

Linear Regression:

$$\theta_j = \theta_j - \alpha \left(\frac{1}{m} \right) \sum_{i=1}^m (h(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

$$\sum_{i=1}^m \Delta^{(i)} x_j^{(i)} \rightarrow \delta_1, \delta_2 = \emptyset \quad \emptyset$$

$$\theta_j = \theta_j - \frac{\alpha}{m} \delta^T$$

$$\begin{pmatrix} x_0 & x_1 \\ x_0 & x_2 \\ x_0 & x_1 \\ x_0 & x_3 \end{pmatrix} \begin{pmatrix} \theta_0 \\ \theta_1 \end{pmatrix} = h(x^{(i)}) = X \cdot \theta \quad m \times 1 \text{ vector}$$

$$\Delta = X \cdot \theta - y^{(i)} \quad m \times 1 \text{ vector}$$

$$\delta = \Delta' (1 \times m \text{ vector}) \cdot X (2 \times m \text{ vector}) = [\delta_0, \delta_1]$$

"Normal Equations" method

$$X \theta = y$$

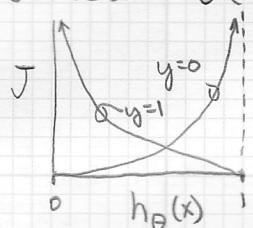
$$X^T X \theta = X^T y \quad (\text{make square matrices})$$

$$\theta = (X^T X)^{-1} X^T y \quad (\text{solve for theta})$$

Logistic Regression:

hypothesis

$$h_\theta(x) = \frac{1}{1 + e^{-\theta^T x}}$$



cost function $J(h_\theta(x), y) = -y \log(h_\theta(x)) - (1-y) \log(1-h_\theta(x))$

$$= \begin{cases} -\log(1-h_\theta(x)) & y=0 \\ -\log(h_\theta(x)) & y=1 \end{cases}$$

Case $y=0$: $J = -\log(1-g(\theta^T x))$
 $= \log(1+e^{\theta^T x})$

$$\frac{\partial J}{\partial \theta_j} = \frac{\partial}{\partial(\theta^T x)} \log(1+e^{\theta^T x}) \cdot \frac{\partial}{\partial \theta_j} (\theta^T x)$$

$$= \frac{1}{1+e^{\theta^T x}} \cdot x_j$$

Case $y=1$: $J = -\log(g(\theta^T x))$
 $= \log(1+e^{-\theta^T x})$

$$\frac{\partial J}{\partial \theta_j} = \frac{\partial}{\partial(\theta^T x)} \log(1+e^{\theta^T x}) \cdot \frac{\partial}{\partial \theta_j} (\theta^T x)$$

$$= -\frac{1}{1+e^{\theta^T x}} \cdot x_j$$

$$\theta_j = \theta_j - \left(\frac{\alpha}{m} \right) \left(\frac{1}{1+e^{\theta^T x}} - y \right)^T X_j = \theta_j - \left(\frac{\alpha}{m} \right) (h_\theta(x) - y)^T X_j$$

$$H_0: X \sim N(355, 2s)$$

$$H_1: n=100 \quad \bar{X}=356.5 \quad \bar{X} > 355$$

~~WUMSP. A. A.~~

$$\text{Diagram of a normal distribution curve with mean } 355. \text{ A vertical line is drawn at } \bar{X} = 356.5. \text{ The area to the right of this line is shaded, representing } P(Z > z).$$

$$Z = \frac{\bar{X} - 355}{\sqrt{\frac{s^2}{n}}}$$

$$\alpha = 0.01$$

$$P(Z > z) = 0.01$$

$$1 - P(Z \leq z) = 0.99$$

$$z_c = 2.32$$

