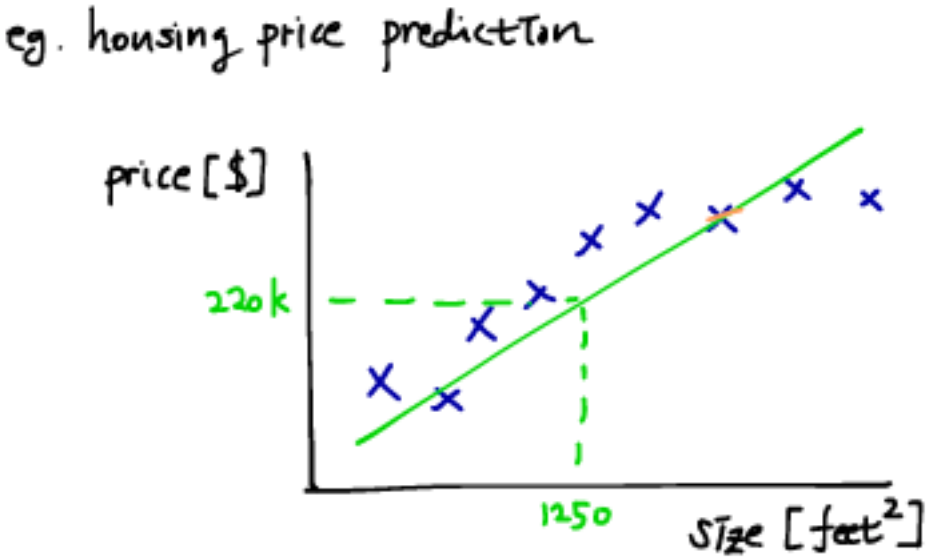
Logistic Regression

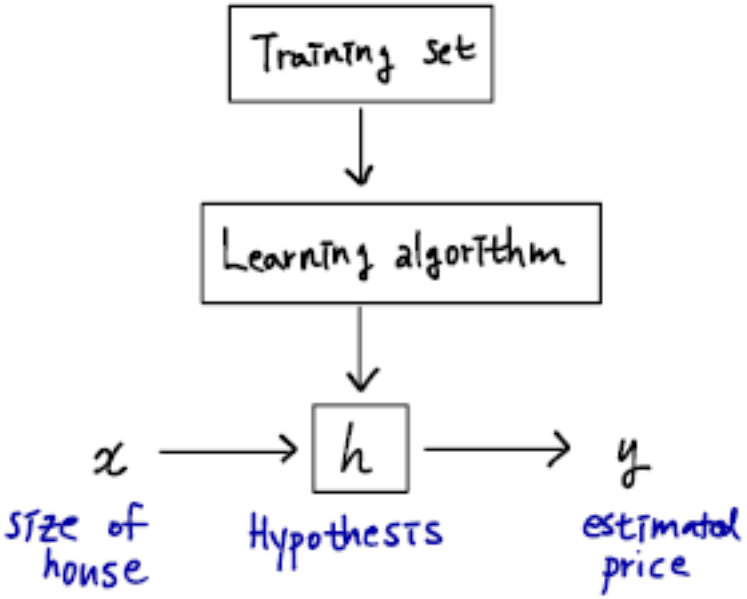
Linear Regression

- Input -> output (실수 값)



Linear Regression

- Hypothesis 함수를 찾는 것이 목적!
- Hypothesis : function of relationship between input and output



Linear Regression

- Cost function

- MSE(Mean-Squared-Error) Cost function

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

- AI 해커톤 코드 참조

Linear Regression

- **Lab**

데이터

x	y
1	1
2	2
3	3

Tensorflow Code

```
X_train = [1,2,3]
Y_train = [1,2,3]

W = tf.Variable(tf.random_normal([1]), name='weight')
b  = tf.Variable(tf.random_normal([1]), name='bias')

hypothesis = X_train * W + b

cost = tf.reduce_mean(tf.square(hypothesis – Y_train))

optimizer =
tf.train.GradientDescentOptimizer(learning_rate=0.01)
train = optimizer.minimize(cost)
```

Logistic Regression

- **Classification**
  - Input -> discrete class (ex: 이메일 스팸, 종양 양성/음성)

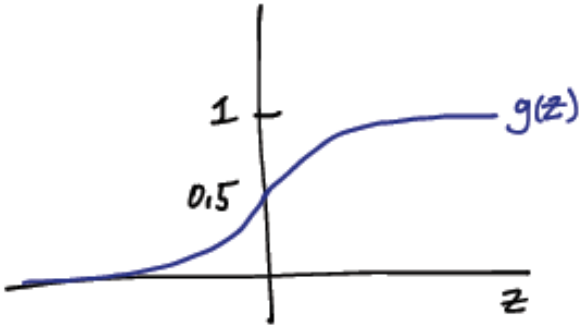
- **Logistic Regression Model**
  - Sigmoid Function (Logistic Function)

$$h_\theta(x) = g(\theta^T x)$$

$$g(z) = \frac{1}{1+e^{-z}}$$

(sigmoid fct, or logistic fct)

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



Logistic Regression

- 주어진 feature 가 x라는 값을 가질 때 class 1에 들어갈 확률

$$h_\theta(x) = P(y = 1 | x; \theta)$$

- Sigmoid Function

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

$$y = \begin{cases} 1 & \text{if } h_\theta(x) \geq 0.5 \\ 0 & \text{if } h_\theta(x) < 0.5 \end{cases}$$

Logistic Regression

- **Cost Function**

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

$$J(\theta) = -\frac{1}{m} \sum_{i=1}^{m} \left[y^{(i)} \log h_\theta(x) + (1 - y^{(i)}) \log(1 - h_\theta(x)) \right]$$