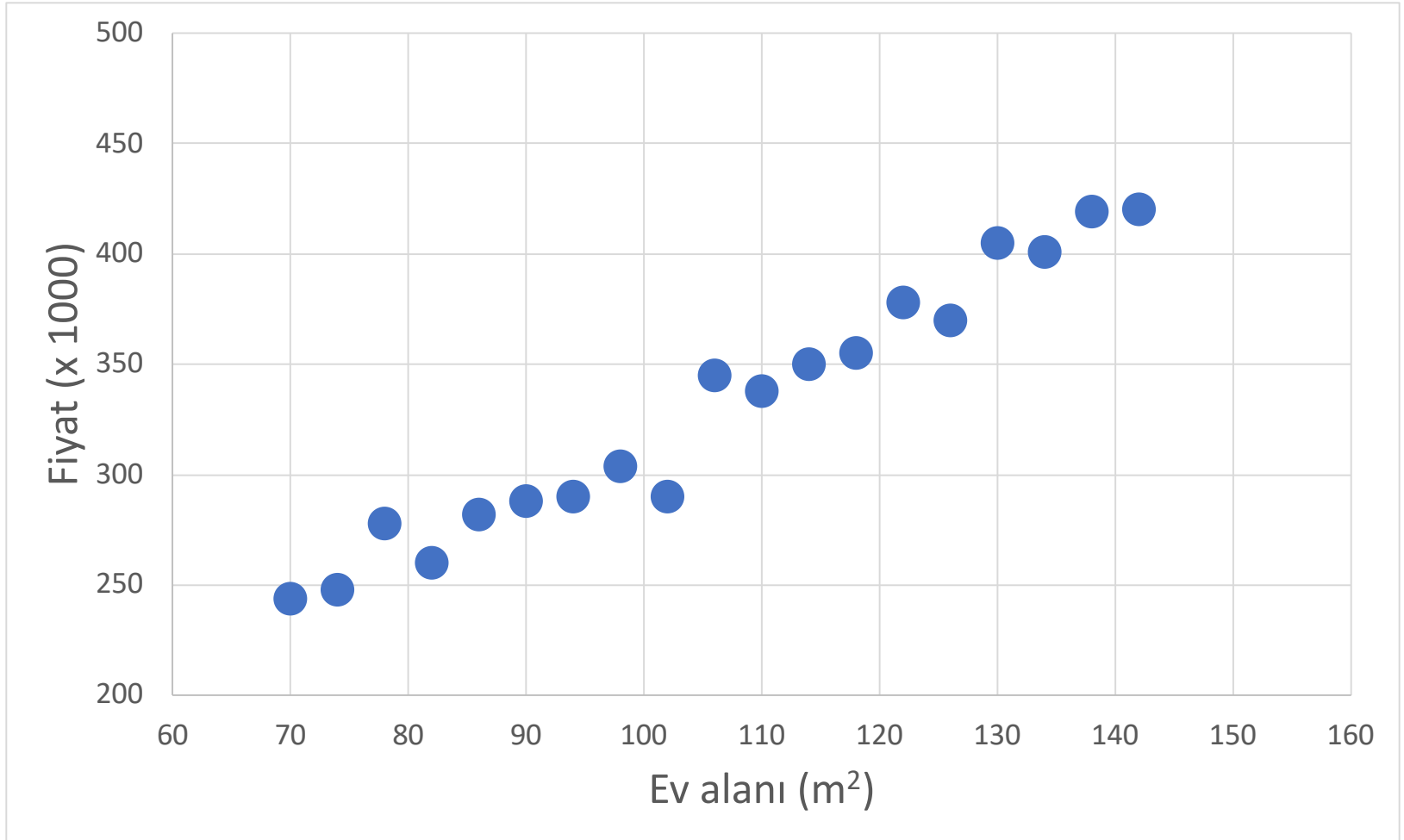
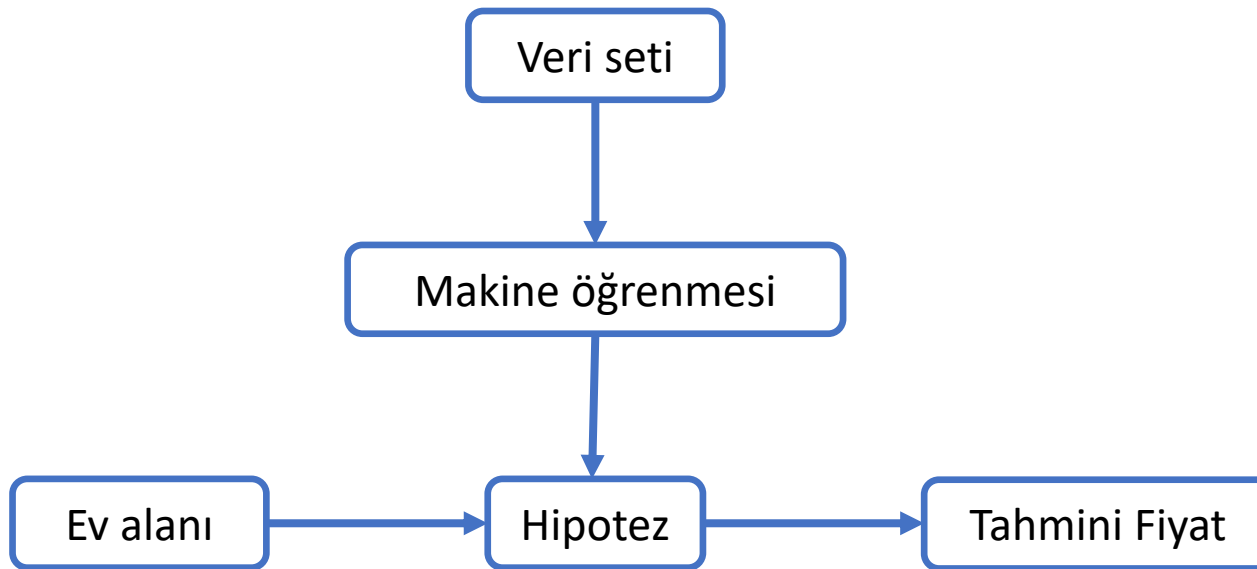


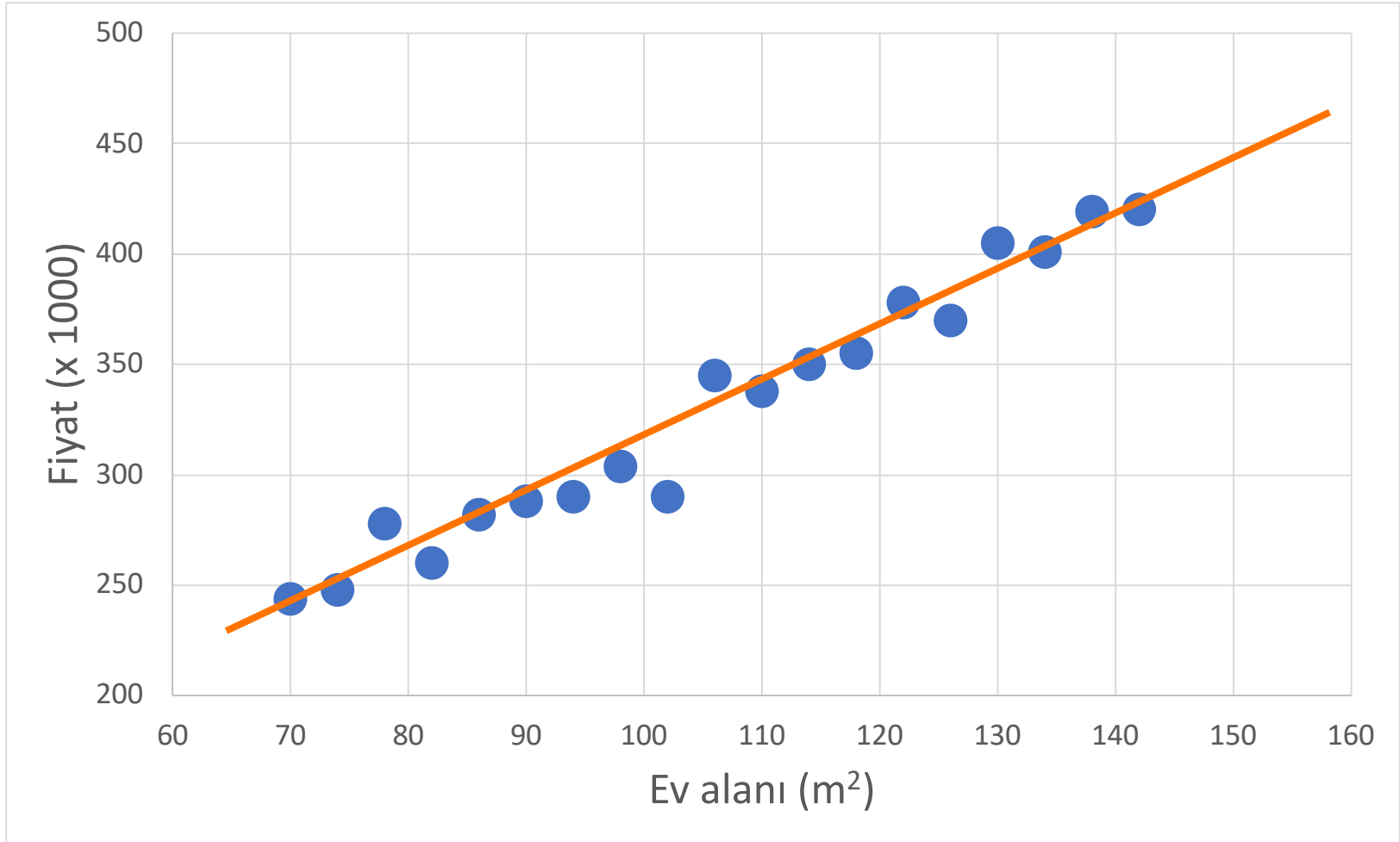
Doğrusal Regresyon (Linear Regression)



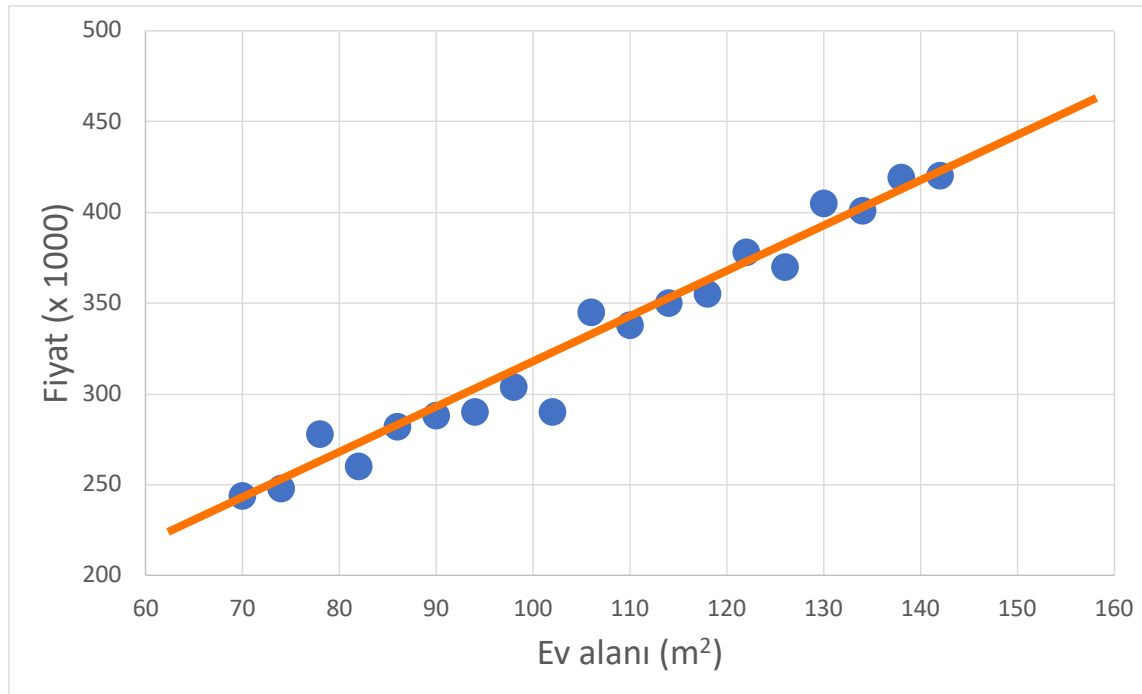
Doğrusal Regresyon (Linear Regression)



Doğrusal Regresyon (Linear Regression)



Doğrusal Regresyon (Linear Regression)



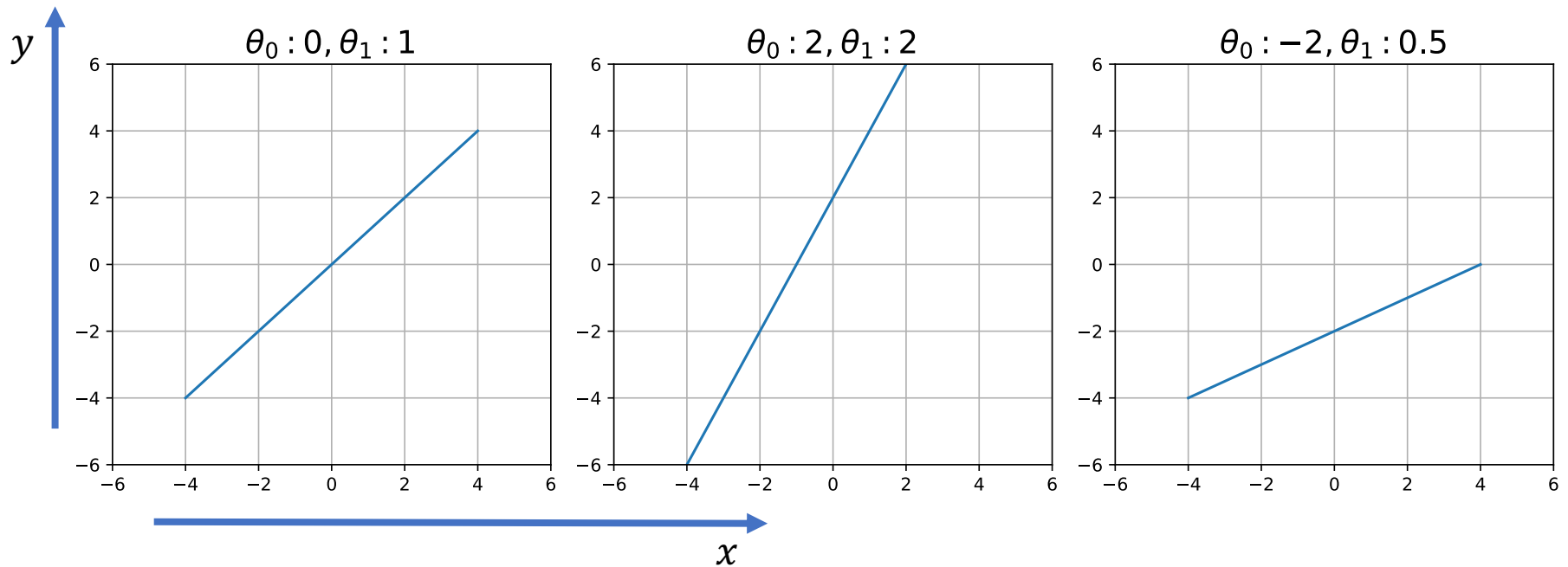
$$Fiyat = a \times Alan + b$$
$$y = ax + b$$

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

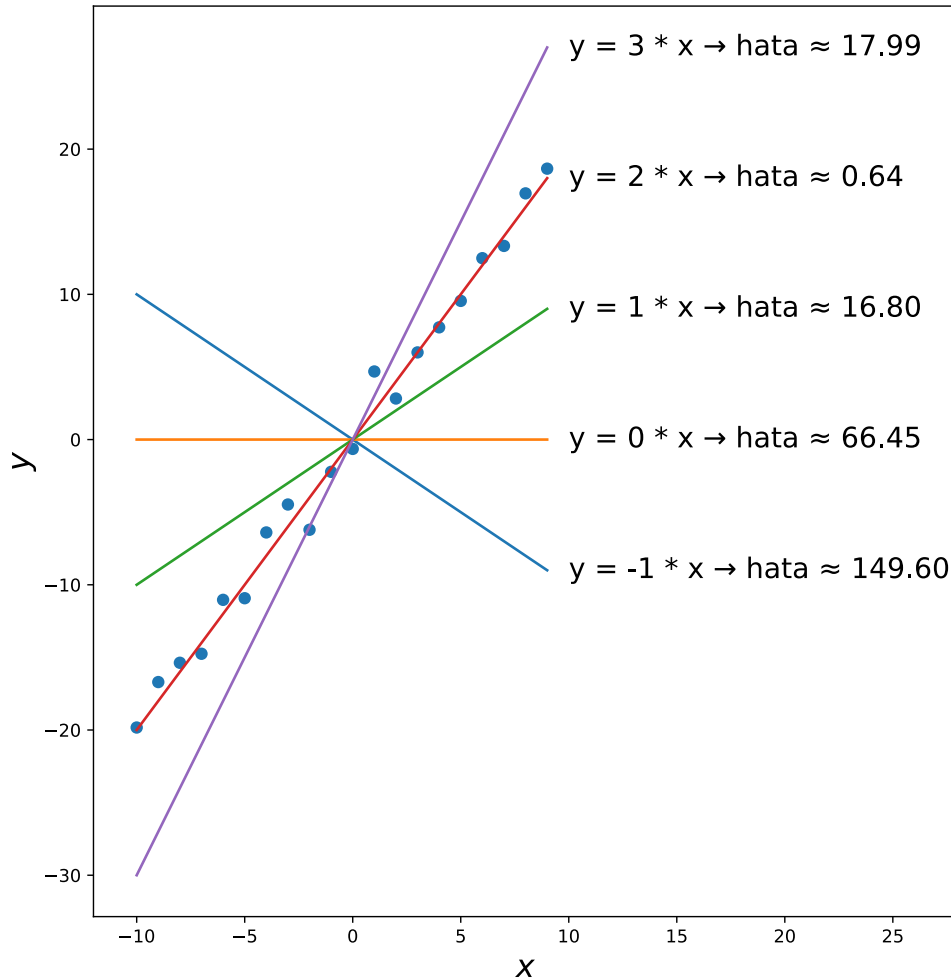
θ_i : Parametreler

Doğrusal Regresyon (Linear Regression)

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



Doğrusal Regresyon (Linear Regression)



Hipotez:

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

Parametreler:

$$\theta_0, \theta_1$$

Hata Fonksiyonu (Cost Function):

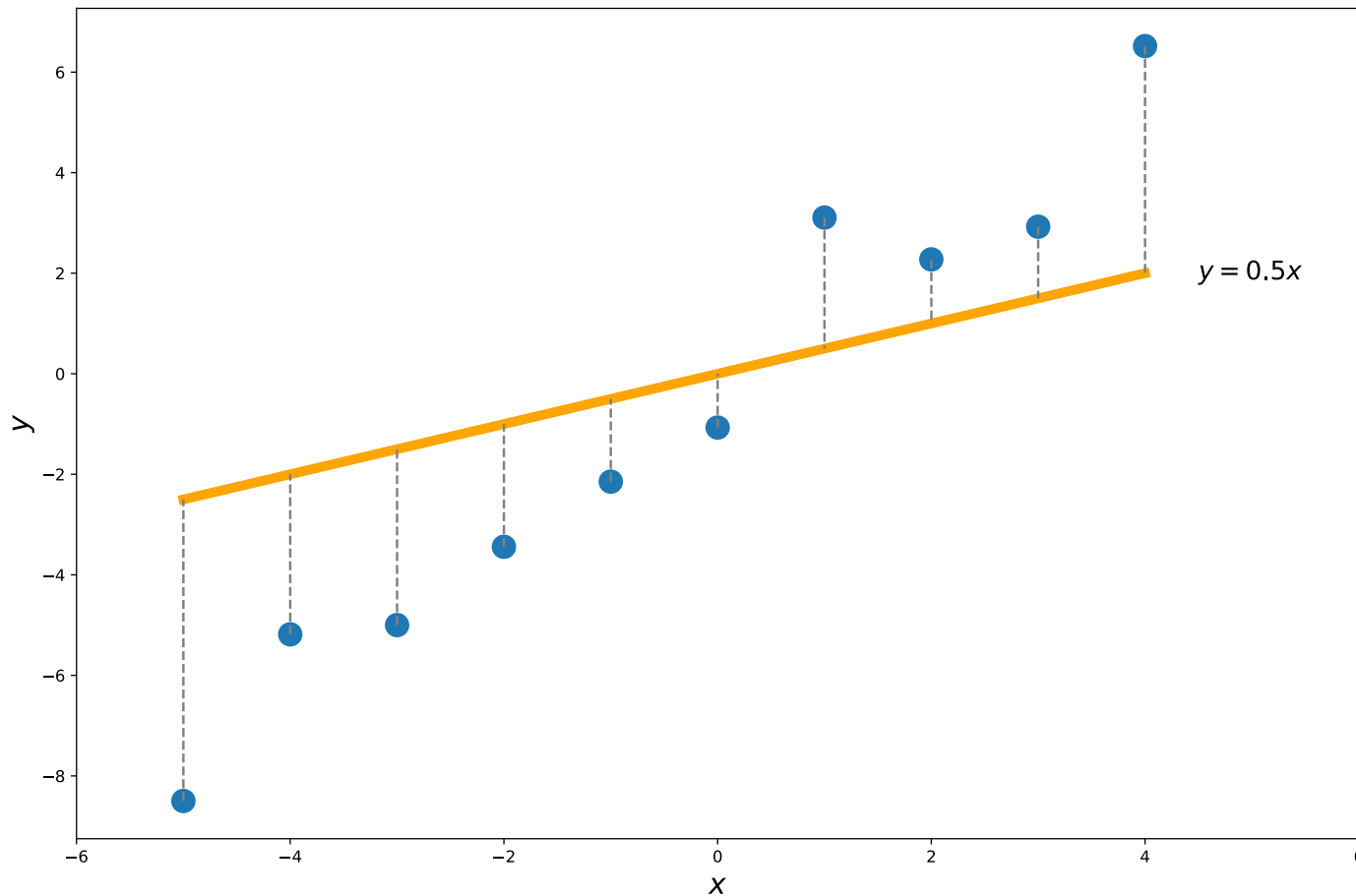
$$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)})^2$$

Hedef:

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

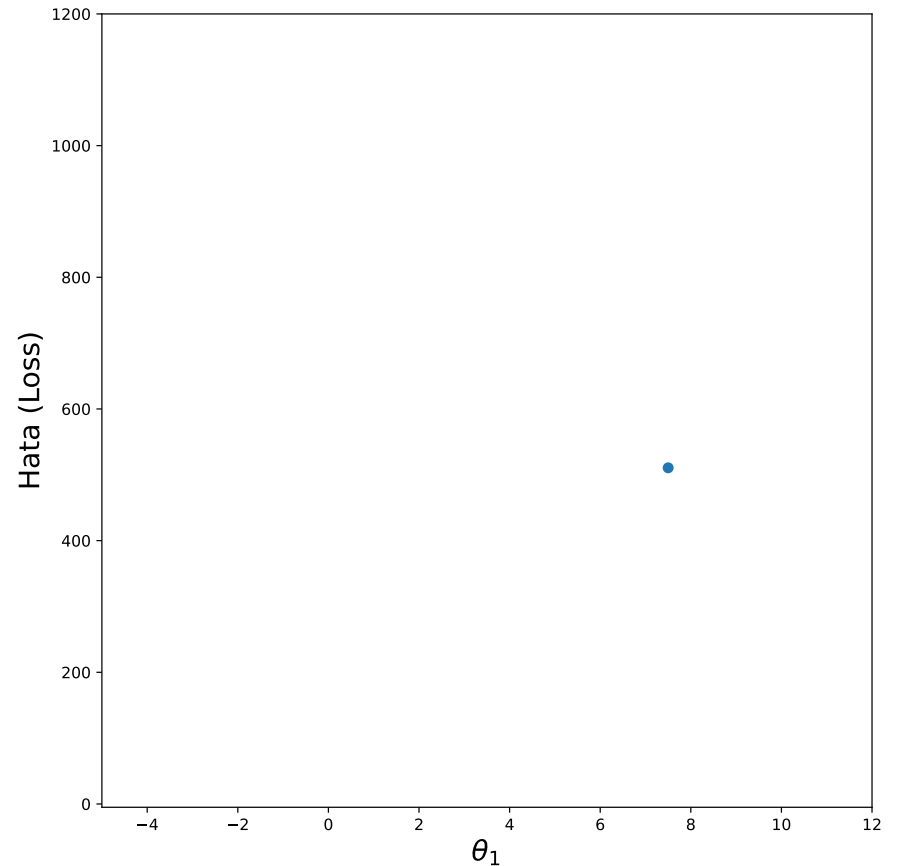
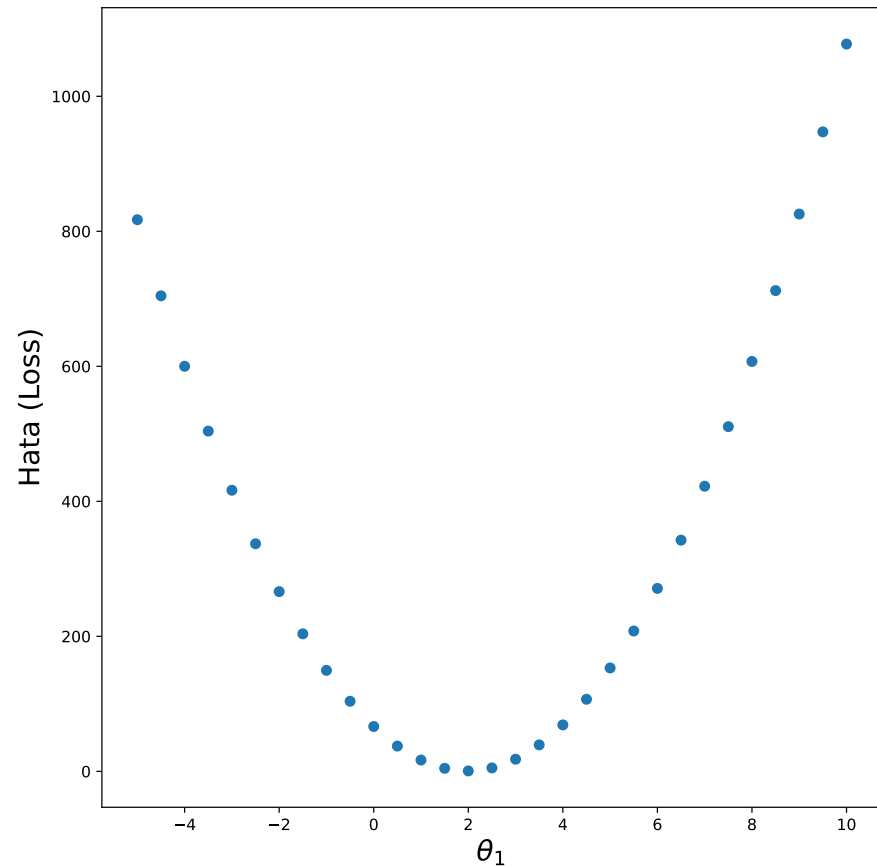
Doğrusal Regresyon (Linear Regression)

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



Doğrusal Regresyon (Linear Regression)

$$h_{\theta}(x) = \theta_1 x \quad (\theta_0 = 0)$$

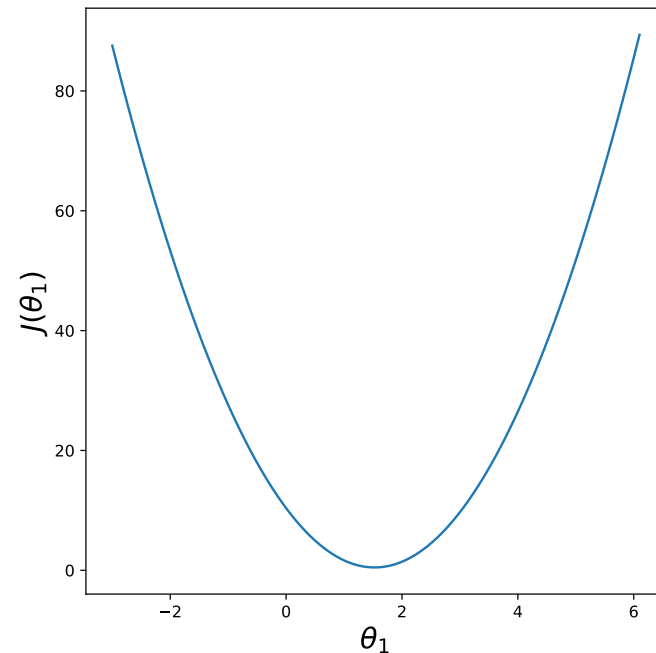
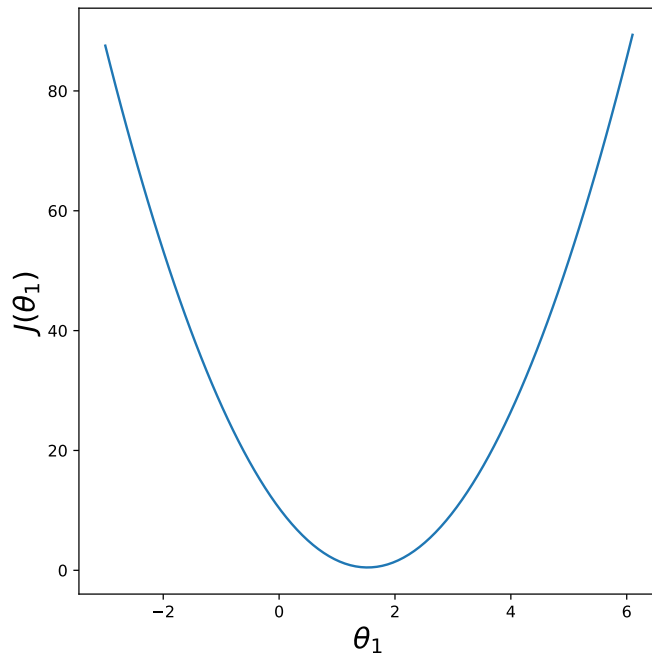


Dereceli Alçalma (Gradient Descent)

$$h_{\theta}(x) = \theta_1 x \quad (\theta_0 = 0)$$

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

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

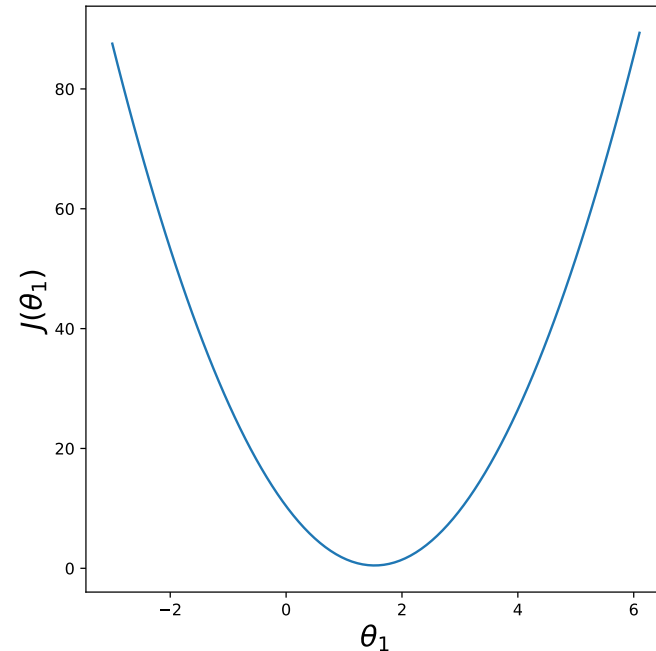
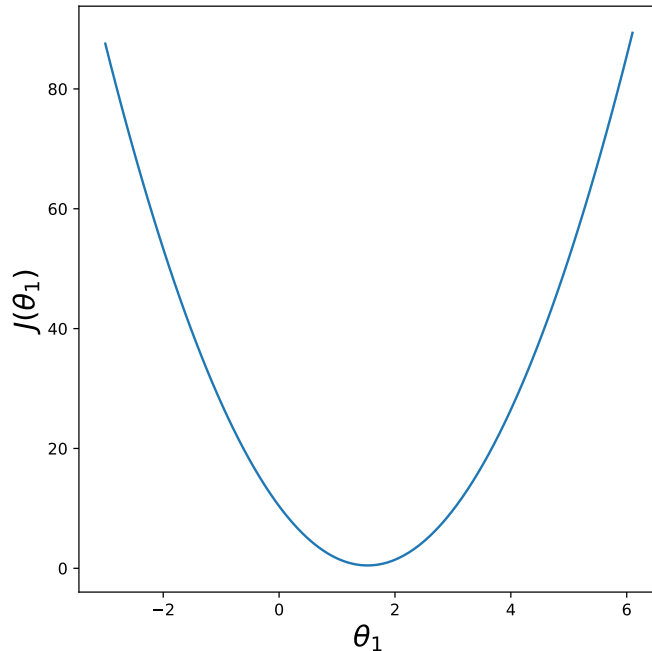


Dereceli Alçalma (Gradient Descent)

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

$$\theta_1 := \theta_1 - \alpha \frac{\partial}{\partial \theta_1} J(\theta_1)$$

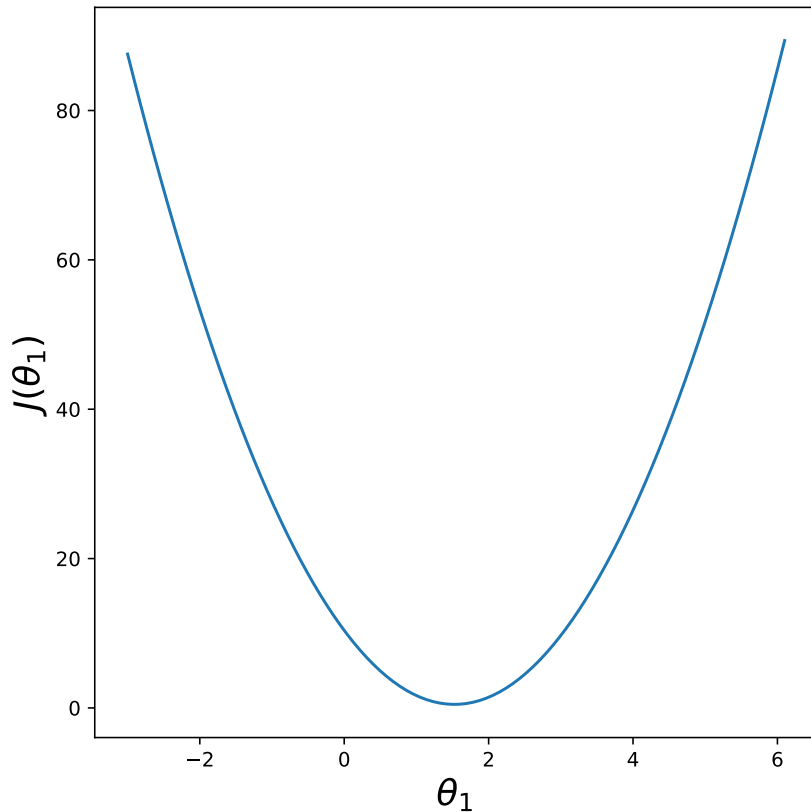
$\alpha \Rightarrow$ öğrenme hızı (learning rate)



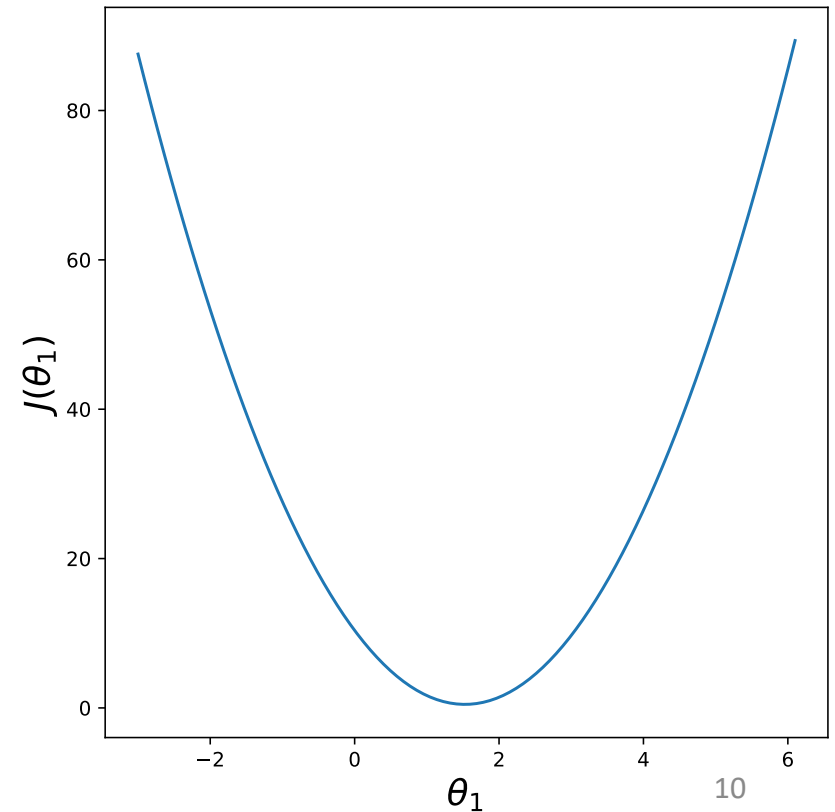
Öğrenme Hızı (Learning rate)

$$\theta_1 := \theta_1 - \alpha \frac{\partial}{\partial \theta_1} J(\theta_1)$$

α çok büyük ise



α çok küçük ise



Dereceli Alçalma (Gradient Descent)

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

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

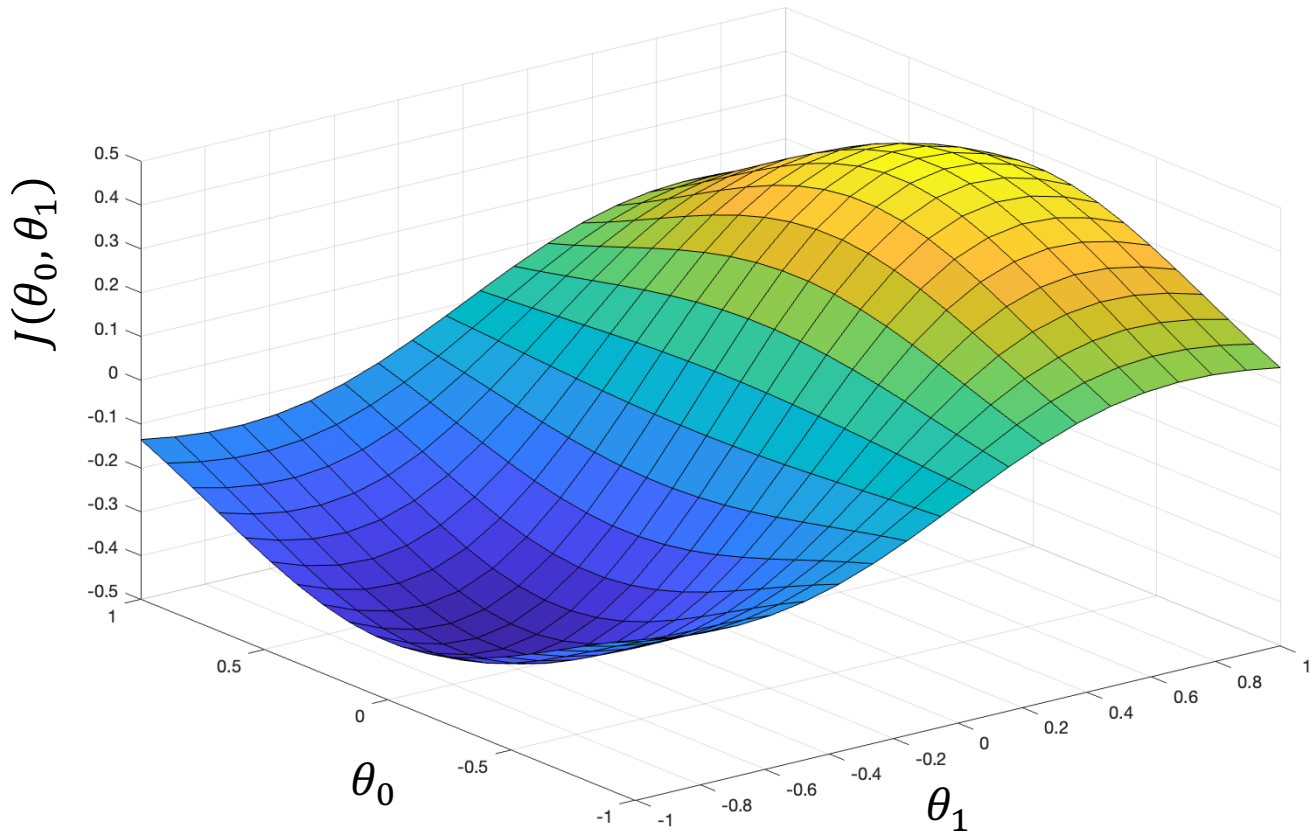
$$\theta_0 := \theta_0 - \alpha \frac{\partial}{\partial \theta_0} J(\theta_0, \theta_1)$$

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

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

$$\frac{\partial}{\partial \theta_1} J(\theta_0, \theta_1) = \frac{1}{m} \sum_{i=1}^m (\theta_0 + \theta_1 x^{(i)} - y^{(i)}) \cdot x^{(i)}$$

Dereceli Alçalma (Gradient Descent)



Doğrusal Regresyon Algoritması

Doğrusal Regresyon Modeli:

$$h_{\theta}(x) = \theta^T x = \theta_0 x_0 + \theta_1 x_1 + \theta_2 x_2 + \cdots + \theta_n x_n$$

$$J(\theta_0, \theta_1, \theta_2, \dots, \theta_n) = J(\theta) = \frac{1}{2m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)})^2$$

Dereceli Alçalma:

Yakınsayana kadar tekrar et {

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

}

Model Eğitimi

1. Fikir: Elimizdeki verilerin tamamıyla modeli eğitmek.

Eğitim (Train)

2. Fikir: Elimizdeki verilerin bir kısmıyla modeli eğitmek. Kalan kısmıyla modelin başarısını ölçmek.

Eğitim (Train)

Doğrulama (Validation)

3. Fikir: Elimizdeki verilerin bir kısmıyla modeli eğitmek. Bir kısmıyla modelin sağlığını ölçmek. Son kısım ile gerçek başarıyı hesaplamak.

Eğitim (Train)

Doğrulama

Test

Model Eğitimi

4. Fikir: Çapraz doğrulama (Cross validation).

Parça 1	Parça 2	Parça 3	Parça 4	Parça 5	Test
---------	---------	---------	---------	---------	------

Parça 1	Parça 2	Parça 3	Parça 4	Parça 5	Test
---------	---------	---------	---------	---------	------

Parça 1	Parça 2	Parça 3	Parça 4	Parça 5	Test
---------	---------	---------	---------	---------	------

Parça 1	Parça 2	Parça 3	Parça 4	Parça 5	Test
---------	---------	---------	---------	---------	------

Parça 1	Parça 2	Parça 3	Parça 4	Parça 5	Test
---------	---------	---------	---------	---------	------

Makine Öğrenmesi Genel Akışı

```
X, y = veriyi_hazirla(veri_seti)
```

```
X_train, X_val, X_test,  
y_train, y_val, y_test = veriyi_böl(X, y, 0.7, 0.2, 0.1)
```

```
model = new DoğrusalRegresyonModeli()  
model.fit(X_train, y_train)  
y_tahmin = model.predict(X_val)  
basari = basari_olc(y_tahmin, y_val)
```

```
nihai_basari = basari_olc( model_predict(X_test), y_test )
```