



Khwopa
College of
Engineering

Deep Neural Network

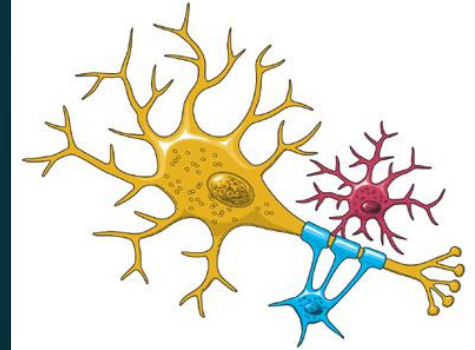
-Ankit Pradhan (074KCEBCT010)



What's in this slide?

Here's what you'll find in this slide:

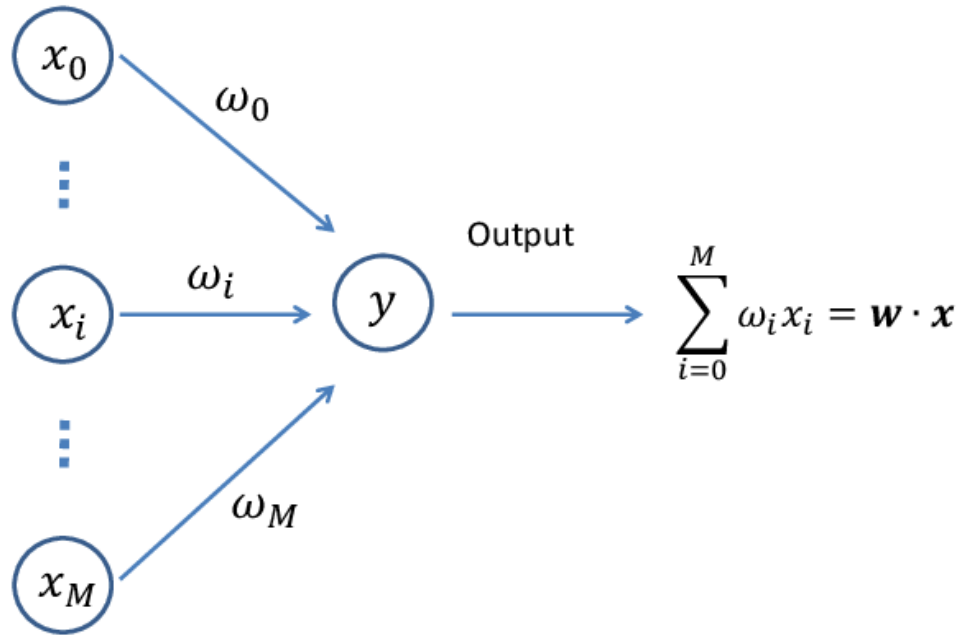
1. What is Neural Network?
2. What is Deep Neural Network?
3. How does a Neural Network learns?
4. What can Deep Neural Network do?
5. What are the types of Neural Networks?



A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. It is basically a system of neurons.

Neural Network

Structure of a simple one layer Neural Network



Deep Neural Network

02

What is Deep Neural
Network?

A DNN is an artificial neural network with multiple layers between input and output, whether having linear relationship or non linear

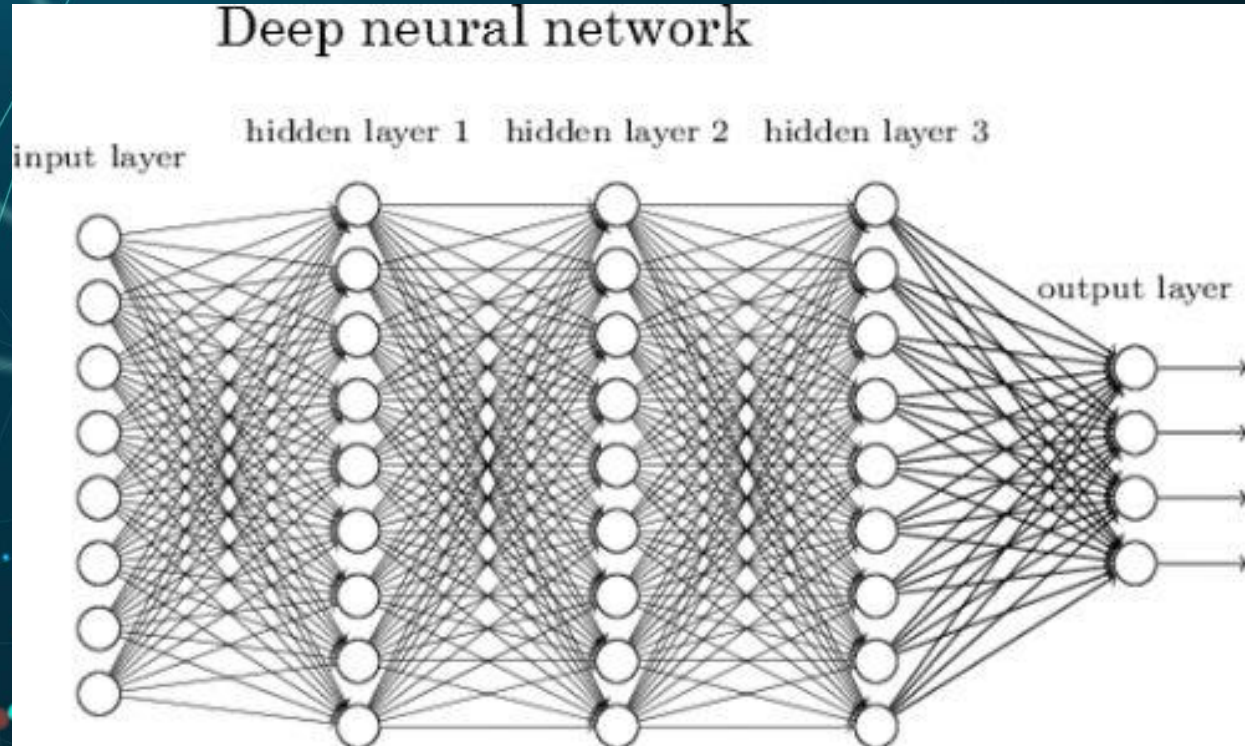
So, the network moves through the layers calculating the probability of each output.

Feed Forward Networks

Eg: For example, a DNN that is trained to recognize dog breeds will go over the given image and calculate the probability that the dog in the image is a certain breed

Deep Neural Network

DNN



How does DNN learns?

02

How does DNN work?

At first, the DNN creates a map of virtual neurons and assigns random numerical values, or "weights", to connections between them. The weights and inputs are multiplied and return an output between 0 and 1. If the network did not accurately recognize a particular pattern, an algorithm would adjust the weights. That way the algorithm can make certain parameters more influential, until it determines the correct mathematical manipulation to fully process the data.

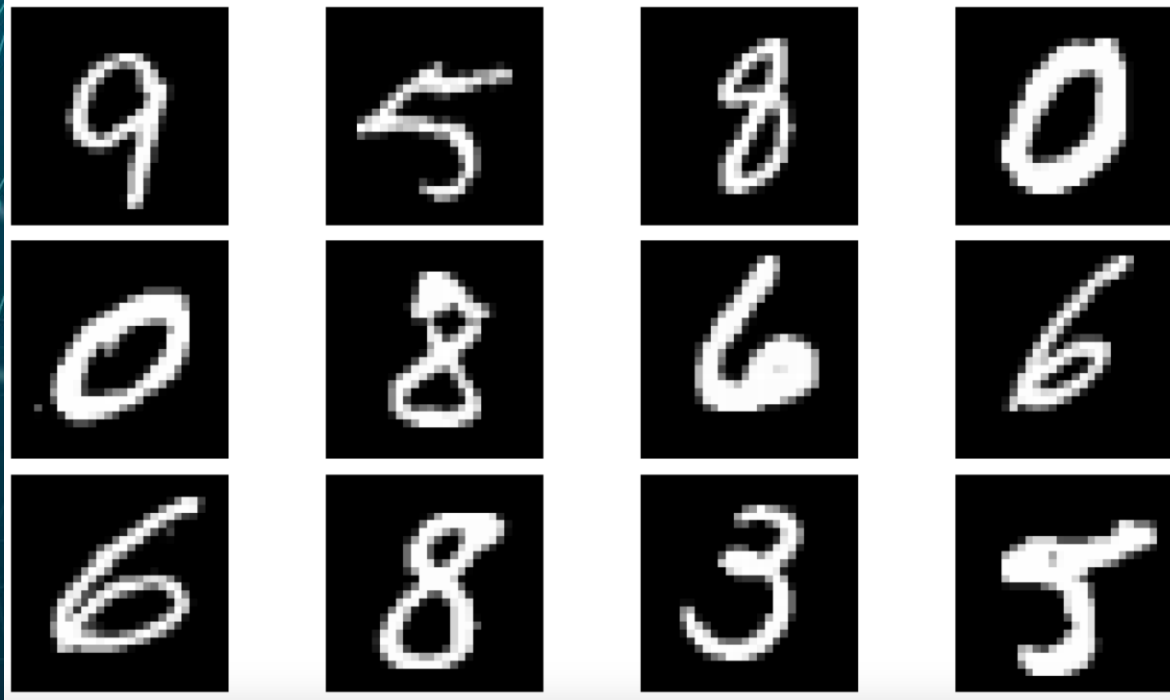
How
does it
work?

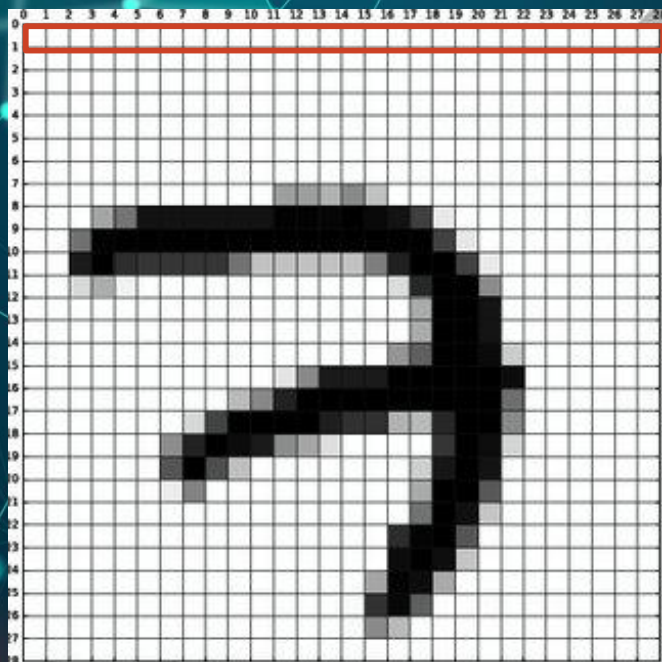
Neuron

0.3

A thing that holds a number

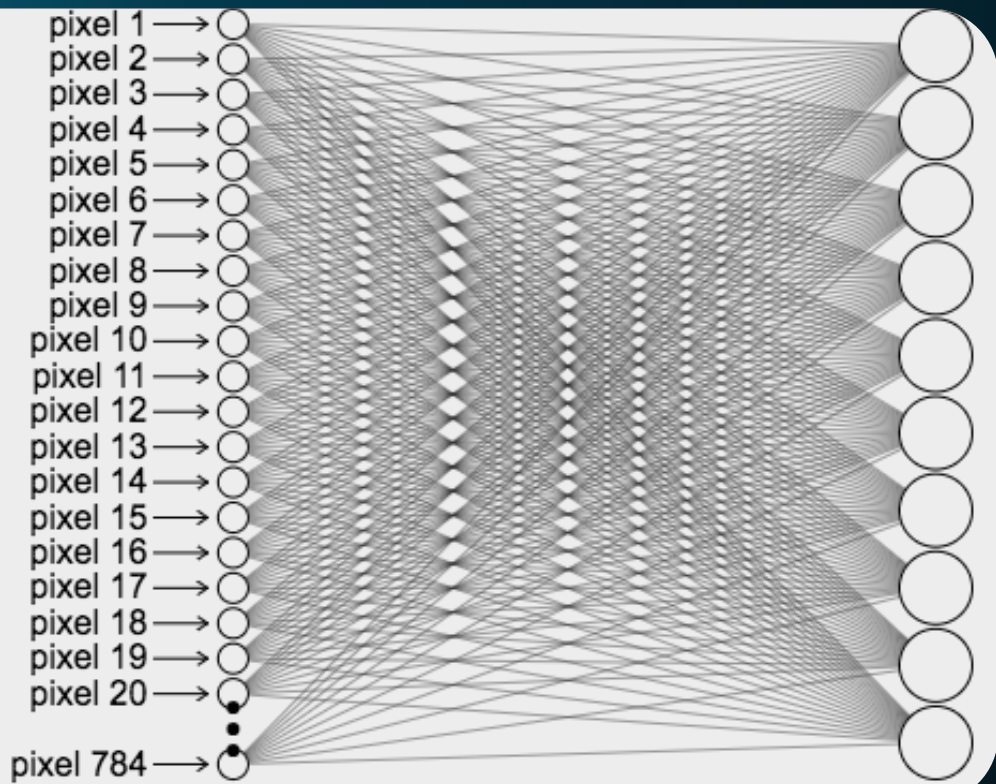
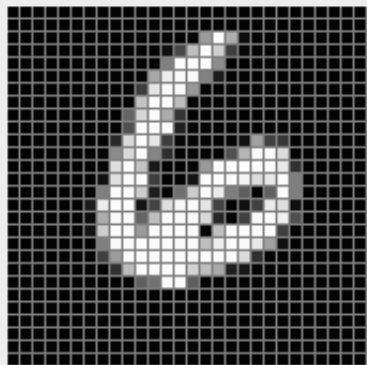
Hand written number recognition

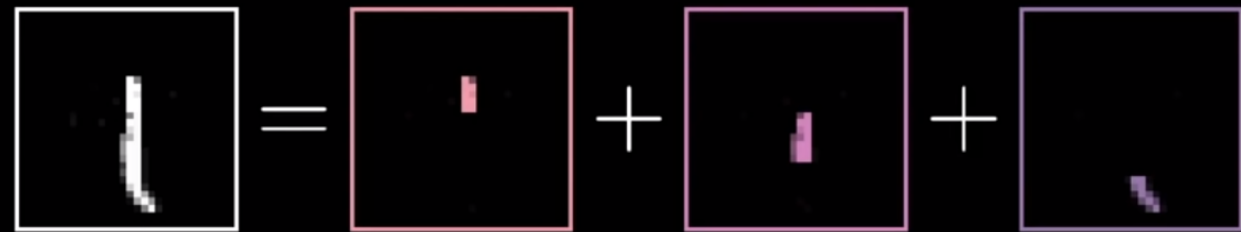




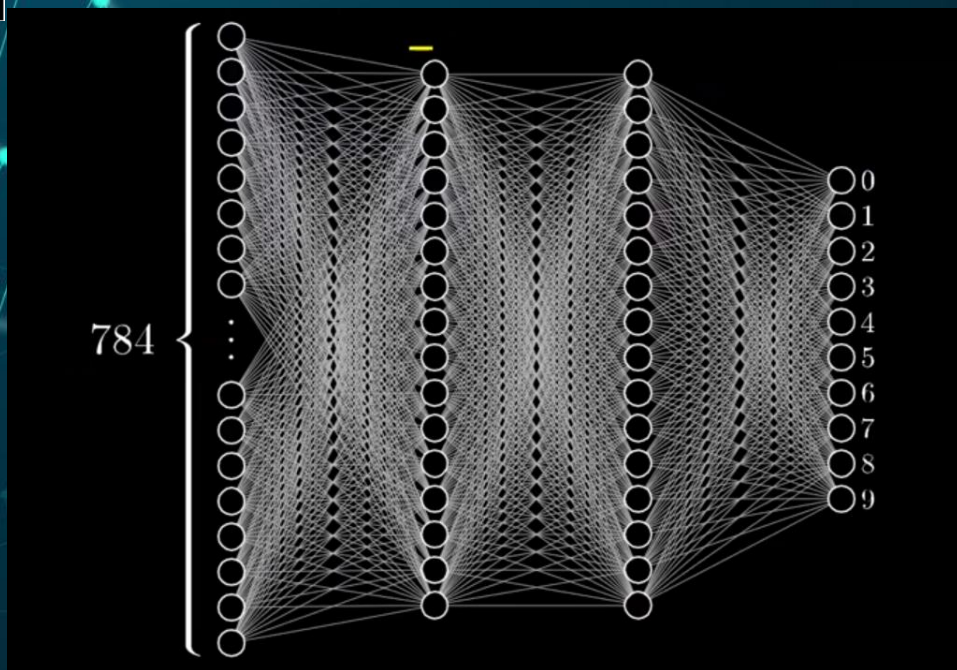
28px

28px





$$\begin{bmatrix} \text{9} \end{bmatrix} = \begin{bmatrix} \text{0} \end{bmatrix} + \begin{bmatrix} \text{1} \end{bmatrix}$$



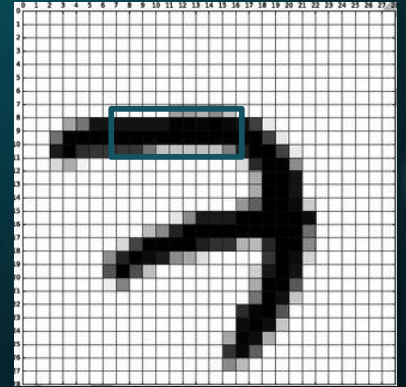
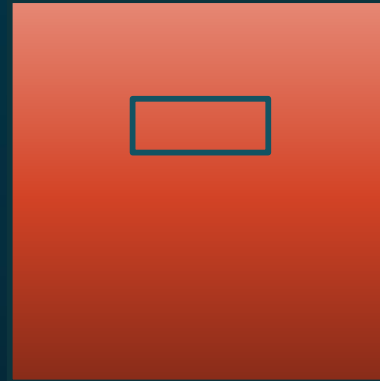


$$a1 * w1 + a2 * w2 + \dots$$

$$\sigma(a1 * w1 + a2 * w2 + \dots + b)$$

Activation function

Bias

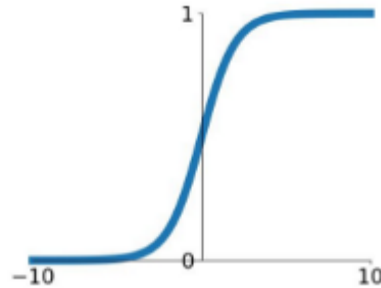


Activation Function

Activation function of a neuron defines output of a neuron given the input

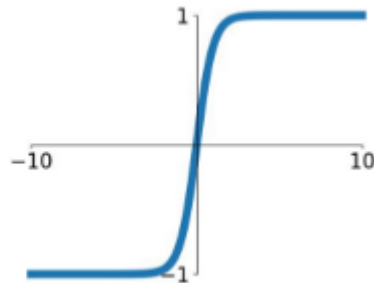
Sigmoid

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



tanh

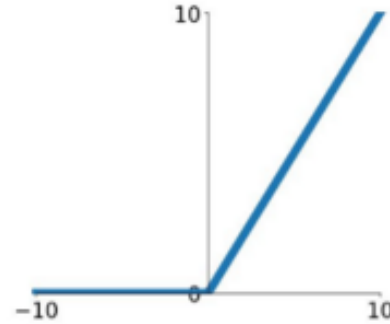
$$\tanh(x)$$



Activation Function

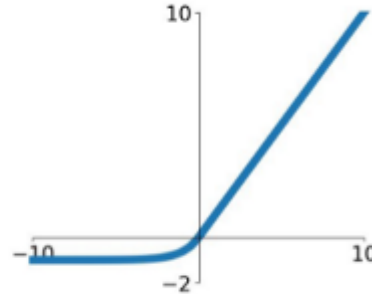
ReLU

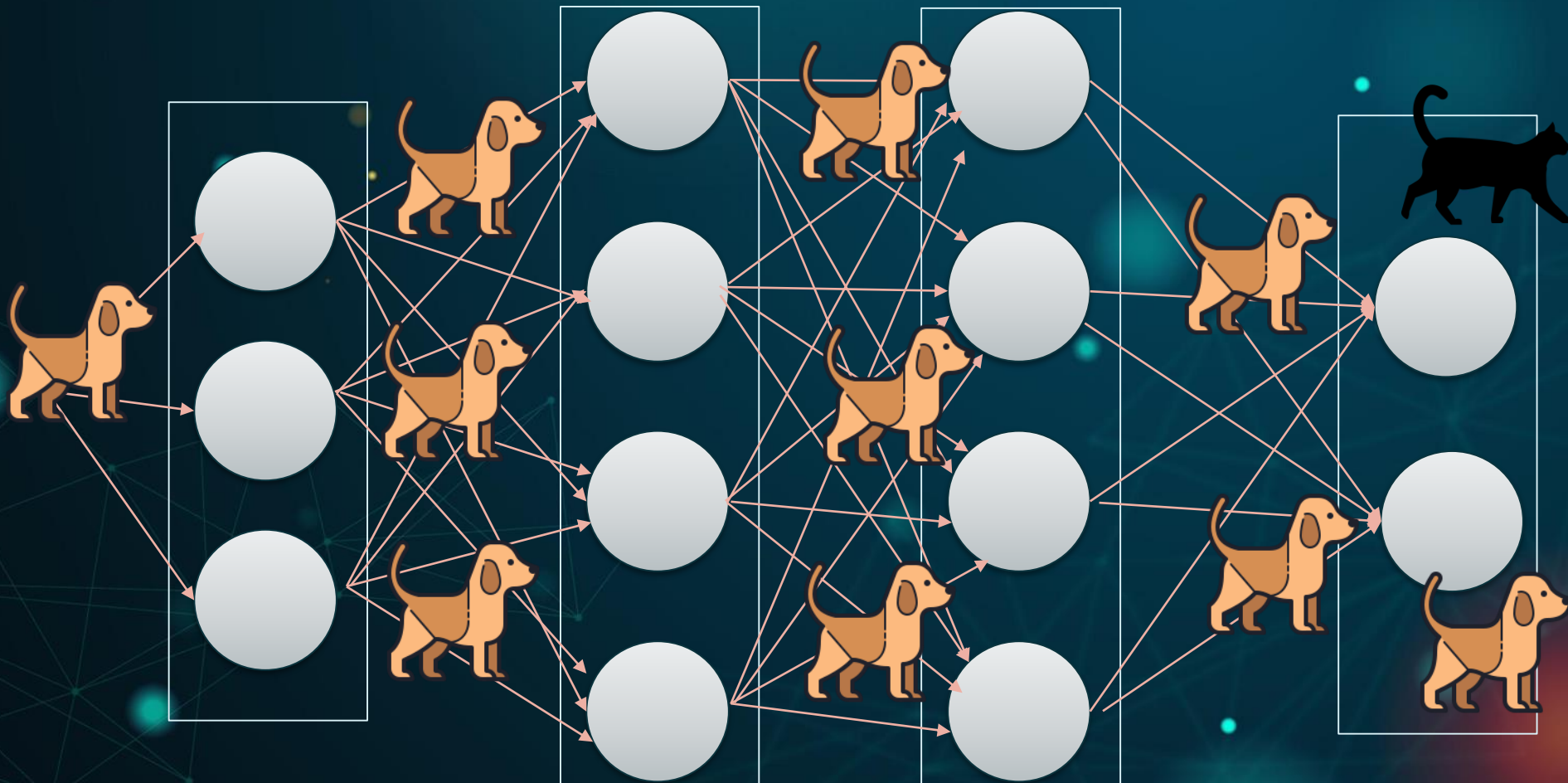
$$\max(0, x)$$



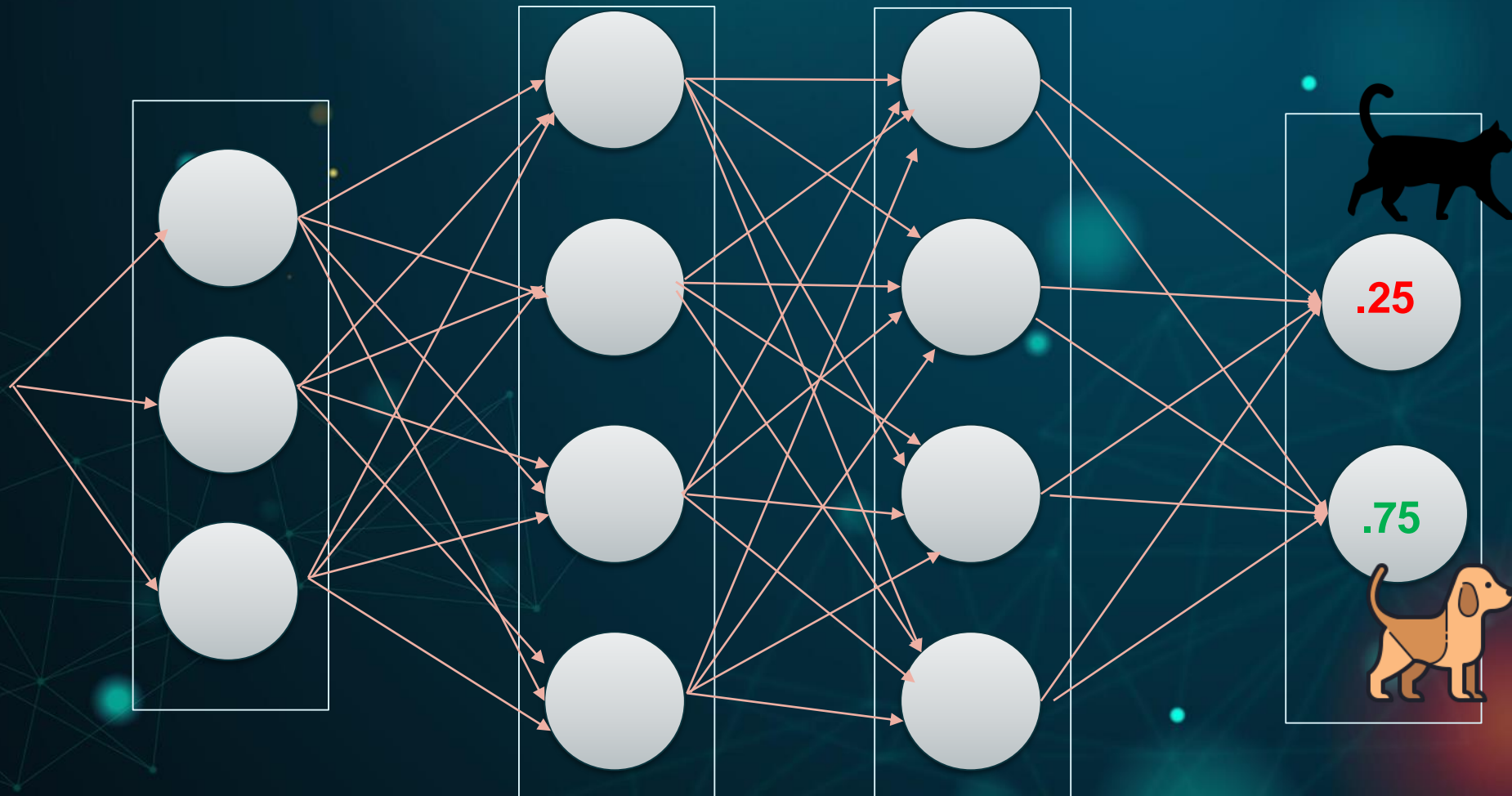
ELU

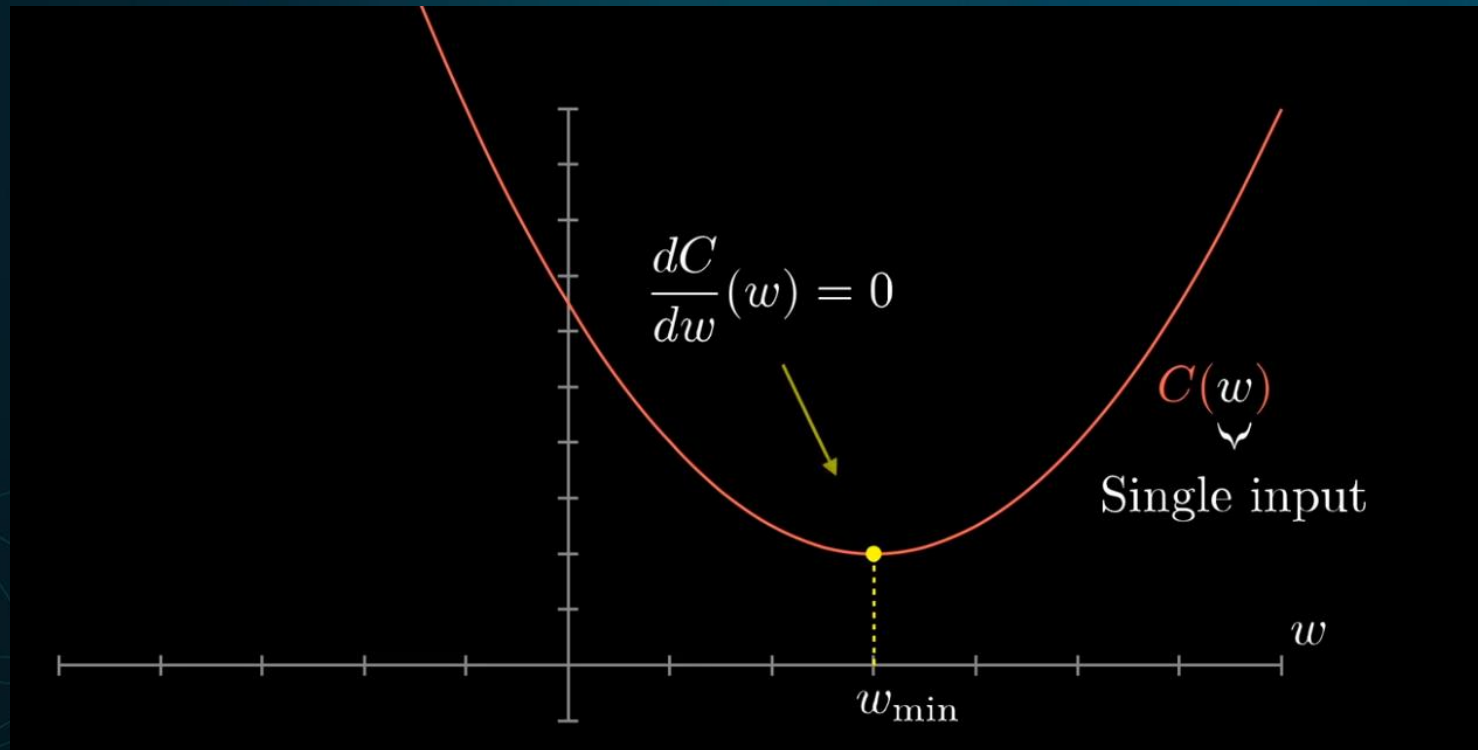
$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$

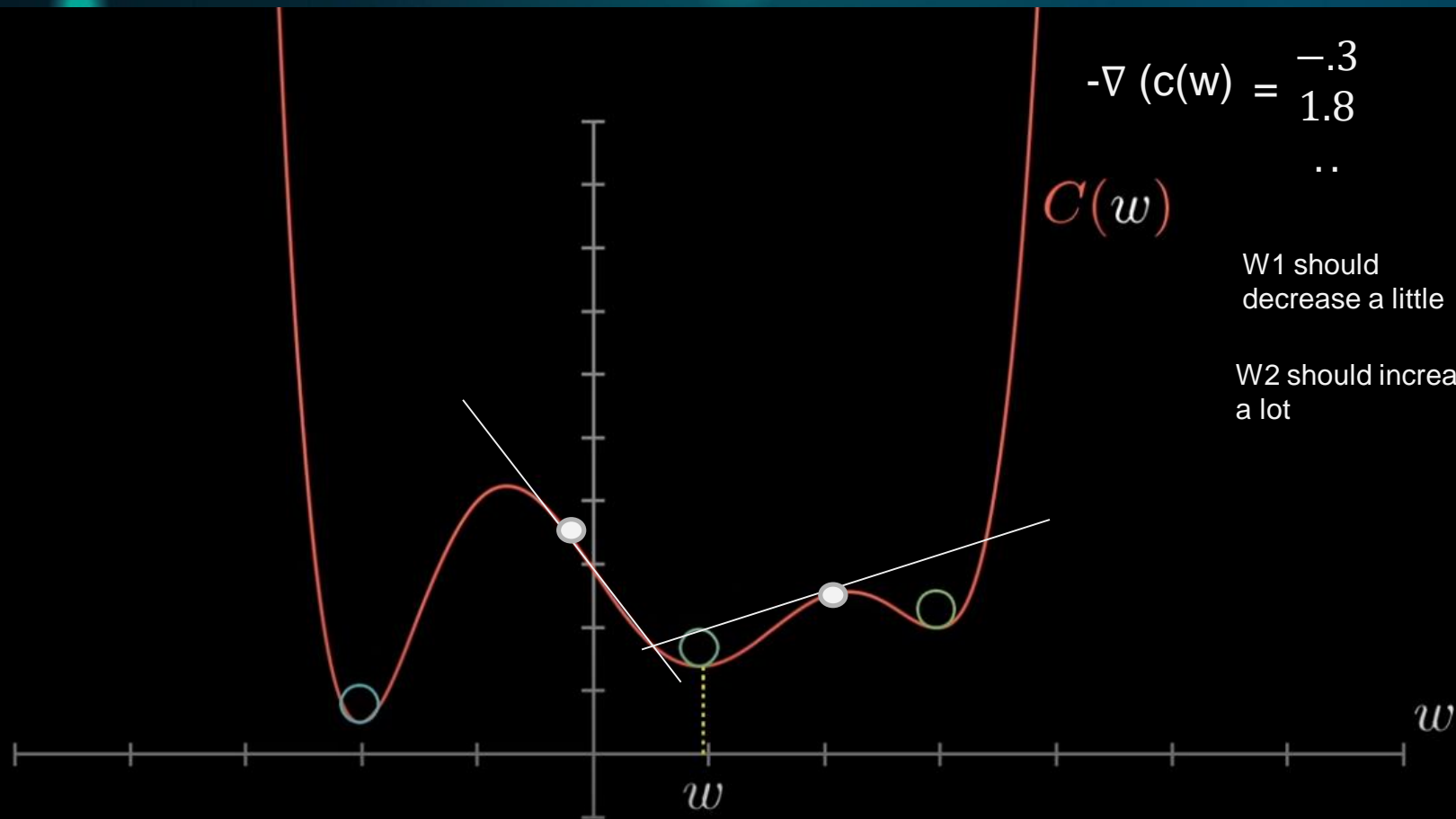




$$C(w) = (.25-0)^2 + (.75-1)^2$$







$$-\nabla (c(w)) = \begin{matrix} -0.3 \\ 1.8 \end{matrix}$$

..

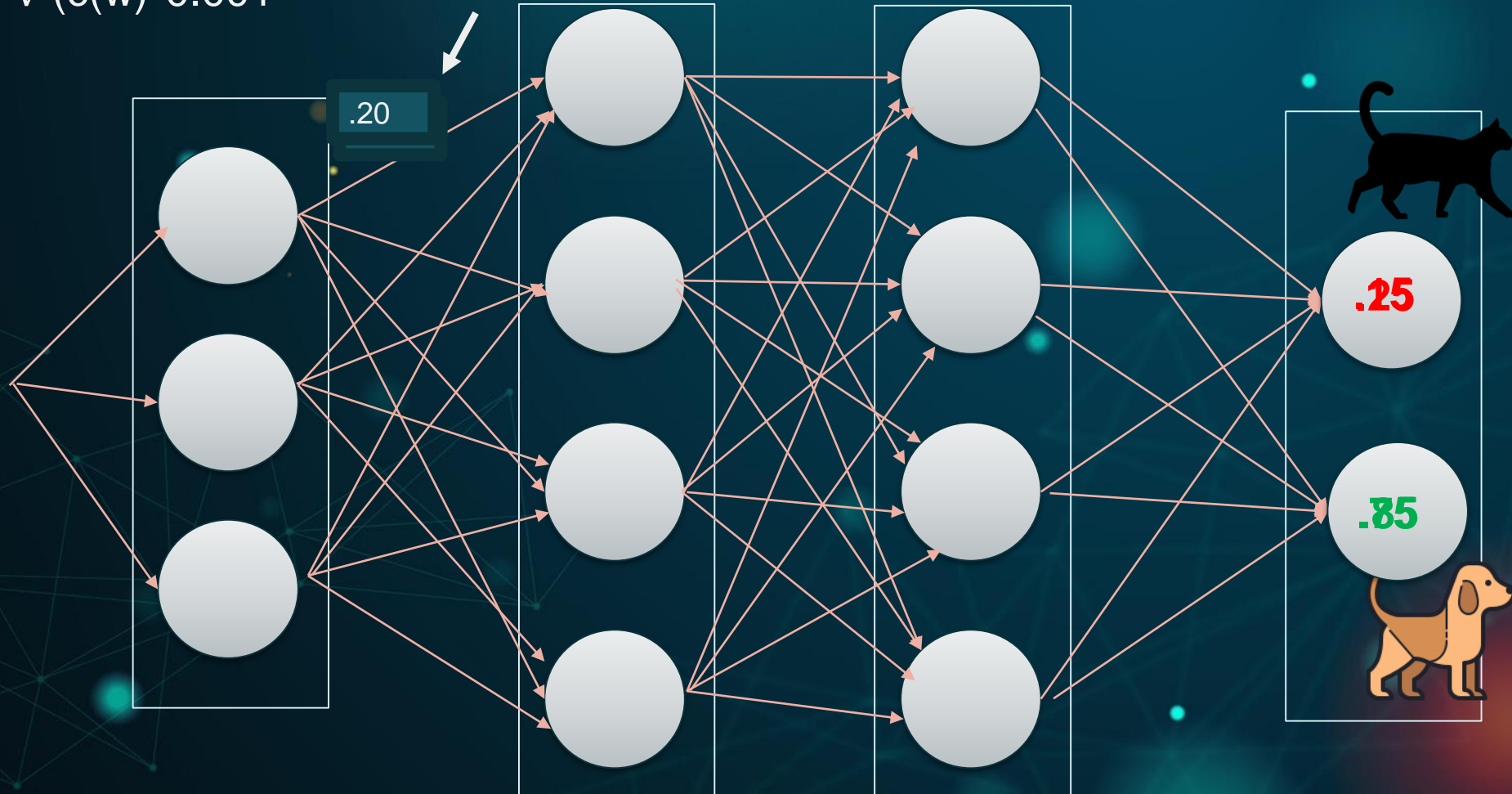
$C(w)$

W1 should
decrease a little

W2 should increase
a lot

Back Propagation

$$-\nabla (c(w) * 0.001)$$



Parameters

1. **Hyperparameters** are the **variables which determines the network structure**(Eg: Number of Hidden Units) and the **variables which determine how the network is trained**(Eg: Learning Rate).
2. **Hyperparameters** are **set before training**(before optimizing the weights and bias).
 - a. Learning rate : slow learning rate (0.0001) converges smoothly but slows down
 - b. number of epochs is number of times the whole training data is shown to the network while training
 - c. Batch size is the number of sub samples given to network after which parameter update happens.
1. **Learnable parameters** are those parameters that will be **learned** by the model **during the training procedure** .

KeyPoints

1. These training happens in the training set.
2. Basically a dataset is divided into train, test, and validation split .
3. The network is exposed to the training set validated on the validation set for the validation accuracy and hence tested on the testing set

**What can
DNN do?**

03

What can DNN do?

WHAT can Deep Neural Network DO?



Translate Text



Identify Faces



Read handwritten Text

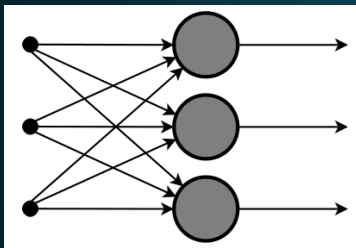


Recognize speech

Types of Neural Neural Network

03

What are the types of Neural Network?



01

Feed Forward NN

Face Recognition Computer Vision



03

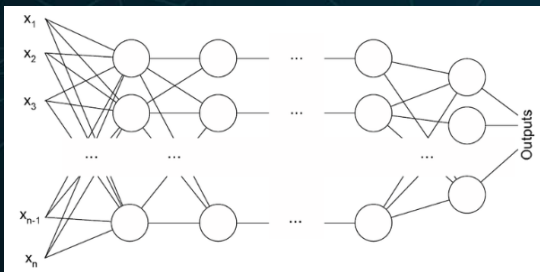
Radial Basis Function NN

Power Restoration Systems

02

Multilayer Perceptron

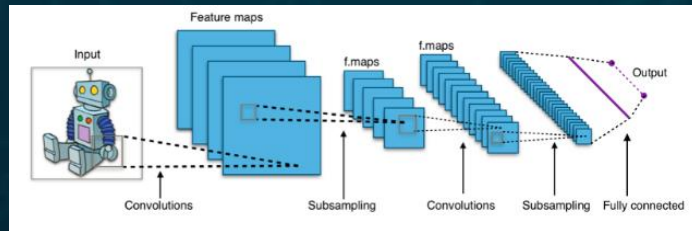
Speech Recognition Machine Translation technologies

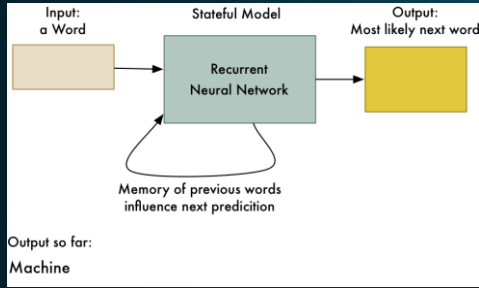


04

Convolutional NN

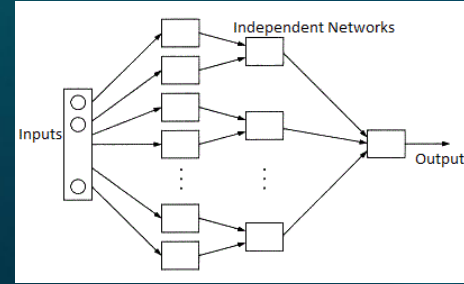
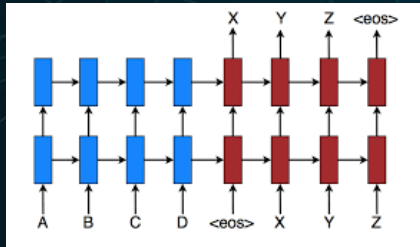
Image Analysis and Recognition





05 | **Recurrent NN**
Natural Language processing
speech recognition

06 | **Sequence to Sequence**
Chatbots, Machine
translation



07 | **Modular NN**
Computer vision,



Thank You