Evaluating a Hypothesis

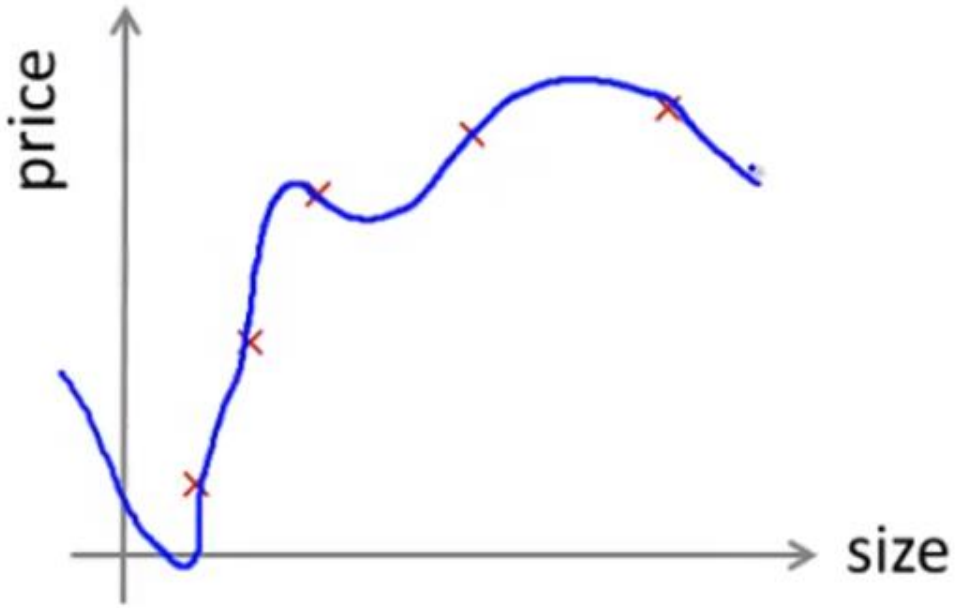
Evaluating a Learning Algorithm

Advice for Applying Machine Learning

Evaluating your hypothesis

$$h_\theta(x) = \theta_0 + \theta_1 x + \theta_2 x^2 + \theta_3 x^3 + \theta_4 x^4$$

Evaluating your hypothesis



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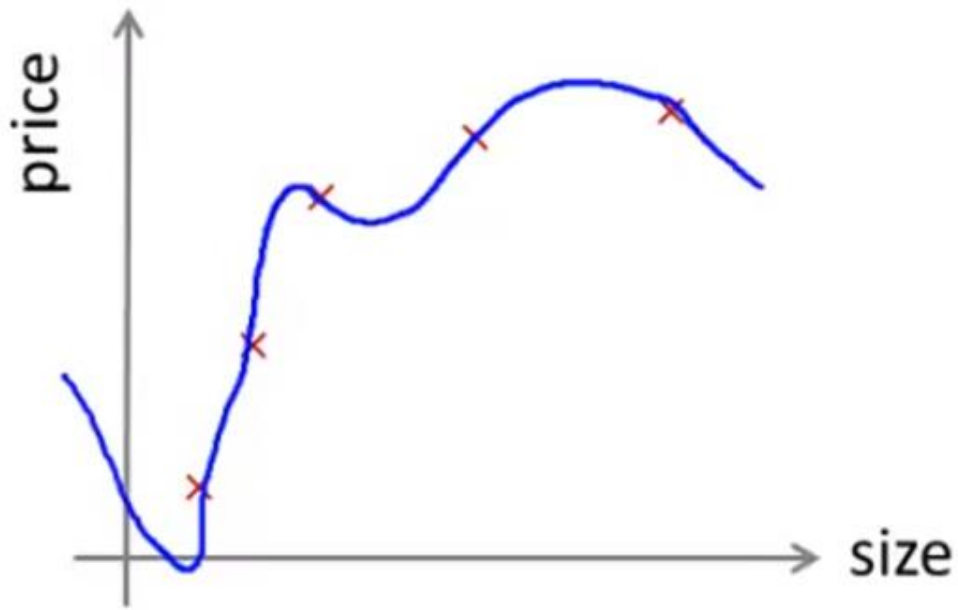

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How to plot too many features?

Fails to generalize to new examples not in training set.

$x_1 =$ size of house
$x_2 =$ no. of bedrooms
$x_3 =$ no. of floors
$x_4 =$ age of house
$x_5 =$ average income in neighborhood
$x_6 =$ kitchen size
$\vdots$
x_{100}

Evaluating your hypothesis

Dataset:

Size	Price
2104	400
1600	330
2400	369
1416	232
3000	540
1985	300
1534	315
1427	199
1380	212
1494	243

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Training set

Evaluating your hypothesis

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Training set

Test Set

Evaluating your hypothesis

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70%

Training set

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Test set

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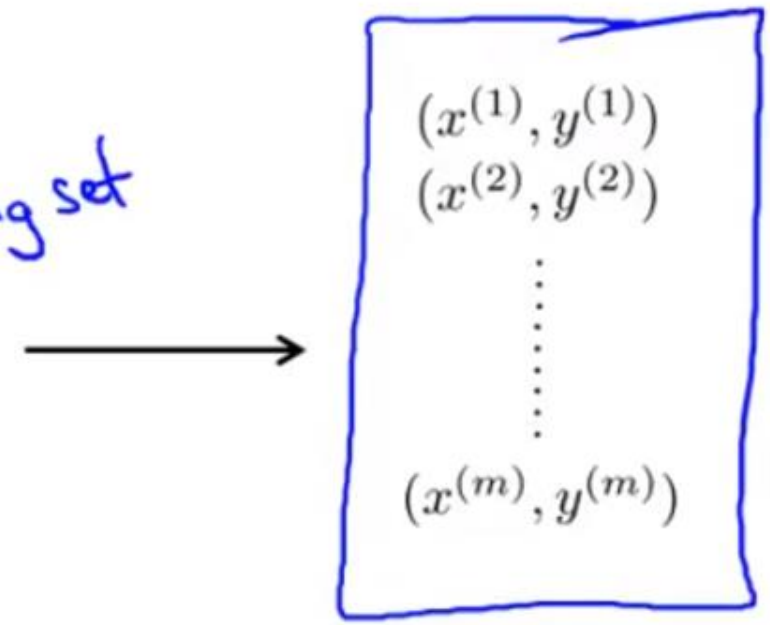

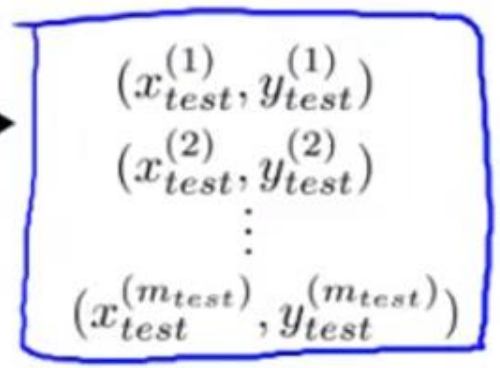

m_{test} = no. of test example

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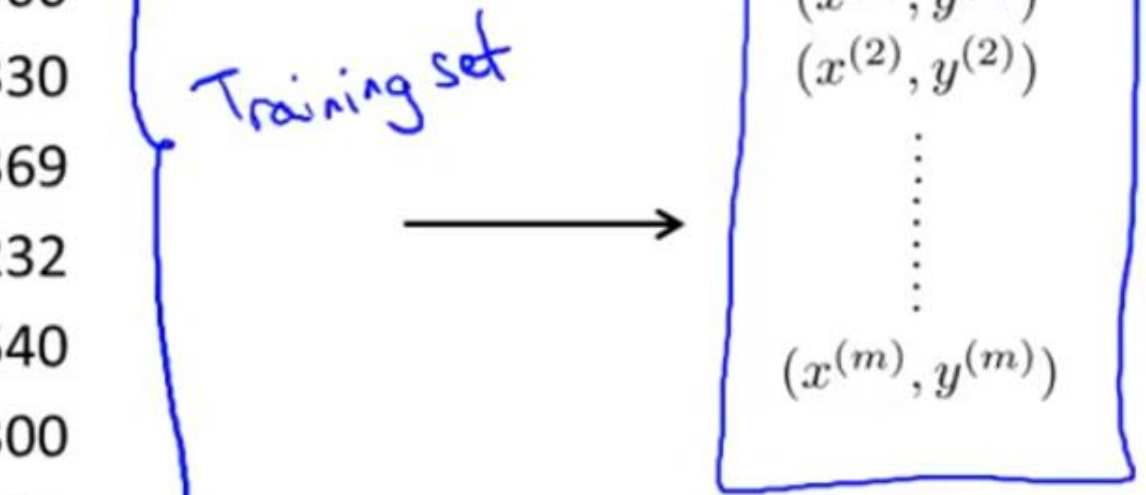

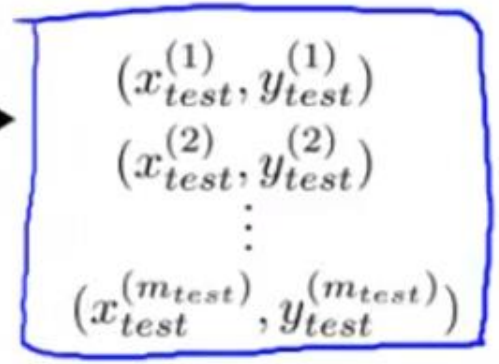

m_{test} = no. of test example

$(x_{test}^{(1)}, y_{test}^{(1)})$

Exercise

- Suppose an implementation of linear regression (without regularization) is badly overfitting the training set. In this case, we would expect:
  - The training error $J(\theta)$ to be **low** and the test error $J_{test}(\theta)$ to be **high**
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-

Procedure

- Trainint/testing procedure for linear regression
  - Learn parameter θ from training data by minimizing the training error J(θ)
  - Compute the test error:
  - $A = \pi r^2$

$$J_{test}(\theta) = \frac{1}{2m_{test}} \sum_{i=1}^{m_{test}} \left(h_\theta(x_{test}^{(i)}) - y_{test}^{(i)} \right)^2$$

Training/testing procedure for logistic regression

- Learn parameter θ from training data
- Compute test set error:

$$J_{test}(\theta) = -\frac{1}{m_{test}} \sum_{i=1}^{m_{test}} y_{test}^{(i)} \log h_\theta(x_{test}^{(i)}) + (1 - y_{test}^{(i)}) \log h_\theta(x_{test}^{(i)})$$

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- Misclassification error (0/1 misclassification error):

$$err(h_\theta(x), y) = \begin{cases} 1 & \text{if } h_\theta(x) \geq 0.5, \; y = 0 \\ & \text{or if } h_\theta(x) < 0.5, \; y = 1 \end{cases} \quad \text{error}$$

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m_{test}

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$$\text{Test error} = \frac{1}{m_{test}} \sum_{i=1}^{m_{test}} err(h_\theta(x_{test}^{(i)}), y^{(i)}).$$