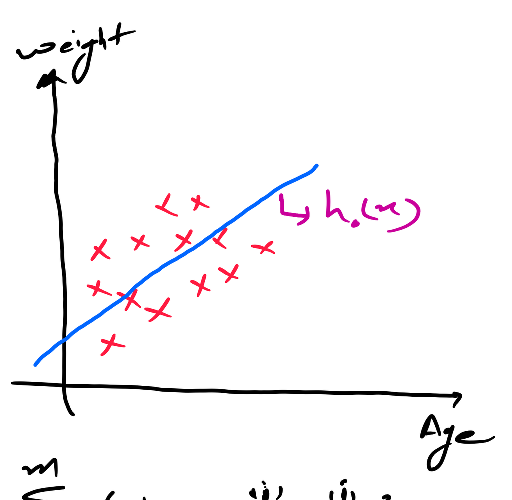
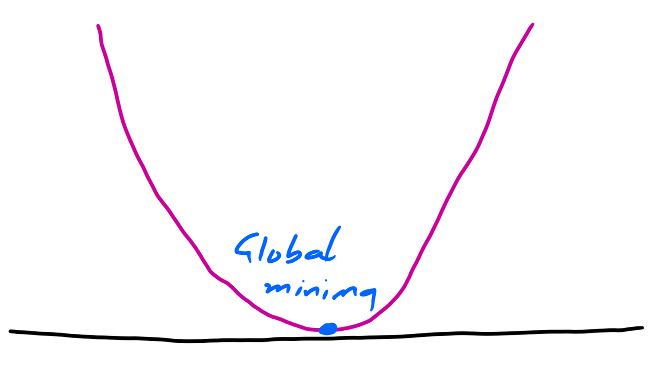
Linear Regression

$h_\theta(x) = \theta_0 + \theta_1 x_1$



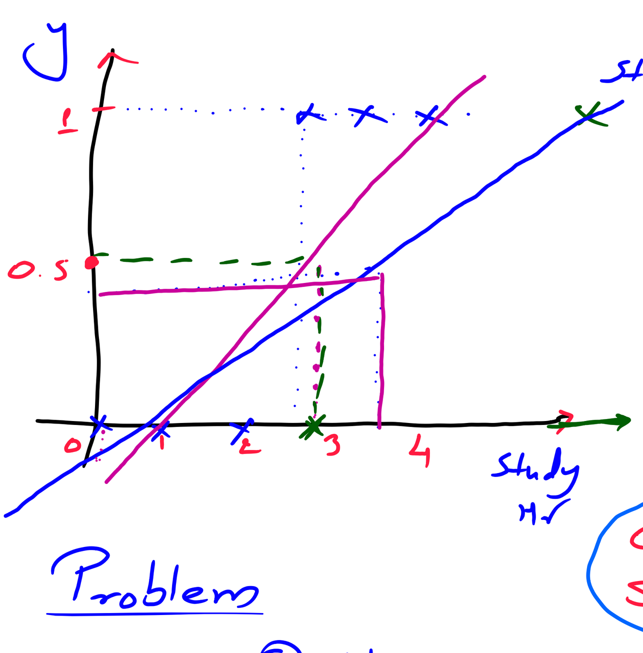
Cost function

$$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} (h_\theta(x)^{(i)} - y^{(i)})^2$$



Logistic Regression

Use for Classification

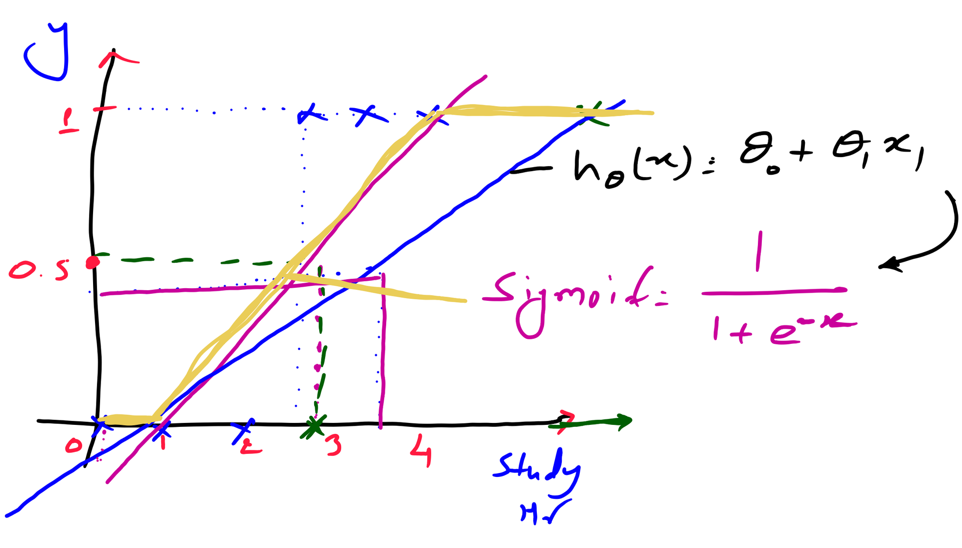


Study Hr	Pass/Fail
3	P
2.5	P
1	F
0	F
2	F
4	P

O/p of classification Should be 0 or 1

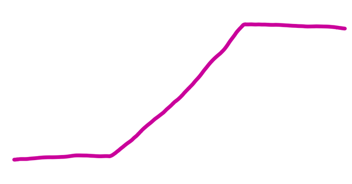
Problem

1. Outlier
2. >1 or <0



I want write $h_\theta(x)$ using Sigmoid funⁿ

$h_\theta(x) = g(\theta_0 + \theta_1 x_1)$



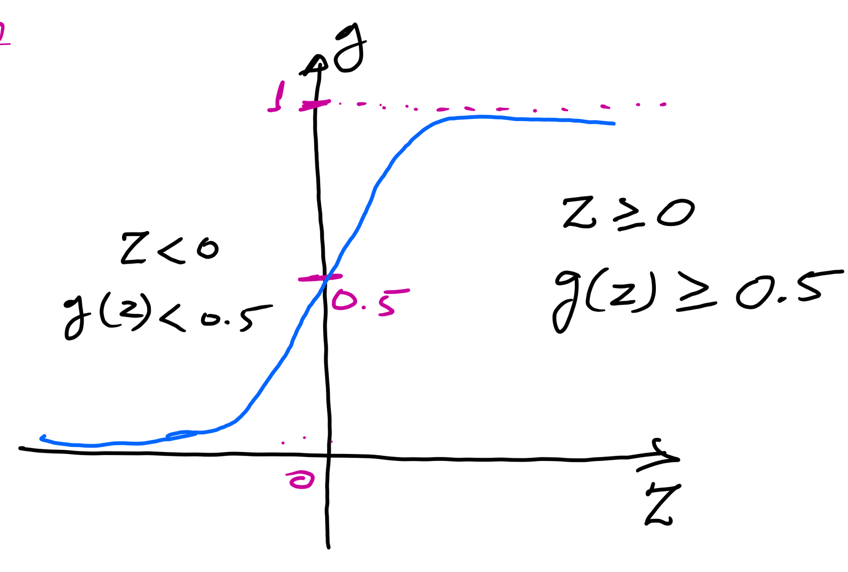
$g = \frac{1}{1+e^{-Z}}$ $\quad Z = \theta_0 + \theta_1 x_1$

$$\boxed{\begin{aligned} h_\theta(x) &= \frac{1}{1+e^{-(\theta_0 + \theta_1 x_1)}} \\ h_\theta(x) &: \theta_0 + \theta_1 x_1 \text{ (Linear)} \end{aligned}}$$

Hypothesis funⁿ

Sigmoid Function

$g : \frac{1}{1+e^{-Z}}$



Data Set

Training set

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

$x \in \begin{bmatrix} x_0 \\ x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}, \quad y \in \{0, 1\}$

$h_\theta(x) = \frac{1}{1+e^{-(\theta_0 + \theta_1 x)}}$ Hypothesis test

Linear Reg Cost funⁿ

$J(\theta_0, \theta_1) = \frac{1}{2M} \sum_{i=1}^{m} (h_\theta(x)^{(i)} - y^{(i)})^2$

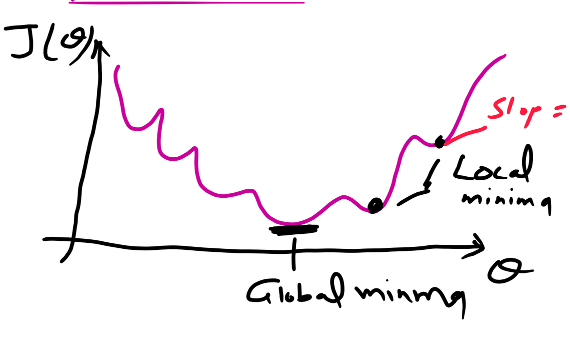
$h_\theta(x) = \theta_0 + \theta_1 x$

Logistic Reg Cost funⁿ

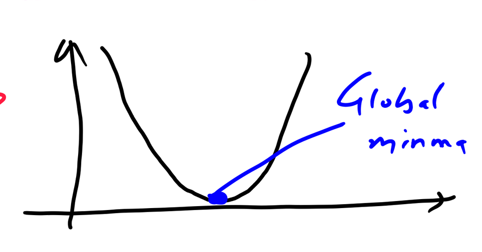
$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} (h_\theta(x)^{(i)} - y^{(i)})^2$

$h_\theta(x) = \frac{1}{1+e^{-(\theta_0 + \theta_1 x)}}$ Non Convex funⁿ

Non Convex



Convex



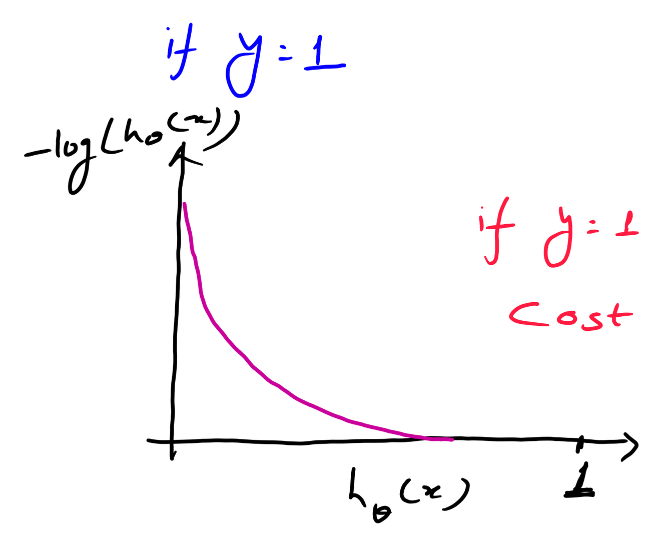
$J(\theta_0, \theta_1) = \frac{1}{2M} \sum_{i=1}^{m} (h_\theta(x)^{(i)} - y^{(i)})^2$

We can represent Cost funⁿ as

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

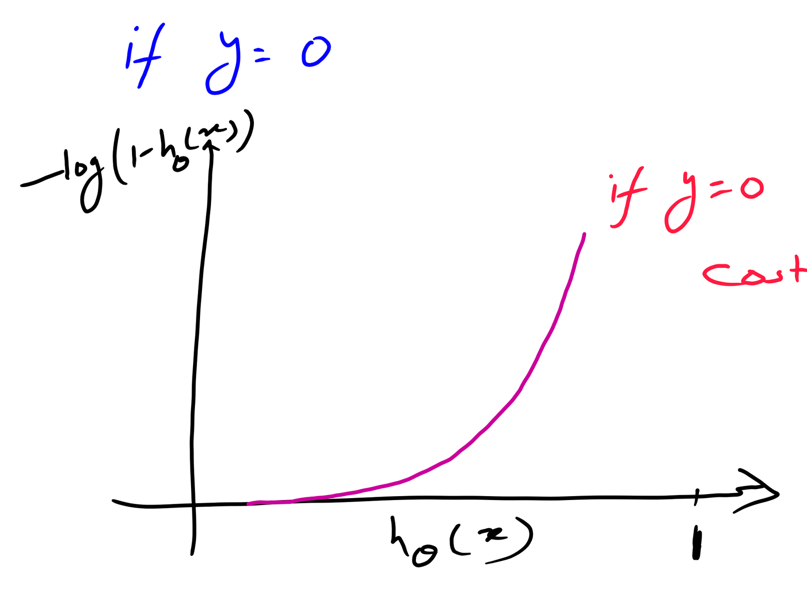
$$Cost(h_\theta(x)^{(i)}, y) = \begin{cases} -\log(h_\theta(x)) & \text{if } y=1 \\ -\log(1-h_\theta(x)) & \text{if } y=0 \end{cases}$$

if $y = 1$



if $y=1$ and $h_\theta(x)=1$
Cost $= 0$

if $y = 0$



if $y=0$ & $h_\theta(x)=0$
cost $= 0$

$$\boxed{\begin{aligned} &Cost(h_\theta(x), y) = \\ &-y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) \end{aligned}}$$

if $y=1$

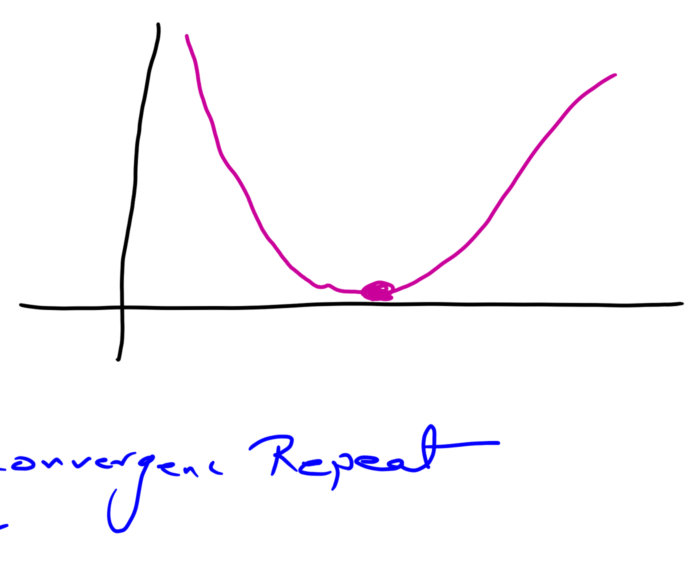
Cost : $-\log(h_\theta(x))$

if $y=0$

$= -\log(1-h_\theta(x))$

$$\boxed{J(\theta_0, \theta_1) = -\frac{1}{2m} \sum_{i=1}^{m} y^{(i)} \log h_\theta(x)^{(i)} + (1-y^{(i)}) \log(1-h_\theta(x)^{(i)})}$$

Cost funⁿ of Logistic Regration



Convergence Repeat

$\{$

$\theta_j := \theta_j - \alpha \frac{\partial \theta J(\theta_0, \theta_1)}{\partial \theta_j}$

$\}$

——— × ——— × ——— × ———

Steps

1. Import Dataset (salary, Purchased)
2. Split Dataset in Training & Testing Data Set
3. Feature Scaling
4. Define class for Logistic Regression
5. Prediction
6. Visualization