Topics

① Loss functions and cost functions

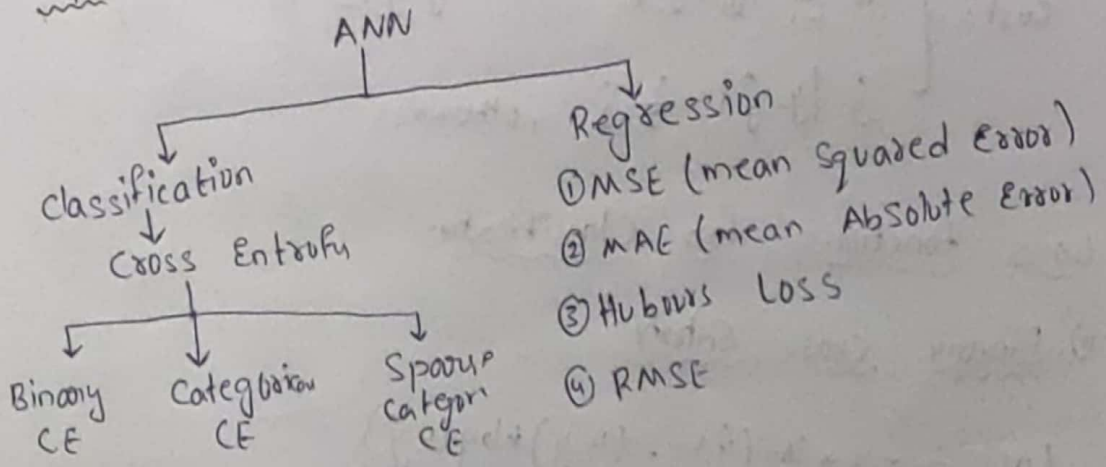
② optimizers

→ Loss function :- Error b/w single data point $(y-\hat{y})^2$

Cost function :- Error b/w batach data point $\frac{1}{n}\sum_{i=1}^{n}(y-\hat{y})^2$

optimizer :- It is used to update the weight in backpropagation

Types of problem we Solve in ANN :-



① MSE :-

$Loss = (y-\hat{y})^2$

$cost = \frac{1}{n}\sum_{i=1}^{n}(y_i-\hat{y}_i)^2$

Advantage

① It is differentiable
② It has 1 global minima
③ It converge faster

Dis-Advantage

① Not Robust to outliers

② Mean Absolute Error (MAE)

$$\text{Loss} = |y - \hat{y}|$$

$$\text{cost} = \frac{1}{n} \sum_{i=1}^{n} |y_i - \hat{y}_i|$$

Advantage

① Robust to outliers

Dis-Advantage

① Convergence is slow

③ Hubr Loss

→ It is combination of ① MSE ② MAE

$$\text{Cost} = \begin{cases} \frac{1}{n} \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 & \text{if } |y - \hat{y}| \leq \delta \\ \delta |y - \hat{y}| - \frac{1}{2}\delta^2 & \text{, otherwise} \end{cases}$$

(hyper)

Loss functions for Classification

① Binary Cross Entropy

$$\text{Loss} = -y * \log(\hat{y}) - (1-y) * \log(1-\hat{y})$$

$$\text{loss} = \begin{cases} -\log(1-\hat{y}) & \text{if } y=0 \\ -\log(\hat{y}) & \text{if } y=1 \end{cases}$$

$$\hat{y} = \frac{1}{1+e^{-z}}$$

② Categorical Cross Entropy

	f_1	f_2	f_3	o/p
$i=1$	2	3	4	G
$i=2$	5	6	7	B
$i=3$	8	9	10	N

	$j=1$	$j=2$	$j=3$
	G	B	N
$i=1$	1	0	0
$i=2$	0	1	0
$i=3$	0	0	1

$C=3$

$$\text{Loss}(x_i, y_i) = -\sum_{j=1}^{c} y_{ij} * \ln(\hat{y}_{ij})$$

Actual value $\Rightarrow y_{ij} = [y_{i1}\ y_{i2}\ y_{i3} \ldots y_{ic}]$

$$y_{ij} = \begin{cases} 1 & \text{if element in the class} \\ 0 & \text{otherwise} \end{cases}$$

prediction $\Rightarrow \hat{y}_{ij} \Rightarrow$ Softmax Activation $: sf(z) = \frac{e^{z_i}}{\sum_{j=1}^{k} e^{z_j}}$

③ Sparse categorical Entropy

→ Take higest of last layer

→ forgot information about other layers.

Right Combination

Hidden layer	o/p layer	Problem Statement	Loss fun^n
① Relu & varient	sigmoid	Binary classifi	Binary Cross entropy
② Relu & varient	softmax	multi class	Catgorical or sparse
③ Relu & varient	Linear	Regression	MSE, MAE, & Hubus, RMSE