2021 Spring: Machine Learning

Linear regression

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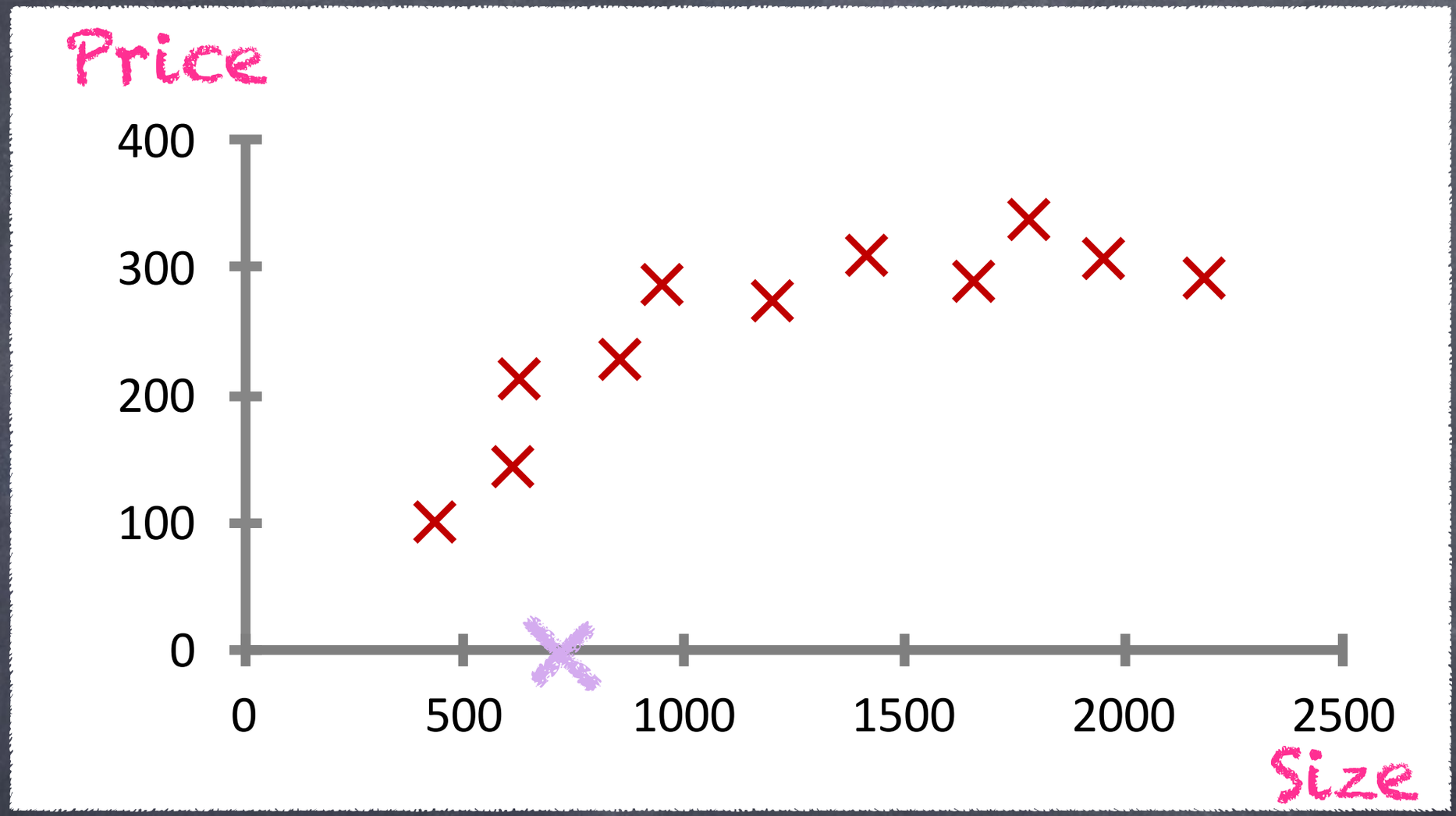

Supervised Learning

"Right Answers" given

Regression:

Predict Continuous Value

Training Set Of House Prices

Size in feet² (x)	Price ($) in 1000's (y)
2104	460
1416	232
1534	315
852	178
…	…

Notation:

m = Number of training examples

x's = "input" variable / features

y's = "output" variable / "target" variable

Training Dataset

↓

Learning Algorithm

↓

Size → h → Estimated Price

?

Linear Regression With One Variable

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

Training Dataset:

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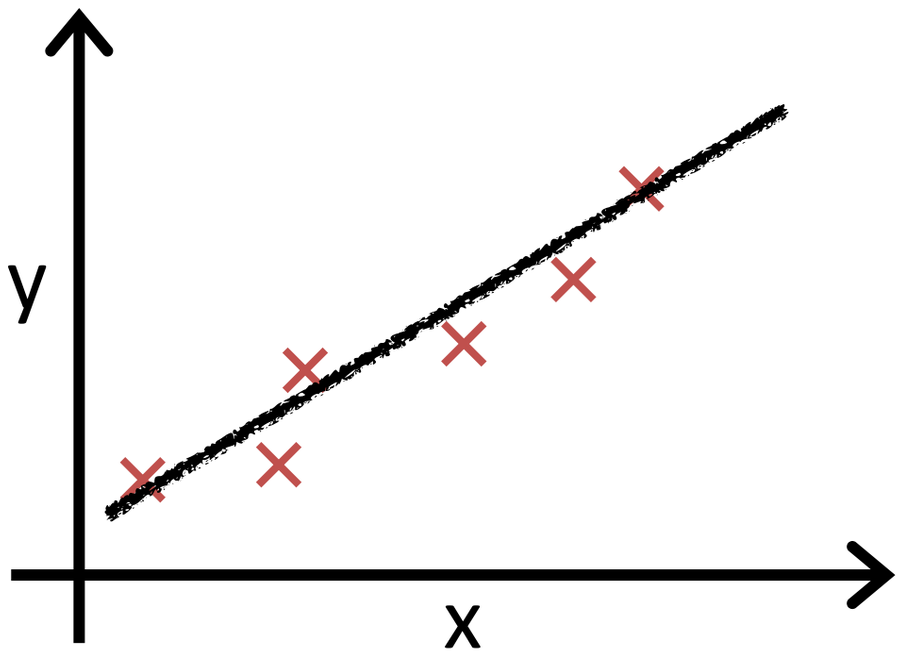
…	…



Hypothesis function:

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

θ_i How to choose ?

Idea: Choose θ_0, θ_1 so that $h_\theta(x)$ is close to y for our training examples (x, y)

Training Dataset:

Size in feet² (x)	Price ($) in 1000's (y)
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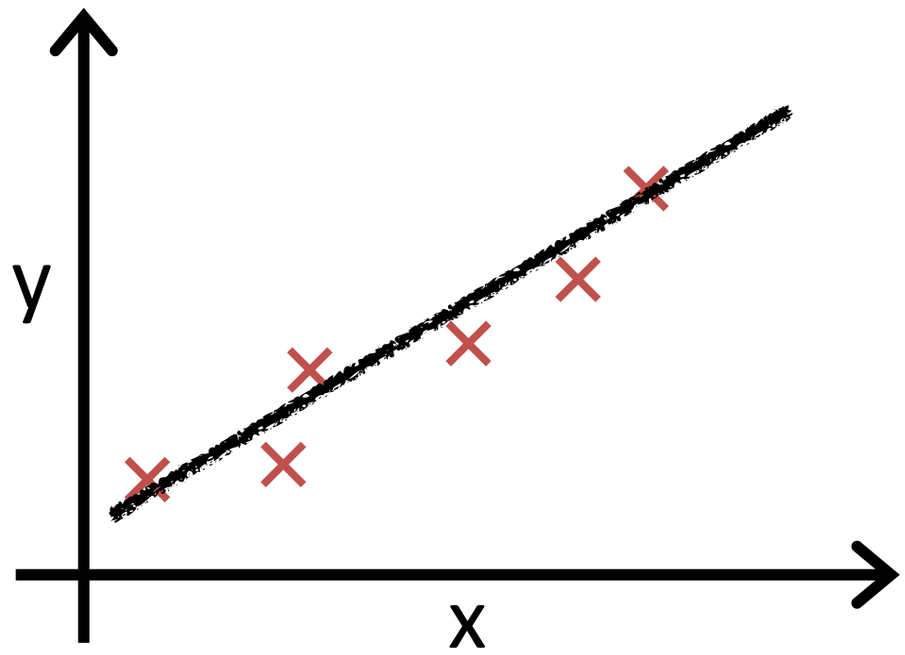
…	…



Idea: Choose θ_0, θ_1 so that $h_\theta(x)$ is close to y for our training examples (x, y)

Hypothesis function:

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

Cost function:

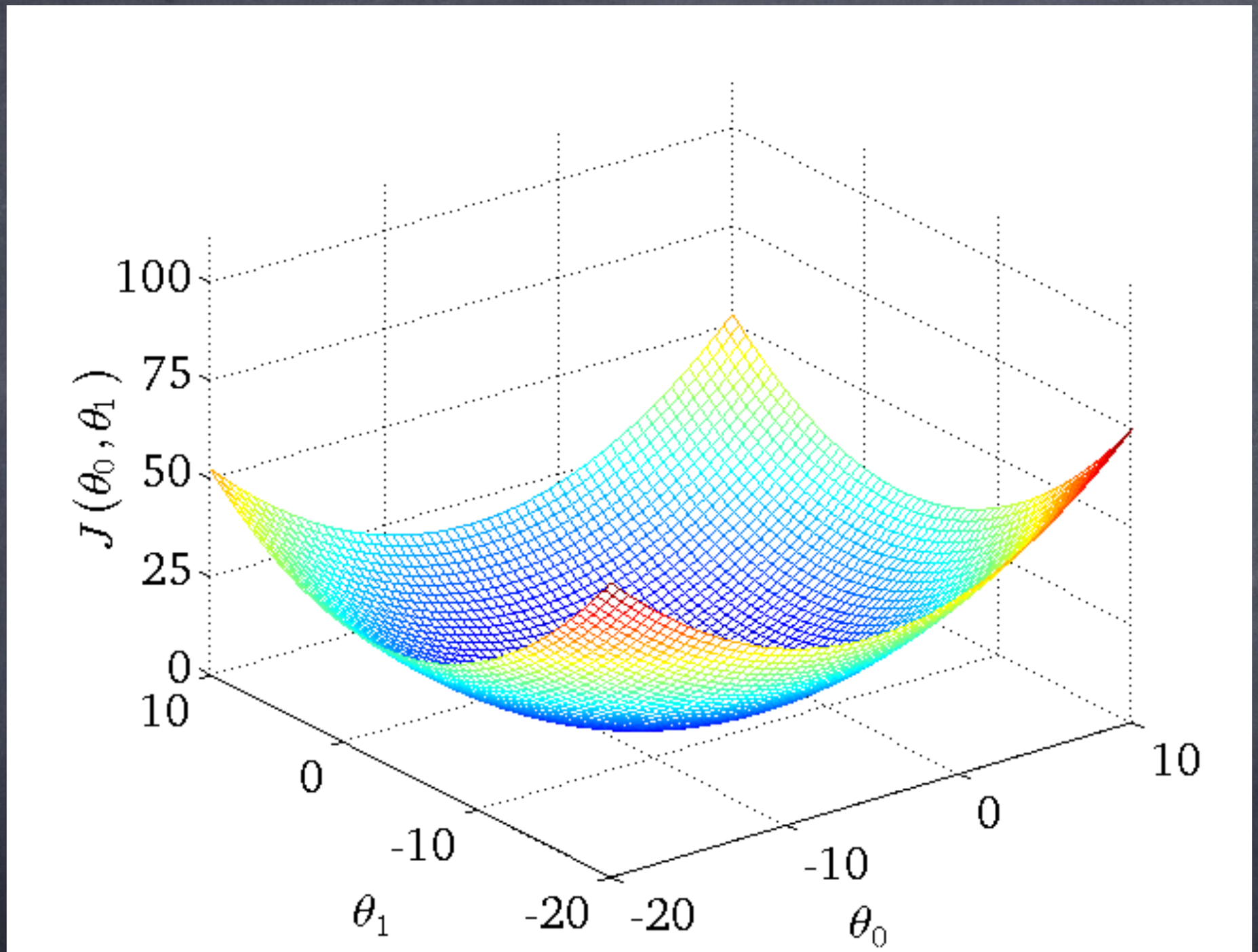
$$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)} \right)^2$$

Goal:

$$\underset{\theta_0, \theta_1}{\text{minimize}}\ J(\theta_0, \theta_1)$$

Gradient Decent

- Have some function $J(\theta_0, \theta_1)$
- Want $\min_{\theta_0, \theta_1} J(\theta_0, \theta_1)$
- Outline:
  - start from θ_0, θ_1
  - keep change θ_0, θ_1 until minimum


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