Evaluating your model

Dataset

size	price	
2104	400	70%
1600	330	
2400	369	
1400	232	
2500	270	
3580	125	
2105	380	
1200	607	30%
4282	555	
4900	700	

training set

m_{train} = no. training examples

= 7

$(x^{(1)}, y^{(1)})$
$(x^{(2)}, y^{(2)})$
$\vdots$
$(x^{(m_{train})}, y^{(m_{train})})$

test set

m_{test} = no. test examples

= 3

$(x^{(1)}, y^{(1)})$
$(x^{(2)}, y^{(2)})$
$\vdots$
$(x^{(m_{test})}, y^{(m_{test})})$

Train/test procedure for linear regression (with squared error cost)

Fits parameters by minimizing cost function $J(\vec{w}, b)$

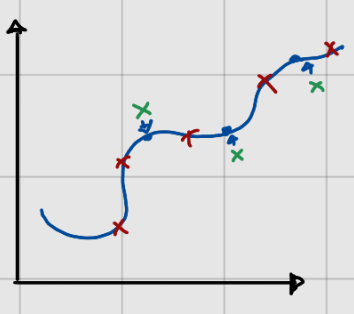
$$J(\vec{w}, b) = \left[\frac{1}{2 m_{train}} \sum_{i=1}^{m_{train}} \left(f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)} \right)^2 + \frac{\lambda}{2 m_{train}} \sum_{j=1}^{n} w_j^2 \right]$$

Compute test error

$$J_{test}(\vec{w}, b) = \left[\frac{1}{2 m_{test}} \sum_{i=1}^{m_{test}} \left(f_{\vec{w},b}(\vec{x}_{test}^{(i)}) - y_{test}^{(i)} \right)^2 \right]$$

Compute train error

$$J_{train}(\vec{w}, b) = \left[\frac{1}{2 m_{train}} \sum_{i=1}^{m_{train}} \left(f_{\vec{w},b}(\vec{x}_{train}^{(i)}) - y_{train}^{(i)} \right)^2 \right]$$



x = train

x = test

$J_{train}(\vec{w}, b)$ will be low

$J_{test}(\vec{w}, b)$ will be high

Train/test procedure for classification problem (0/1)

Fits parameters by minimizing $J(\vec{w}, b)$ to find $\vec{w}, b$

$$J(\vec{w}, b) = -\frac{1}{m_{train}} \sum_{i=1}^{m_{train}} \left[y^{(i)} \log\left(f_{\vec{w},b}(\vec{x}^{(i)})\right) + (1 - y^{(i)}) \log\left(1 - f_{\vec{w},b}(x^{(i)})\right) \right] + \frac{\lambda}{2 m_{train}} \sum_{j=1}^{n} w_j^2$$

Compute test error

$$J_{test}(\vec{w}, b) = -\frac{1}{m_{test}} \sum_{i=1}^{m_{test}} \left[y_{test}^{(i)} \log\left(f_{\vec{w},b}(\vec{x}_{test}^{(i)})\right) + (1 - y_{test}^{(i)}) \log\left(1 - f_{\vec{w},b}(x_{test}^{(i)})\right) \right]$$

Compute train error

$$J_{train}(\vec{w}, b) = -\frac{1}{m_{train}} \sum_{i=1}^{m_{train}} \left[y_{train}^{(i)} \log\left(f_{\vec{w},b}(\vec{x}_{train}^{(i)})\right) + (1 - y_{train}^{(i)}) \log\left(1 - f_{\vec{w},b}(x_{train}^{(i)})\right) \right]$$

Fraction of the test set and the fraction of the train set that the algorithm has misclassified

$$\hat{y} = \begin{cases} 1 \text{ if } f_{\vec{w},b}(\vec{x}^{(i)}) \geq 0.5 \\ 0 \text{ if } f_{\vec{w},b}(\vec{x}^{(i)}) < 0.5 \end{cases}$$

count $\hat{y} \neq y$

$J_{test}(\vec{w}, b)$ is the fraction of the test set that has been misclassified

$J_{train}(\vec{w}, b)$ is the fraction of the train set that has been misclassified

Training /test set / cross validation

validation set
development set
dev set

size	price		
2104	400	60%	Training set
1600	380		
2400	369		
1400	232		
2500	270		
3580	125		
205	380	20%	cross-validation set
1200	607		
4282	555	20%	test set
4500	700		

$(x^{(1)}, y^{(1)}) \ldots (x^{(m_{train})}, y^{(m_{train})})$ $\quad m_{train} = 6$

$(x_{cv}^{(1)}, y_{cv}^{(1)}) \ldots (x_{cv}^{(m_{cv})}, y_{cv}^{(m_{cv})})$ $\quad m_{cv} = 2$

$(x^{(1)}, y^{(1)}) \ldots (x^{(m_{test})}, y^{(m_{test})})$ $\quad m_{test} = 2$

Training error : $J_{train}(\vec{w}, b) = \left[\frac{1}{2m_{train}} \sum_{i=1}^{m_{train}} \left(f_{\vec{w},b}(\vec{x}_{train}^{(i)}) - y_{train}^{(i)} \right)^2 \right]$

Test error : $J_{test}(\vec{w}, b) = \left[\frac{1}{2m_{test}} \sum_{i=1}^{m_{test}} \left(f_{\vec{w},b}(\vec{x}_{test}^{(i)}) - y_{test}^{(i)} \right)^2 \right]$

Cross - validation error : $J_{cv}(\vec{w}, b) = \left[\frac{1}{2m_{cv}} \sum_{i=1}^{m_{cv}} \left(f_{\vec{w},b}(\vec{x}_{cv}^{(i)}) - y_{cv}^{(i)} \right)^2 \right]$