Logistic Regression With Regularization Parameters

Cost function

$$h_\theta(x) = \frac{1}{1+e^{-(\theta_0+\theta_1 x_1)}}$$

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x))$$

$$J(\theta_0,\theta_1) = \begin{cases} -\log(h_\theta(x)) & \text{if } y=1 \\ -\log(1-h_\theta(x)) & \text{if } y=0 \end{cases}$$

Reduce Overfitting

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + L2 \text{ Regularization}$$

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + L1 \text{ Regularization}$$

feature selection.

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + L2 \text{ Reg} + L1 \text{ Reg.}$$

L2 Regularization ⇒ Reduce Overfitting

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + \lambda\sum_{i=1}^{n}(\text{Slope})^2$$

L1 Regularization ⇒ feature selection

$$J(\theta_0,\theta_1) = -y\log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + \lambda\sum_{i=1}^{n}|\text{Slope}|$$

Elastic Net

$$J(\theta_0, \theta_1) = -y \log(h_\theta(x)) - (1-y)\log(1-h_\theta(x)) + \lambda_1 \sum_{i=1}^{n} (\text{slope})^2 + \lambda_2 \sum_{i=1}^{n} |\text{slope}|$$

$$\boxed{C \propto \frac{1}{\lambda}}$$

$C = 2.0 \quad \lambda = \frac{1}{2}$