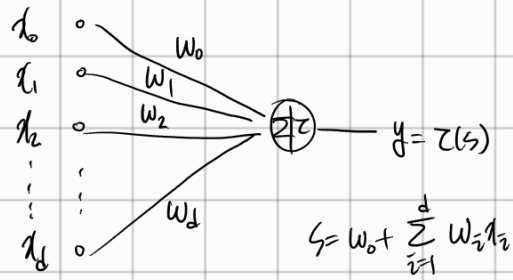
[ML_06] Perceptron



$$s = w_0 + \sum_{i=1}^{d} w_i x_i = \sum_{i=0}^{d} w_i x_i = \underline{w}^T \underline{x}$$

Cost Function

$$J(\underline{w}) = \sum_{\underline{x}^k \in Y} -y^k (\underline{w}^T \underline{x}^k)$$

$y^k = 1$: $-(\underline{w}^T \underline{x}^k)$
- 오분류: $\underline{w}^T \underline{x}^k < 0 \Rightarrow -(\underline{w}^T \underline{x}^k) > 0$
- 정분류: $\underline{w}^T \underline{x}^k > 0 \Rightarrow -(\underline{w}^T \underline{x}^k) < 0$

$y^k = -1$: $(\underline{w}^T \underline{x}^k)$
- 오분류: $\underline{w}^T \underline{x}^k > 0 \Rightarrow \underline{w}^T \underline{x}^k > 0$
- 정분류: $\underline{w}^T \underline{x}^k < 0 \Rightarrow \underline{w}^T \underline{x}^k < 0$

Gradient of cost function

$$J(\underline{w}) = \sum_{\underline{x}^k \in Y} -y^k (\underline{w}^T \underline{x}^k)$$

$$\frac{\partial J(\underline{w})}{\partial w_i} = \sum_{\underline{x}^k \in Y} \frac{\partial \left(-y^k (w_0 x_0^k + w_1 x_1^k + w_2 x_2^k + \cdots + w_d x_d^k)\right)}{\partial w_i}$$

$$= \sum_{\underline{x}^k \in Y} -y^k x_i^k$$

$$\Rightarrow w_i = w_i + \rho \frac{\partial J(\underline{w})}{\partial w_i} = w_i + \rho \sum_{\underline{x}^k \in Y} -y^k x_i^k$$

Learning Algorithms

Batch mode: 훈련집합의 샘플을 모두 맞출때까지 epoch를 반복함.

Stochastic mode: 샘플 하나를 선택, 틀린 샘플이 발생하면 즉시 갱신

Stochastic mini batch mode

Decision Boundary ~> 결국 모델이 이 리턴을 하는 값들의 모임.

$$d(\underline{x}) = w_1 x_1 + w_2 x_2 + w_3 x_3 + \cdots + w_0 = 0$$

$$= \underline{w}^T \underline{x} + b$$