

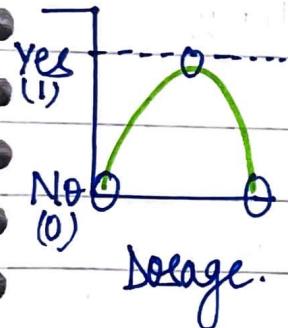
Dosage.  
0 - 1

13 May 2023

## # Neural Networks PART 3: ReLU in Action

### \* SUMMARY

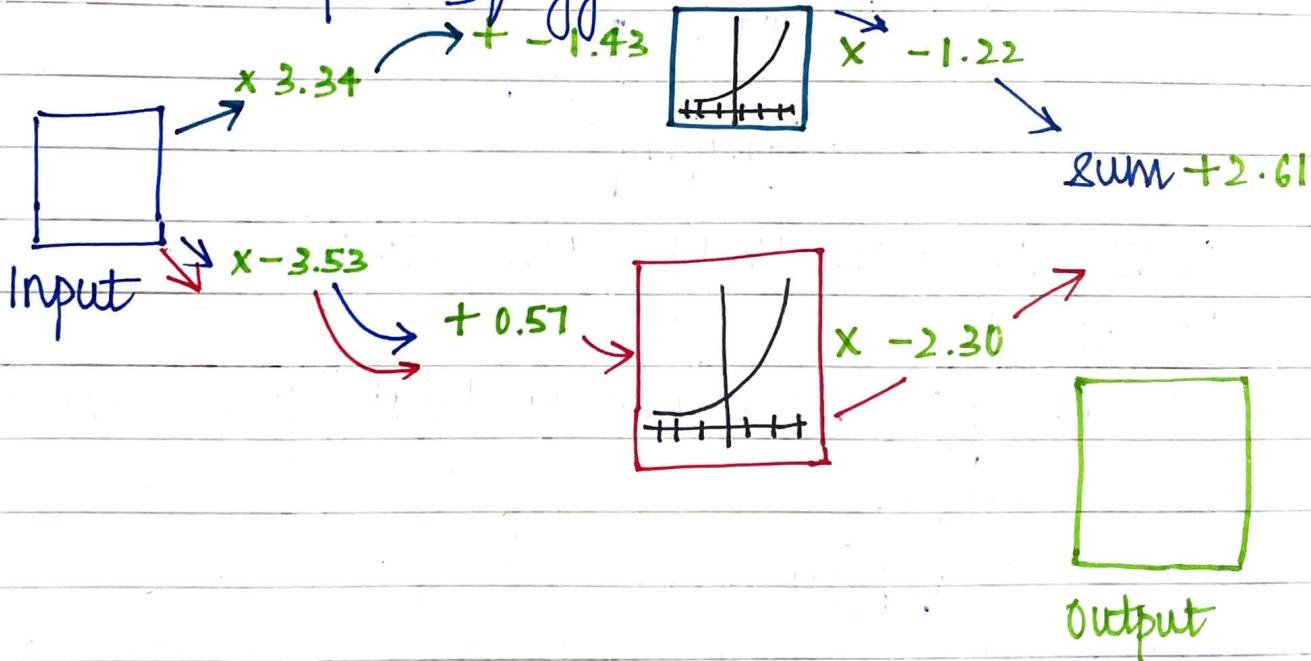
#### PT 1: Inside the Black Box



- (1) Started w a simple dataset that showed if a drug is effective at a given dosage.
- Low & High dosage not effective.
  - Medium dosage was effective.

- (2.) How a NN uses the Softplus activation function in the hidden layer?

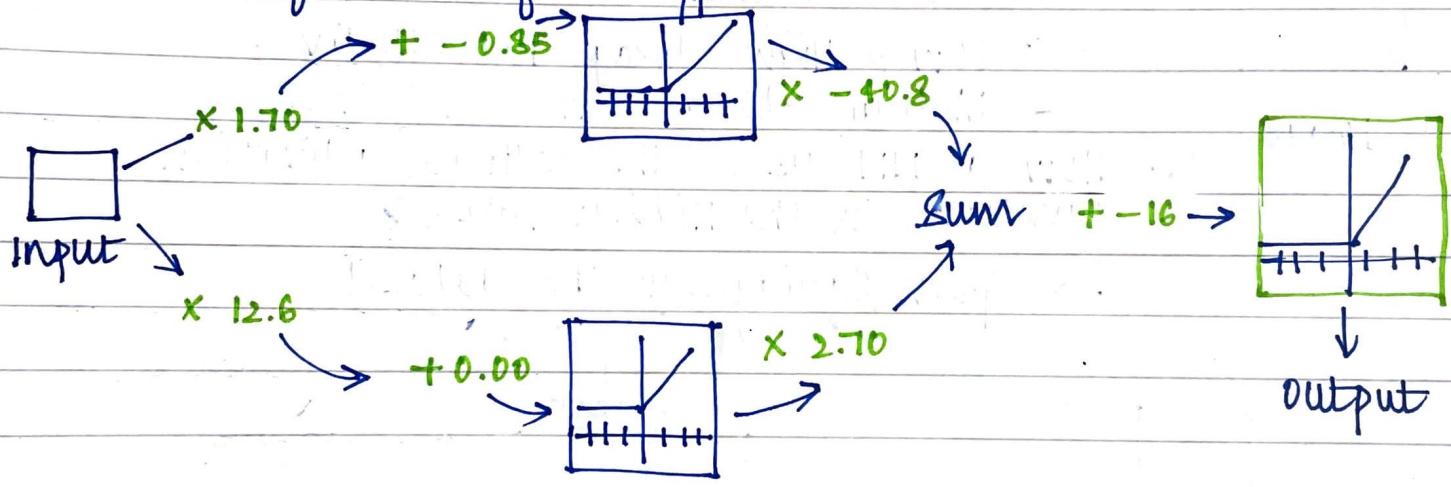
→ Green Squiggle in the dataset



• Now let's see what happens if we swap out the SOFTPLUS activation function in hidden layer w one of the most popular activation functions for DL & CNN

the ReLU Activation Function  
which is short for Rectified Linear Unit.

- \* It's common to put an activation function before the final o/p.



Now, we run dosage from 0 to 1.

$$\text{Eg: } \text{i/p} = 0$$

$$0 \times 1.70 - 0.85 = x \text{ axis coordinate for activation fn}$$

$$\begin{array}{r} -0.85 \\ \hline \text{ReLU} \end{array}$$

$$f(-0.85) = \max(0, -0.85) = y \text{ axis coordinate} = 0$$

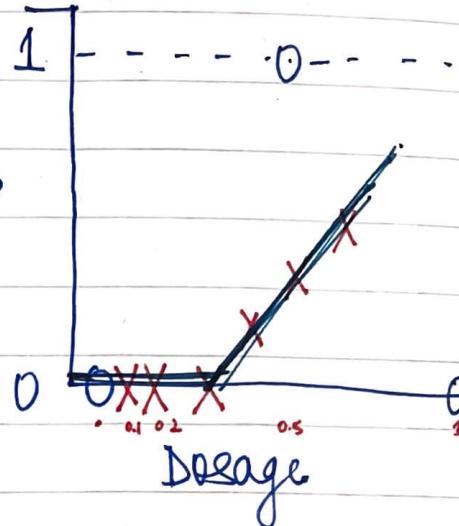
$\therefore$  corresponding y axis coordinate = 0

Eg<sub>2</sub> Doseage = 0.1

$$x = (0.1 \times 1.70) + -0.85 = -0.51$$

$$f(x) = 0$$

R/W



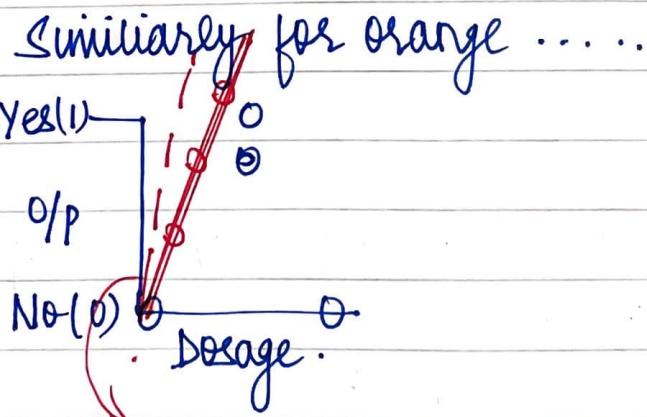
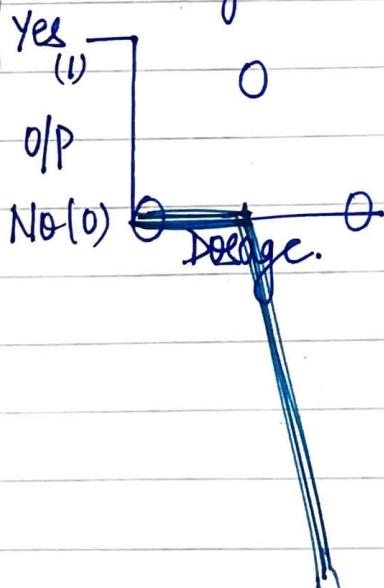
Doseage = 0.2

$$x = (0.2 \times 1.70) + -0.85 = -0.51$$

$$f(x) = 0$$

\* Next Step

Multiply yaxis coordinate on the bent blue line by  $-40.8$  & new bent blue line \*

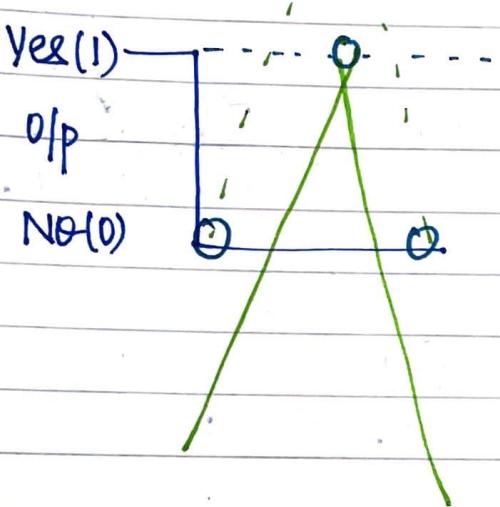


dotted  
is final  
line

\* Next Step

Add the Bent Blue & St orange line together  
for following green wedge & add -16 to  
it.

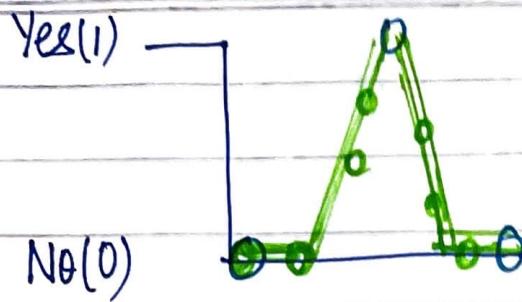
Final Curve.



\* Last Step

ReLU Activation after above O/p  
Function

Final Curve :



### ★ ReLU Activation Function

- Might look strange
- Actually much simpler

$$f(x) = \max(0, x)$$

$= y$  axis coordinate

NOTE: ReLU activation f'n curve is bent,

↓

The derivative is not defined at that point.  
 & we need derivative to be defined for  
 grad descent to estimate the weights & biases.  
 for all points

↓ SOLVED BY:  
 Simply defining the derivative at the bent  
 part to be 0 or 1