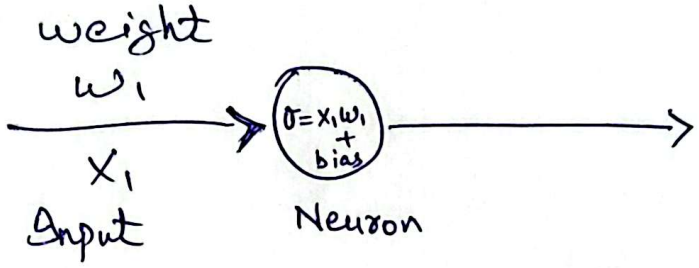
Neural Network.

Neuron: is a basic building block of a neural network.

→ Consider them as a mathemetical functions that processes input data and produce an Output.

E.g



The input is multiplied by the corresponding weight, a bias is added to it.

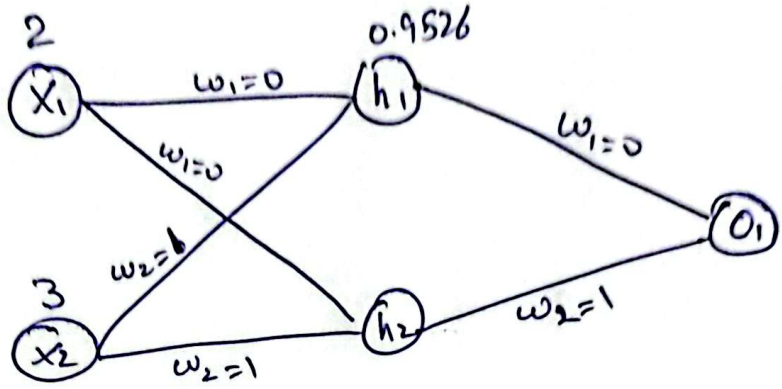
Bias, is an additional parameter in the neuron that helps the model in making accurate Prediction.

Activation function: The result of neuron is passed through an activation function to produce results.

E.g of A.F = ReLU, Sigmoid.

→ Weights and Biases are tuned during the training process. (Learning of model).

Problem:



x_1 x_2

$X = [2, 3]$

$w = [0, 1]$

$b = 0$

Sigmoid.

$h_1 = (2 \times 0) + (3 \times 1) + 0 = f(3) = 0.9526$

$h_2 = (2 \times 0) + (3 \times 1) + 0 = f(3) = 0.9526$

Sigmoid funct=

$O_1 = (0.9526 \times 0) + (0.9526 \times 1) = f(0.9526)$

$= 0.7216$

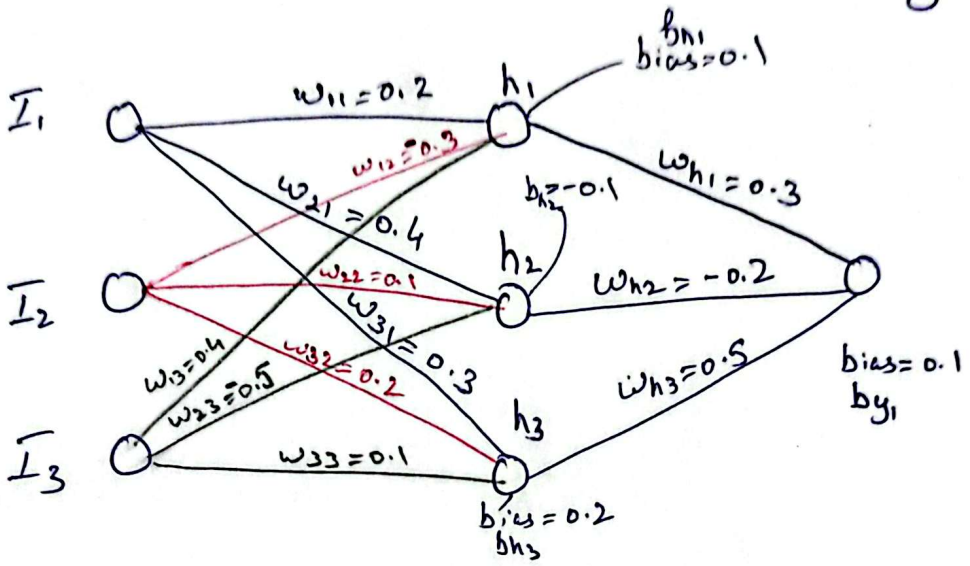
Value > 0.5 = Diseases.

Value < 0.5 = No - disease.

So the result will be diseased.

Lets build an ANN having.

- 3 input neurons (input layer)
- 3 " in hidden layer.
- 1 neuron in output layer.



The network will have weights and biases associated with each connection and neuron.

Weights and Biases

* input vector $x = [x_1, x_2, x_3]$
  - $w_{11} = 0.2$, $w_{12} = -0.3$, $w_{13} = 0.4$
  - $w_{21} = 0.4$, $w_{22} = 0.1$, $w_{23} = -0.5$
  - $w_{31} = -0.3$, $w_{32} = 0.2$, $w_{33} = 0.1$
* Biases for hidden layer neurons.

$b_{h1} = 0.1$, $b_{h2} = -0.1$, $b_{h3} = 0.2$

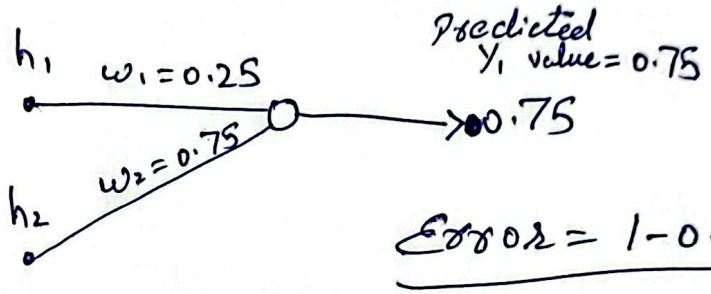
* Weights from hidden layer to output layer.

$w_{h_1} = 0.3$, $w_{h_2} = 0.2$, $w_{h_3} = 0.5$.

* Bias for output neuron.

$b_y = 0.1$

Explanation of Error.



Error = 1 − 0.75 = 0.25

Individual Contribution of weights in the output result.

$$\frac{w_1}{w_1+w_2} \times 100 = \frac{0.25}{0.25+0.75} \times 100 = 25\%$$

$$\frac{0.75}{0.25+0.75} \times 100 = 75\%$$

Now finding the actual Error value for h_1 and h_2.

$$E_{h_1} = \frac{w_1}{w_1+w_2} \times \text{Error} = \frac{0.25}{0.25+0.75} \times 0.25 = 0.0625$$

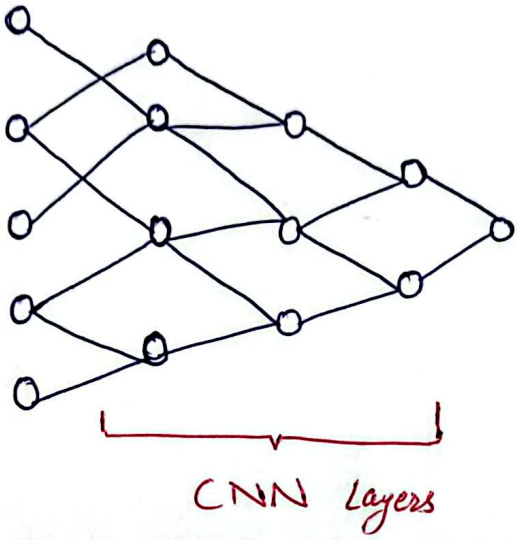
$$E_{h_2} = \frac{w_2}{w_1+w_2} \times \text{Error} = \frac{0.75}{0.25+0.75} \times 0.25 = 0.1875$$

So Error from h_2 is high.

Remember sum of error = 0.0625 + 0.1875 = 0.25 (Total error value)

Convolutional Neural Network.

CNN is an area of deep-learning that specializes in pattern recognition.



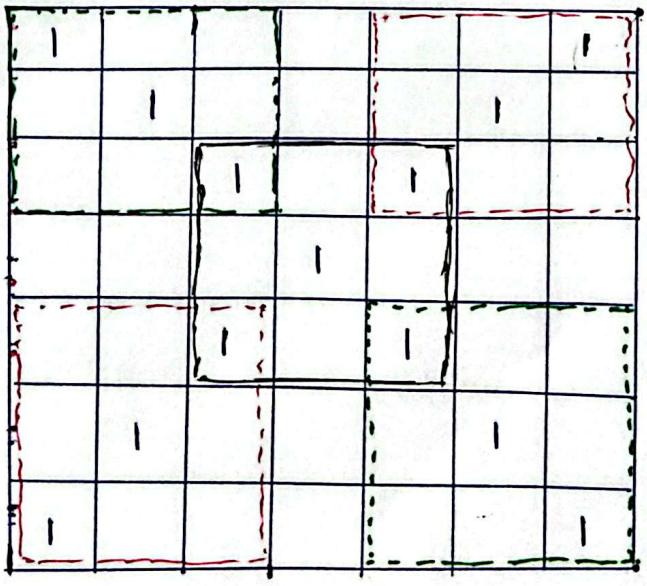
Types of layers in Convolutional neural network

1) Convolutional layer.
2) Relu layer.
3) Pooling layer.

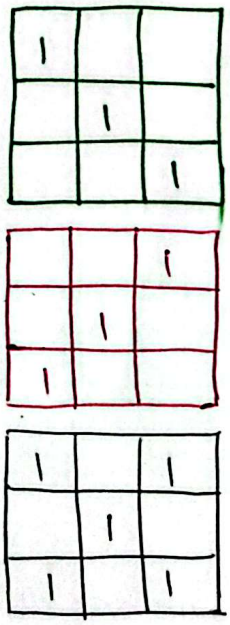
⊗ Within these CNN layers there are filters that perform the pattern recognition.

How the filters do pattern recognition.

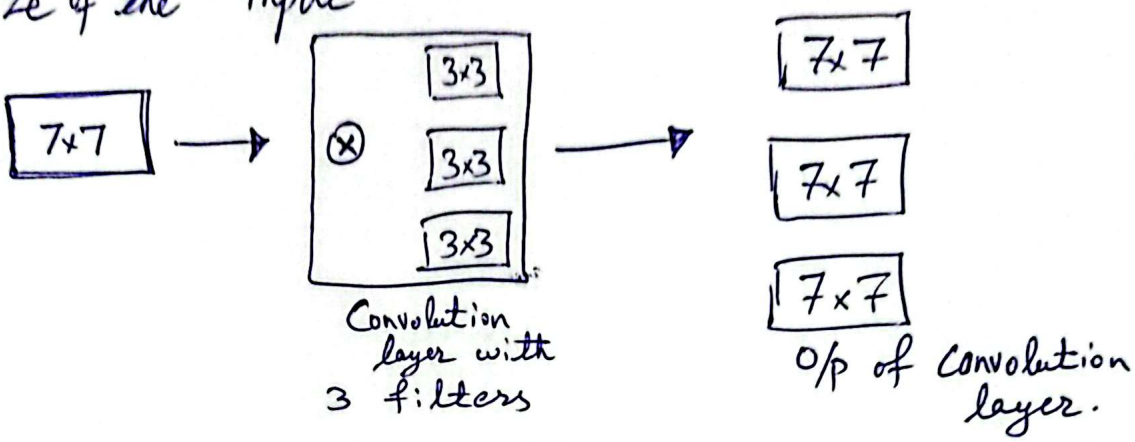
E.g



3 filters. can find the pattern in given example.

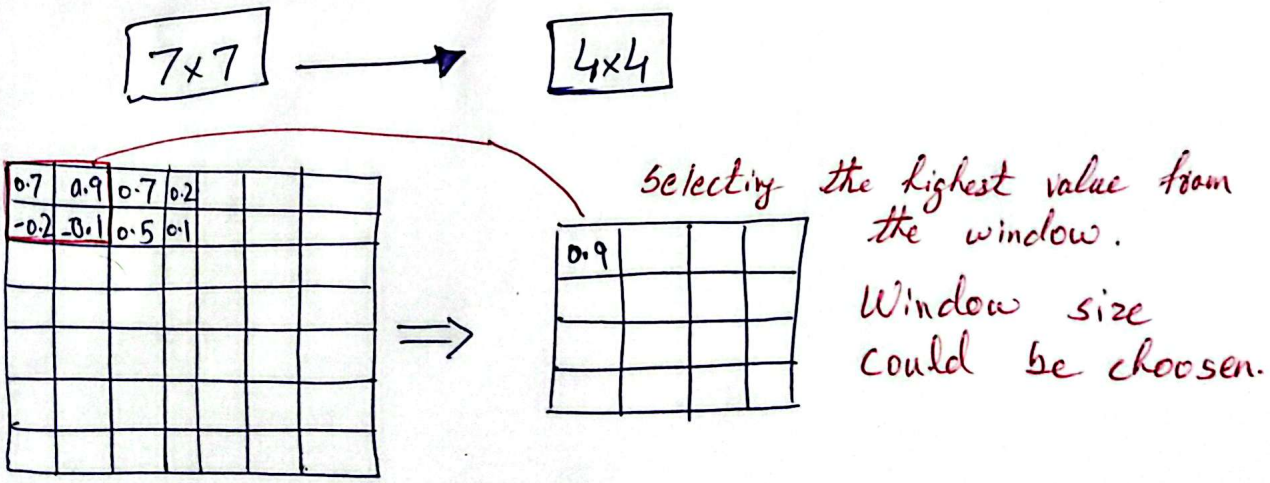


Output of Convolutional layer will be equal to the number of filters number of outputs of the same size of the input

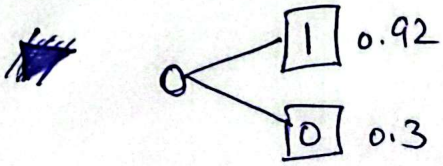


- **Relu layer:** remove all negative values from the convolutional layer output. Replace negative values with zero.

- **Pooling layer:** Pooling layer reduce the size of image.



Fully Connected Layer: image classification.



based on output numerical value.