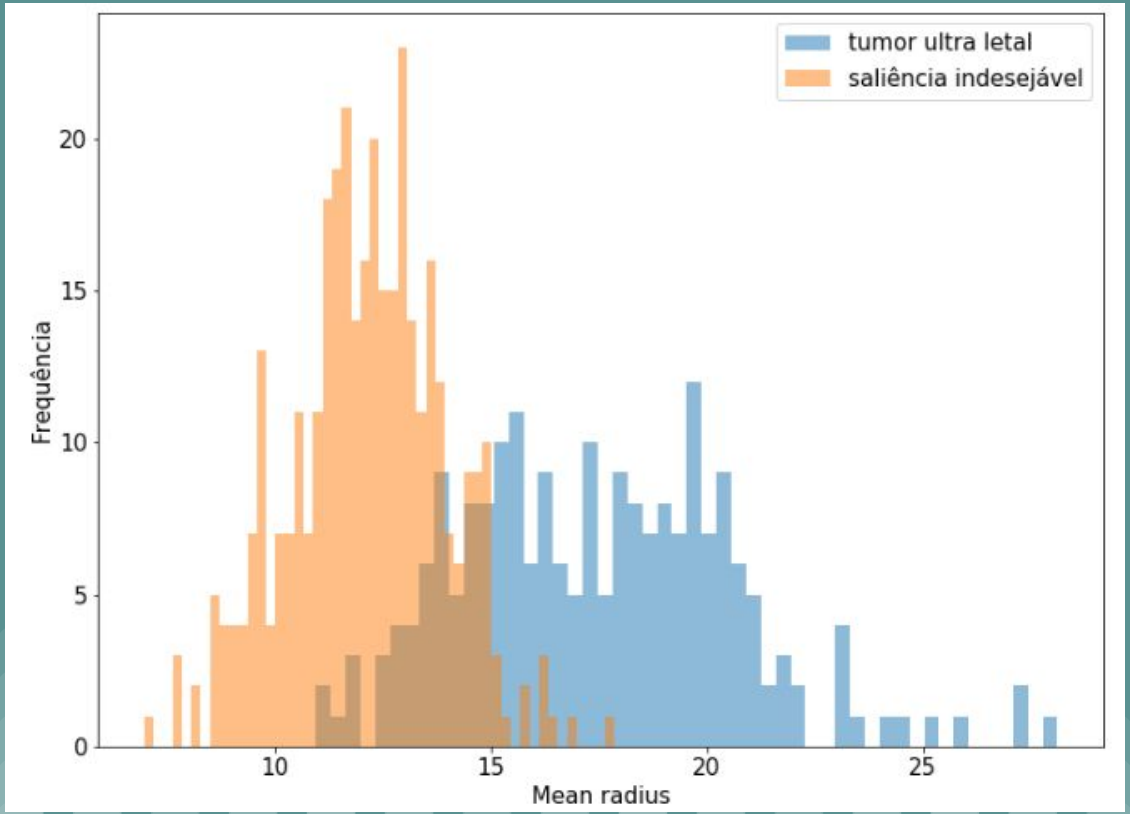



```
plt.subplot(1,2,2)
_x = np.linspace(min(bins),max(bins), 40)
_y = np.polyval(p, _x)
plt.plot(_x, _y)
```

Contour plot



Histograma


tumor ultra letal
saliência indesejável
Frequência
Mean radius
0
5
10
15
20
10
15
20
25

4 - Revisão

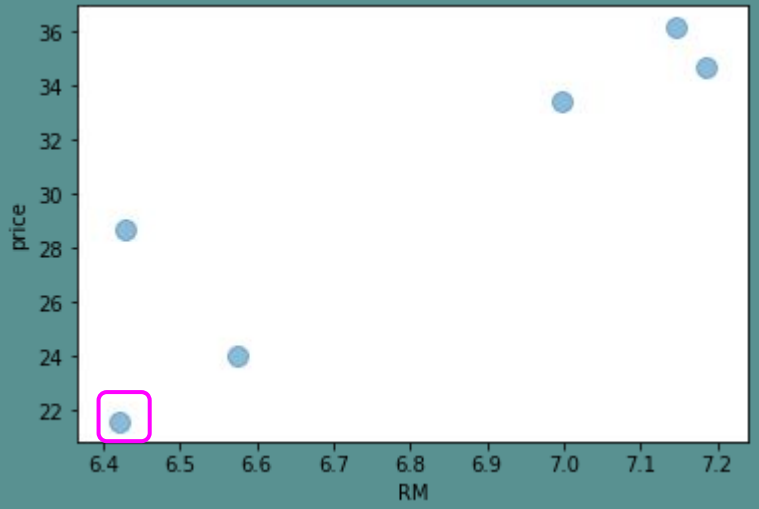
4.1 - Regressão

Regressão:

Quando o valor que queremos prever para uma dada instância é uma quantidade

Base de Dados

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	price
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	24.0
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	21.6
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	34.7
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	33.4
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	36.2



Predição e Erro

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	price
96	0.11504	0.0	2.89	0.0	0.445	6.163	69.6	3.4952	?
97	0.12083	0.0	2.89	0.0	0.445	8.069	76.0	3.4952	?
98	0.08187	0.0	2.89	0.0	0.445	7.820	36.9	3.4952	?
99	0.06860	0.0	2.89	0.0	0.445	7.416	62.5	3.4952	?
100	0.14866	0.0	8.56	0.0	0.520	6.727	79.9	2.7778	?

$h_\Theta(x) = \Theta_0 + \Theta_1 x$

Predição

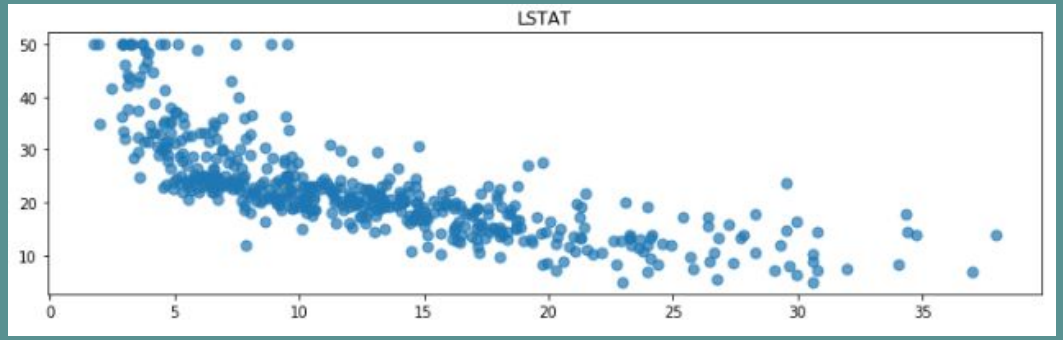
Real

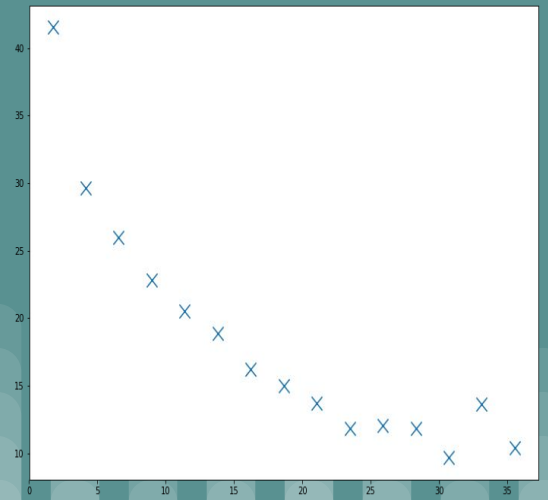
price
20.8
39.0
43.0
25.1
28.9

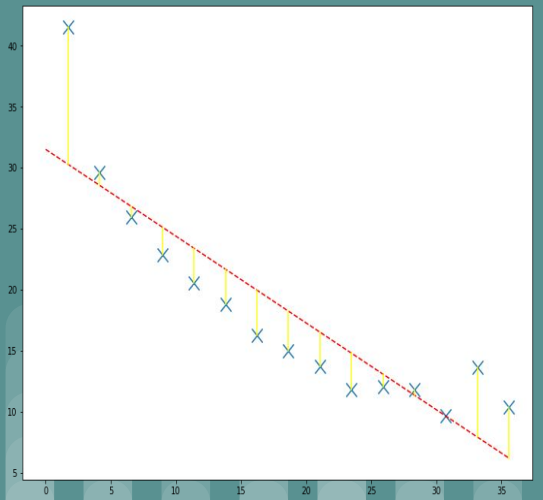
X

price
21.4
38.7
43.8
33.2
27.5

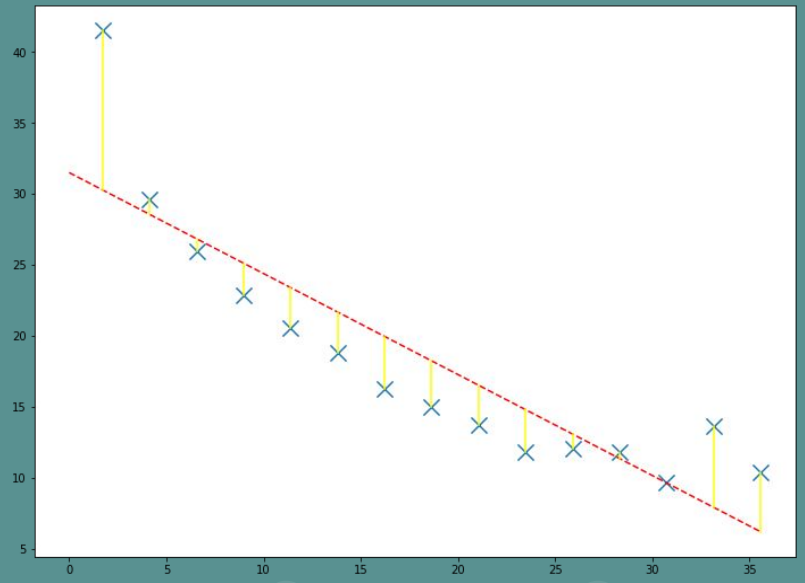
Regressão

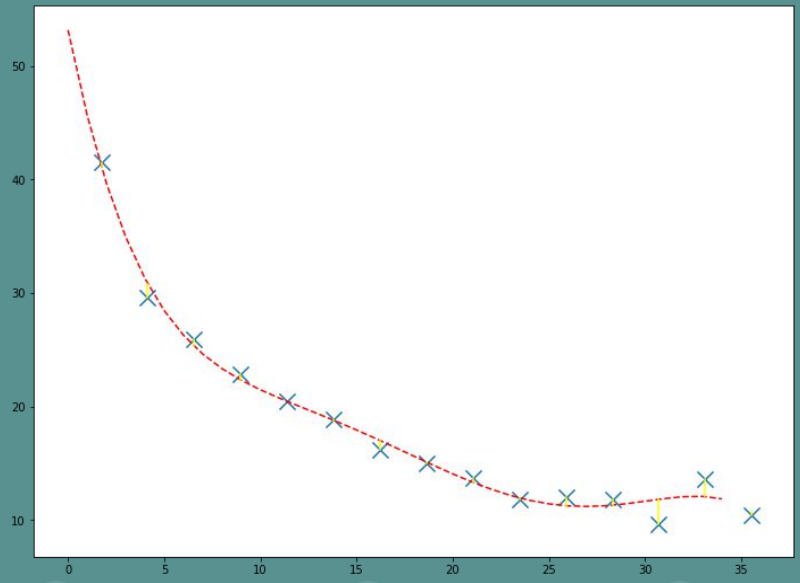




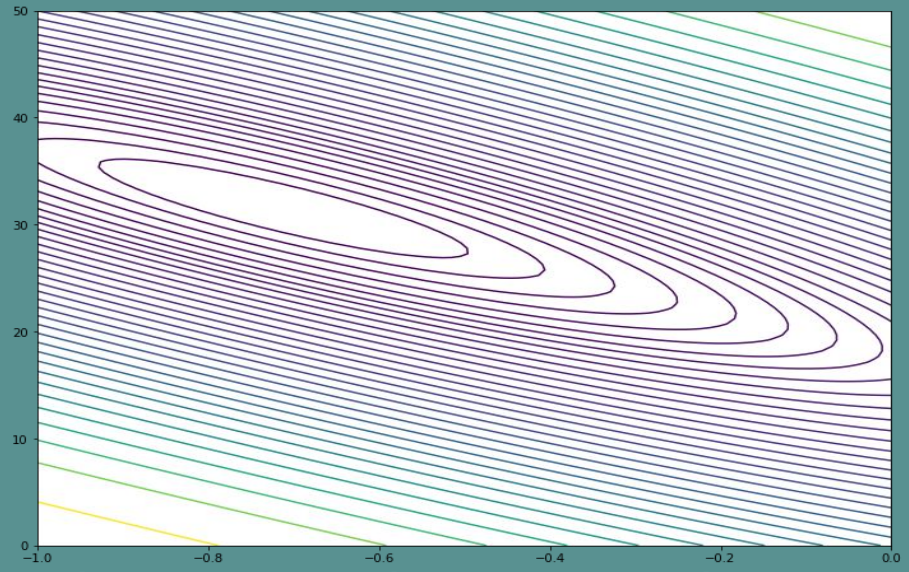


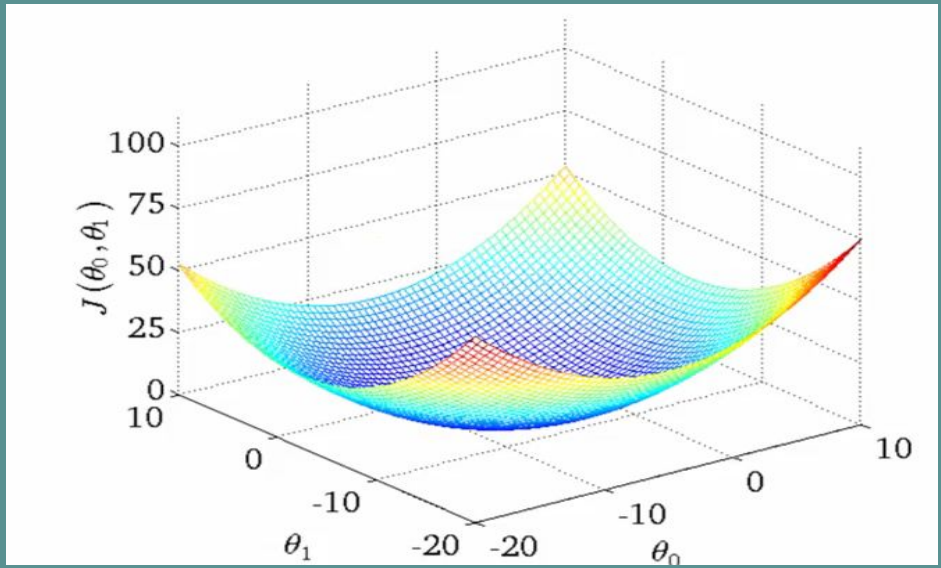
Custo


40
35
30
25
20
15
10
5
0
5
10
15
20
25
30
35


50
40
30
20
10
0
5
10
15
20
25
30
35

Custo


50
40
30
20
10
0
−1.0
−0.8
−0.6
−0.4
−0.2
0.0


100
75
50
25
0
$J(\theta_0, \theta_1)$
10
0
-10
-20
θ_1
-20
-10
0
10
θ_0

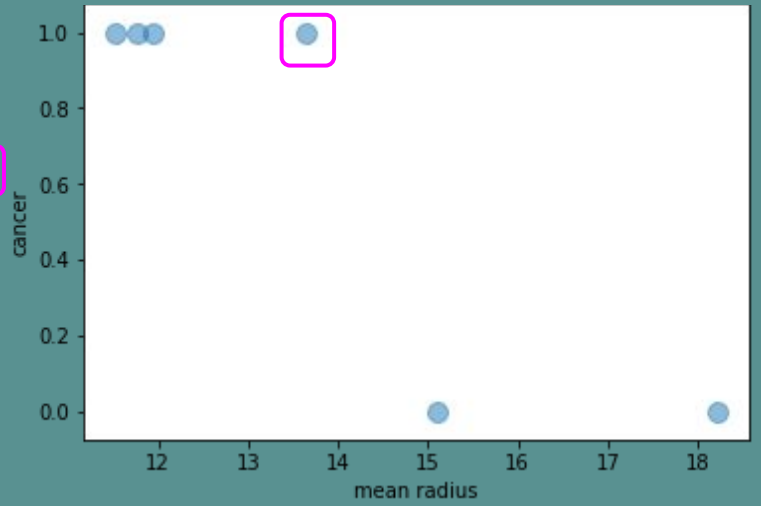
4.2 - Classificação

Classificação:

Quando o valor que queremos prever para uma dada instância é uma classe (um valor categórico)

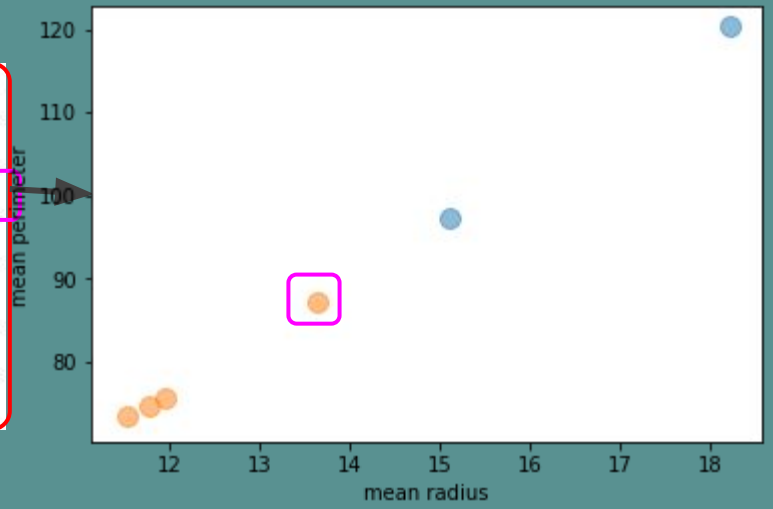
Base de Dados

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	cancer
50	11.76	21.60	74.72	427.9	0.08637	1
51	13.64	16.34	87.21	571.8	0.07685	1
52	11.94	18.24	75.71	437.6	0.08261	1
53	18.22	18.70	120.30	1033.0	0.11480	0
54	15.10	22.02	97.26	712.8	0.09056	0
55	11.52	18.75	73.34	409.0	0.09524	1



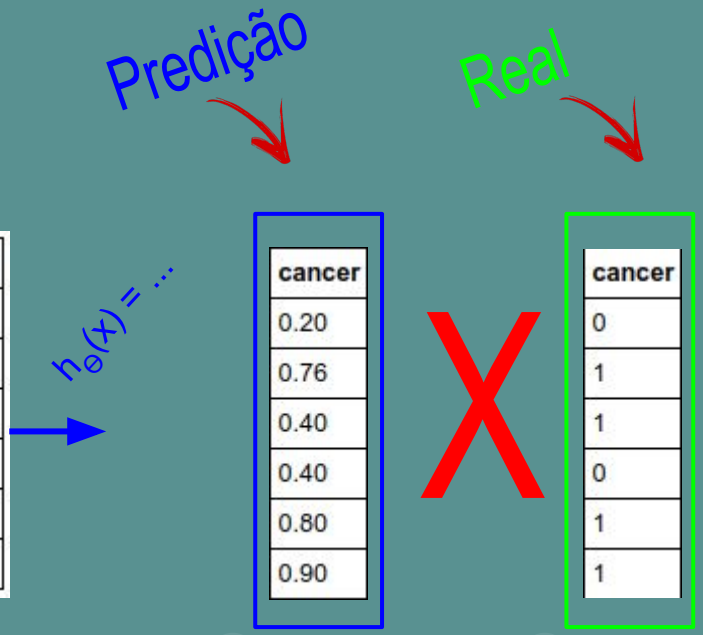
Base de Dados

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	cancer
50	11.76	21.60	74.72	427.9	0.08637	1
51	13.64	16.34	87.21	571.8	0.07685	1
52	11.94	18.24	75.71	437.6	0.08261	1
53	18.22	18.70	120.30	1033.0	0.11480	0
54	15.10	22.02	97.26	712.8	0.09056	0
55	11.52	18.75	73.34	409.0	0.09524	1

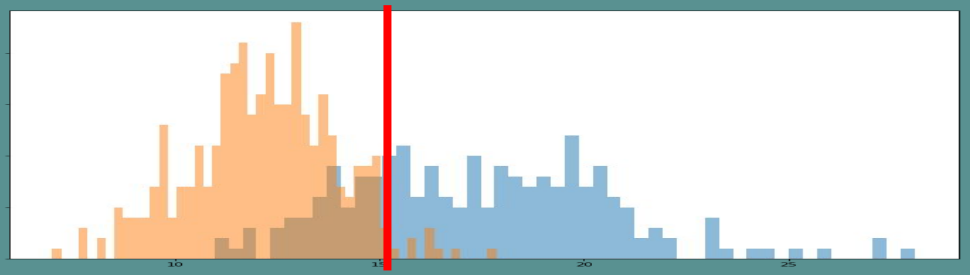


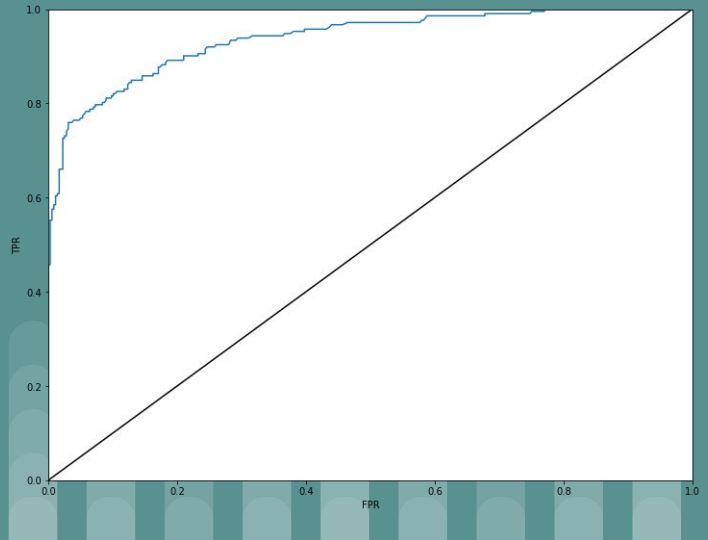
Predição e Erro

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	cancer
105	13.110	15.56	87.21	530.2	0.13980	?
106	11.640	18.33	75.17	412.5	0.11420	?
107	12.360	18.54	79.01	466.7	0.08477	?
108	22.270	19.67	152.80	1509.0	0.13260	?
109	11.340	21.26	72.48	396.5	0.08759	?
110	9.777	16.99	62.50	290.2	0.10370	?



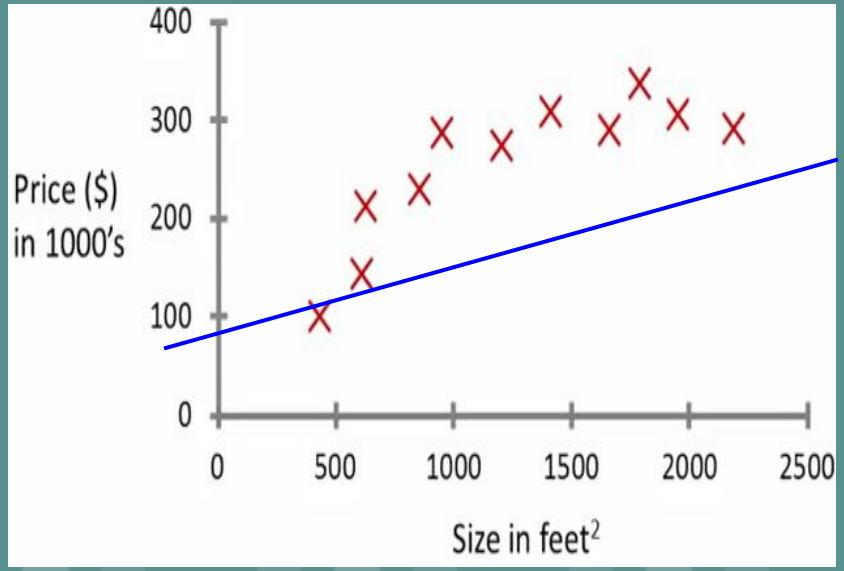
Classificação

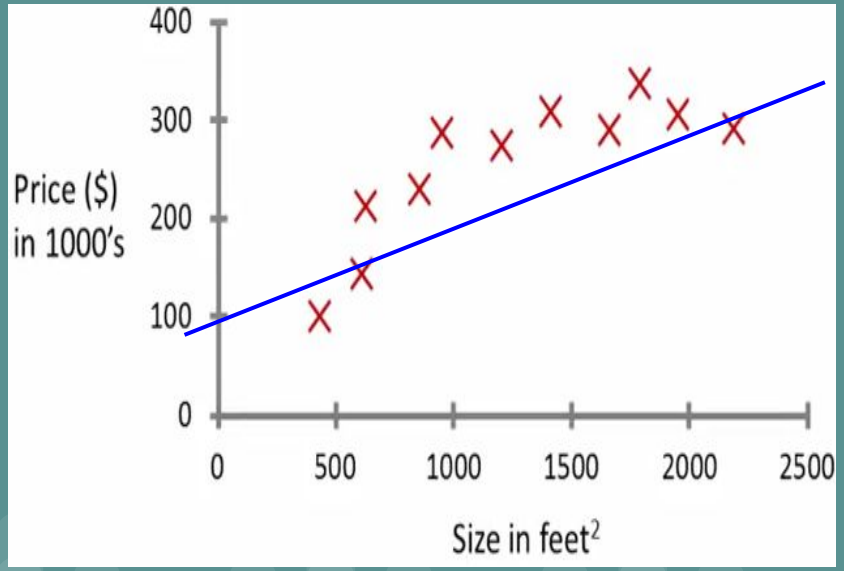




4.3 - Aprendizagem

Ajustar modelo (to fit a model)





Gradient descent:

Repeat $\{$

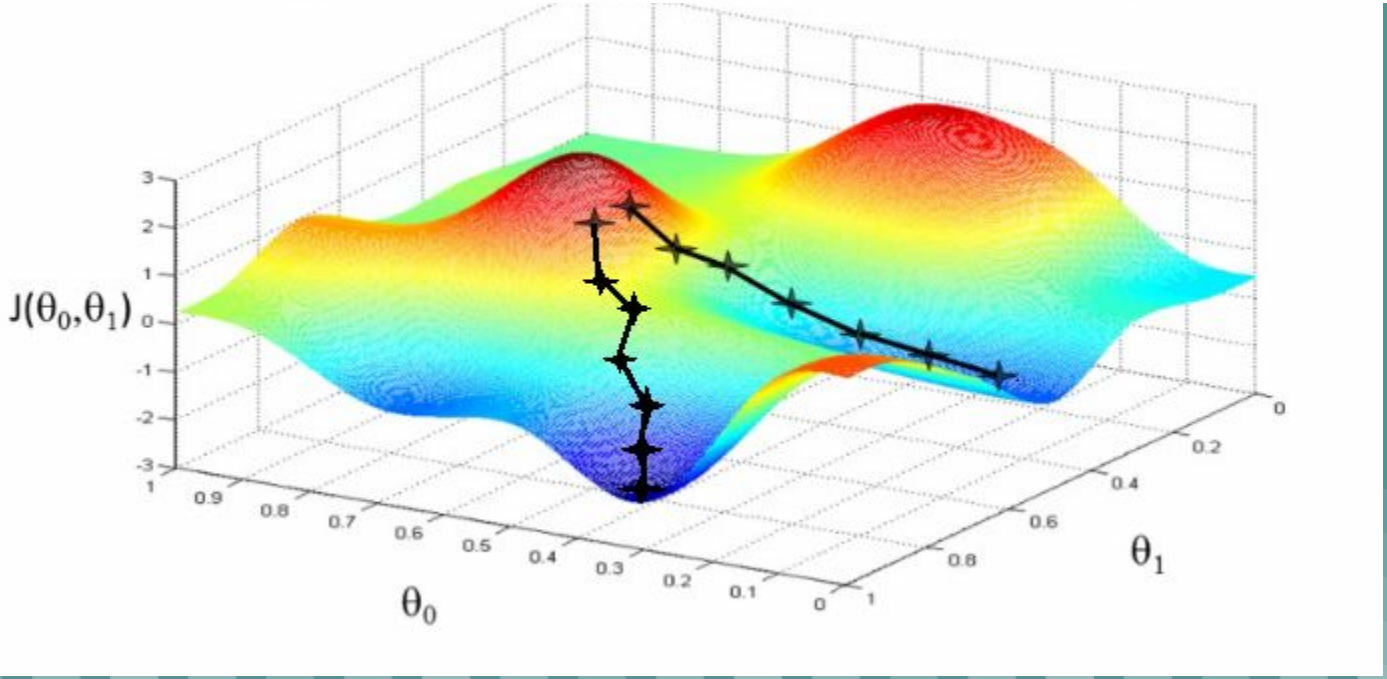
$$\theta_j := \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta_0, \ldots, \theta_n)$$

$\}$

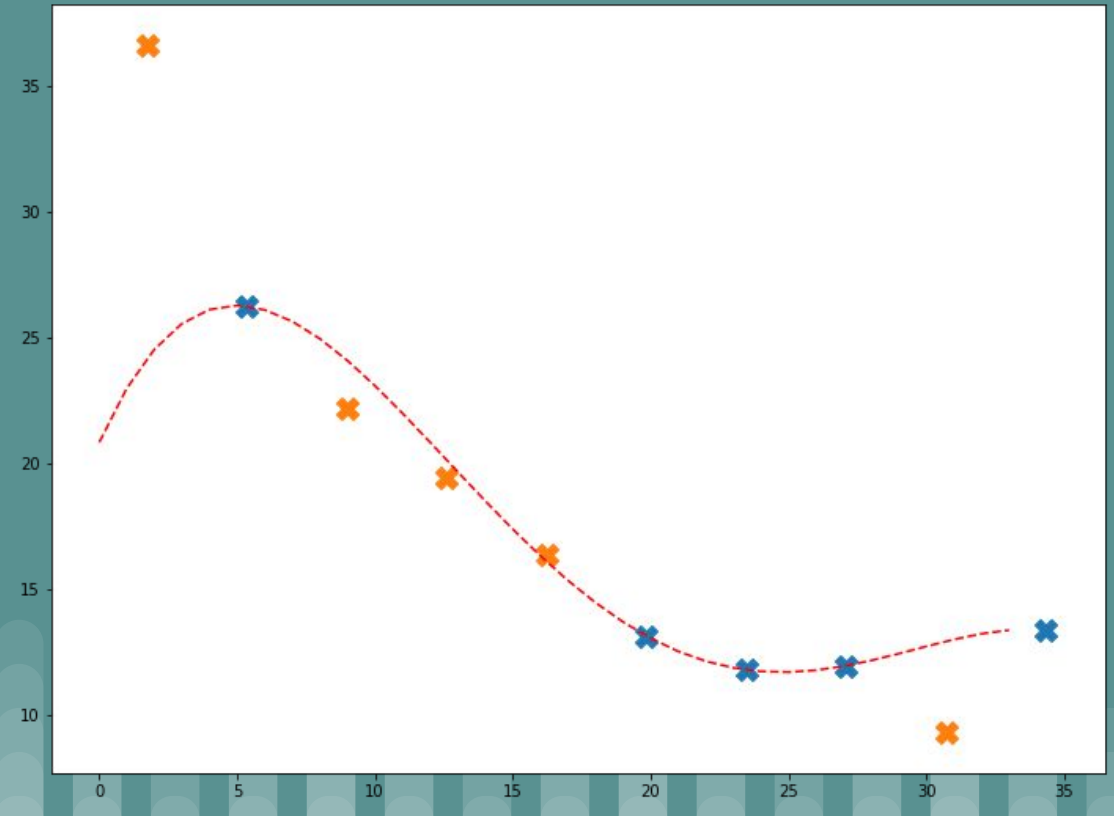
$$\frac{1}{2m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)})^2$$

1:24

(simultaneously update for every $j = 0, \ldots, n$)

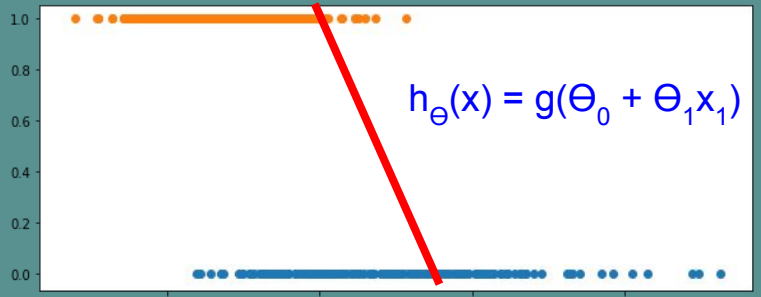


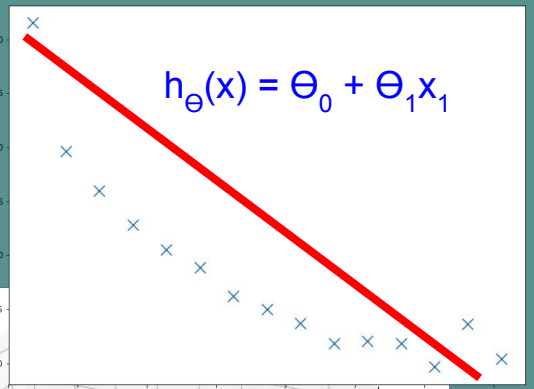
Validação

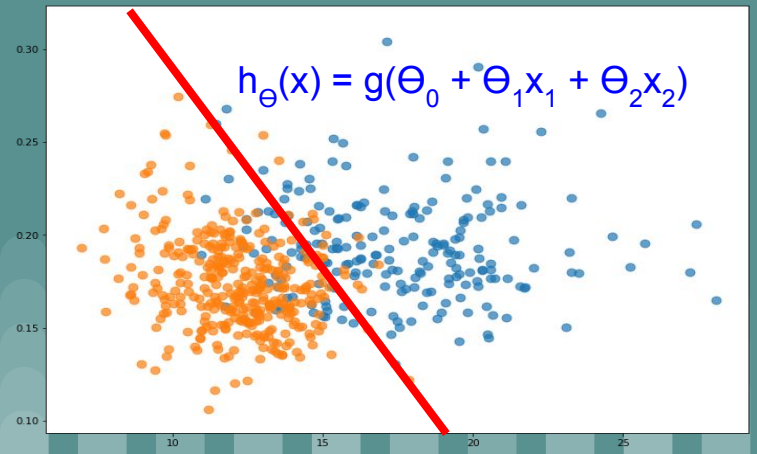


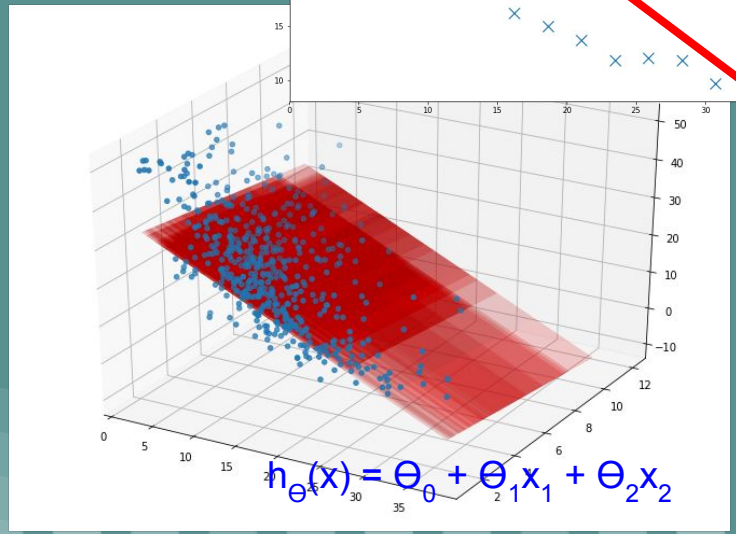
5 - Redes Neurais

Reta, Plano, Hiperplano









Reta, Plano, Hiperplano

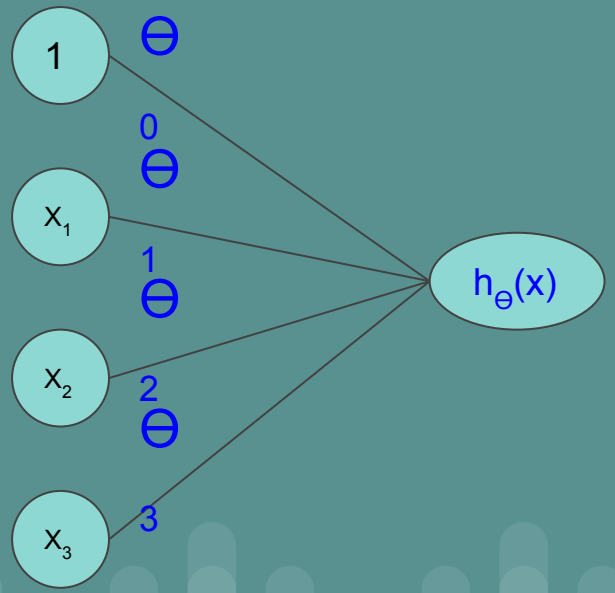
$$h_\Theta(x) = \Theta_0 + \Theta_1 x_1 + \Theta_2 x_2 + \Theta_2 x_2$$

$$ax + by + cz + d = 0$$

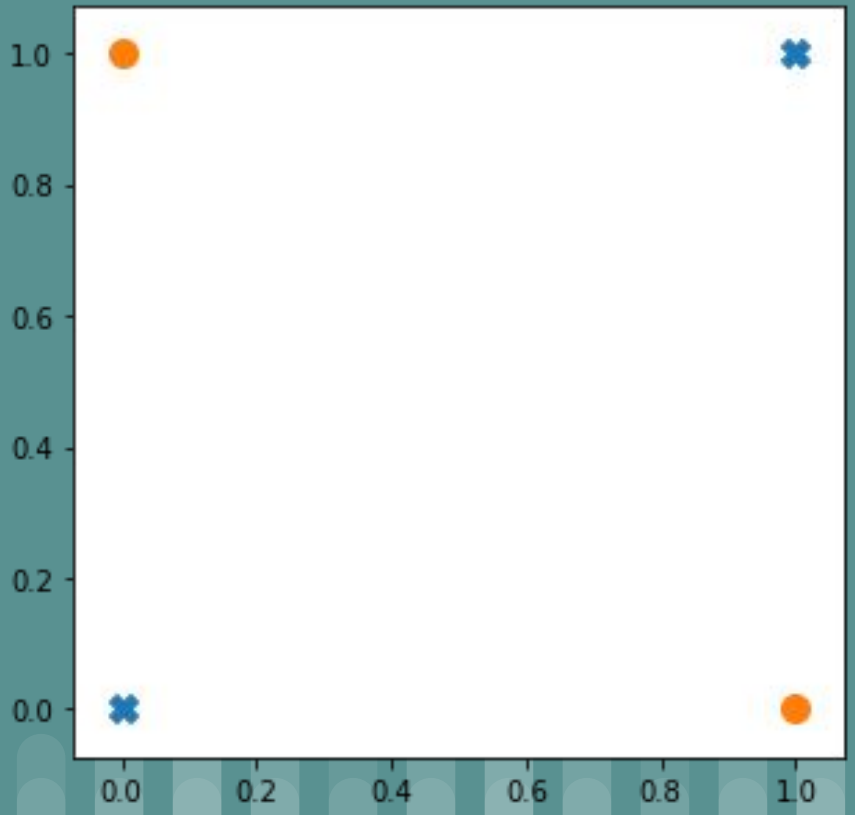
Representação gráfica

$$h_\Theta(x) = \Theta_0 + \mathbf{\Sigma}\ \Theta_i x_i$$

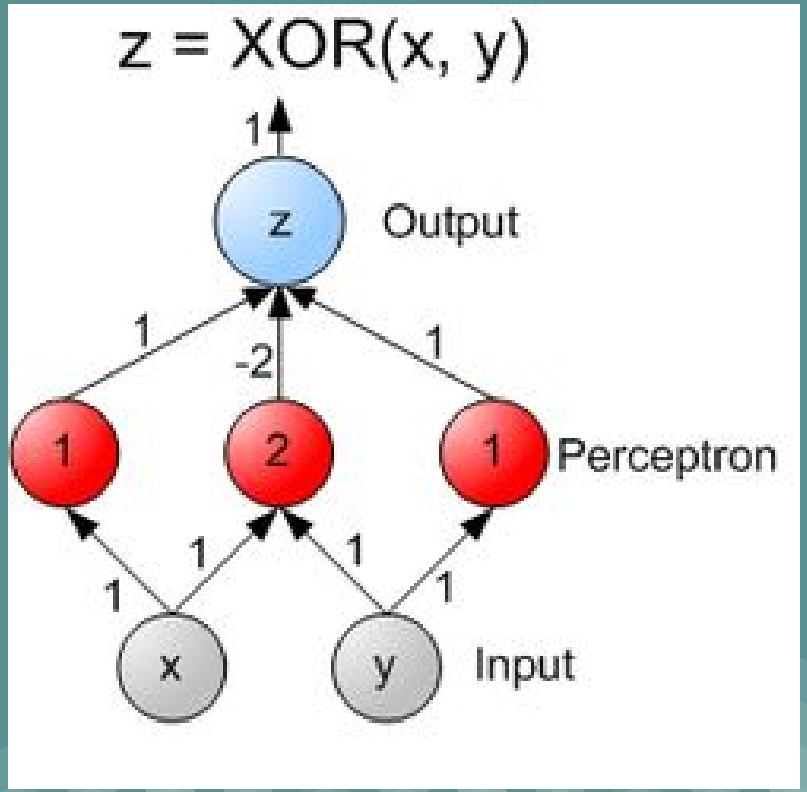
$$h_\Theta(x) = \mathbf{\Theta}\ .\ \mathbf{x}$$



XOR



XOR



Mas e o treino?

...

Mas e o treino?

Não muda!

Gradient descent:

Repeat $\{$

$$\theta_j := \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta_0, \ldots, \theta_n)$$

$\}$ 1:24 (simultaneously update for every $j = 0, \ldots, n$)