Machine Learning Foundations

Linear Regression

Mingshan
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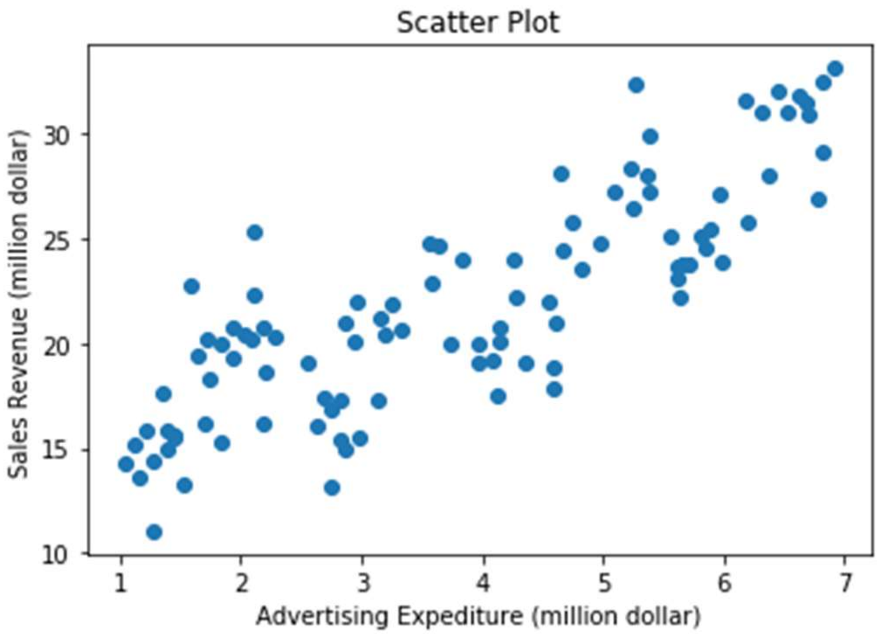
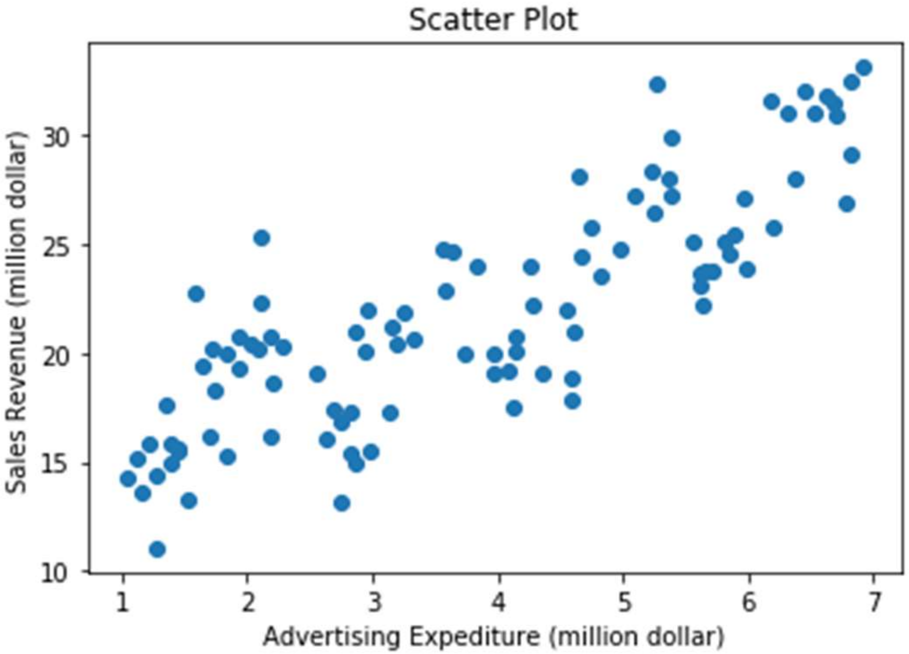
Univariate Linear Regression

- feature (x): advertising expenditure of that year
- target (y): sales revenue for a year



Hypothesis



$$h(x) = \theta_0 + \theta_1 x$$

Cost Function (MSE)

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

- $Minimize\ J(\theta_0, \theta_1)\ over\ \theta_0, \theta_1$

Gradient Descent

- repeat until $J(\theta_0, \theta_1)$ converges to minimum:

$$\theta_j = \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta_0, \theta_1)$$ (in this example, $j = 0$ and 1)

- Plug in $J(\theta_0, \theta_1)$

  repeat until $J(\theta_0, \theta_1)$ converges to minimum:

$$\theta_0 = \theta_0 - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta\left(x^{(i)}\right) - y^{(i)}) \cdot x_0^{(i)}$$

$$\theta_1 = \theta_1 - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta\left(x^{(i)}\right) - y^{(i)}) \cdot x_1^{(i)}$$