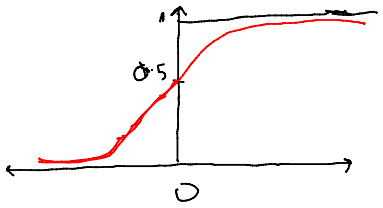
Activation and Loss Functions

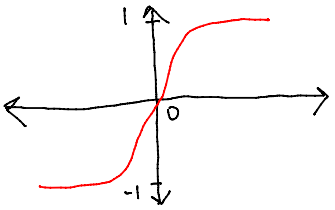
Tuesday, June 28, 2022 8:11 AM

(i) SIGMOID :

$$Sig(x) = \frac{1}{1+e^{-x}}$$



(ii) $\tanh(x)$:

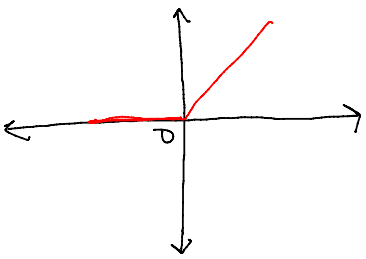


DRAW BACKS (Sigmoid and Tanh) :-

> Limited Range
> Saturation towards tails.

* ReLU (Rectified Linear Unit) :-

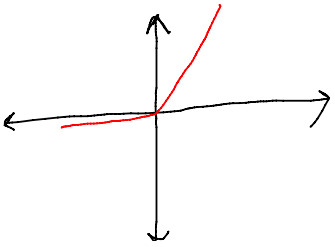
$$ReLU(x) = \begin{cases} 0, & x \le 0 \\ x, & x > 0 \end{cases}$$



\+ Range
\+ NO saturation
\- Zero gradient problem

* LEAKY RELU :-

$$LReLU(x) = \begin{cases} 0.1x, & x \le 0 \\ x, & x > 0 \end{cases}$$



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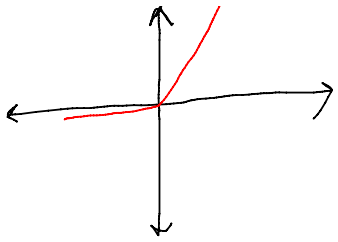

* SOFTMAX :-

$$SOFTMAX(z_i) = \frac{e^{z_i}}{\sum e^{z_i}}$$

z_i : vector

e^{z_i} : vector, e raised to power all values in z_i

* Gives n outputs for a vector n
* Each output is a probability value between 0-1.
* Sum of all values is equal to 1.

Ex:

$$Z = \begin{bmatrix} 1 \\ 1 \\ 8 \end{bmatrix}$$

$$Softmax(z) = \frac{\begin{bmatrix} e^1 \\ e^1 \\ e^8 \end{bmatrix}}{Sum\left(\begin{bmatrix} e^1 \\ e^1 \\ e^8 \end{bmatrix}\right)}$$

* LOSS FUNCTIONS:

$$MSE = \frac{1}{n}\sum (Y_i - \hat{Y}_i)^2$$

* REGRESSION : $MSE = \frac{1}{n}\sum(Y_i - \hat{Y}_i)^2$

* BINARY CLASSIFICATION:

$$LogLoss = -\frac{1}{n}\sum_{i=0}^{n}[y_i log(\hat{y}_i) + (1 - y_i)\log(1 - \hat{y}_i)]$$

* MULTICLASS CLASSIFICATION:

CATEGORICAL CROSSENTROPY = $\sum_{0}^{m} \hat{Y}_i \log(\hat{Y}_i)$

```
result = np.array([0.9,0.01,0.01,0.08])
log_array = -np.log(result)
cat_cross_entropy = sum(result * log_array)
cat_cross_entropy
```

	ACTIVATION HIDDEN LAYERS	ACTIVATION OUTPUT LAYER	LOSS FUNCTION
REGRESSION	ReLU	Linear	MSE
BINARY CLASS.	ReLU	Sigmoid	Binary Crossentropy
MULTI. CLASS.	ReLU	Softmax	Categorical Cross Entropy