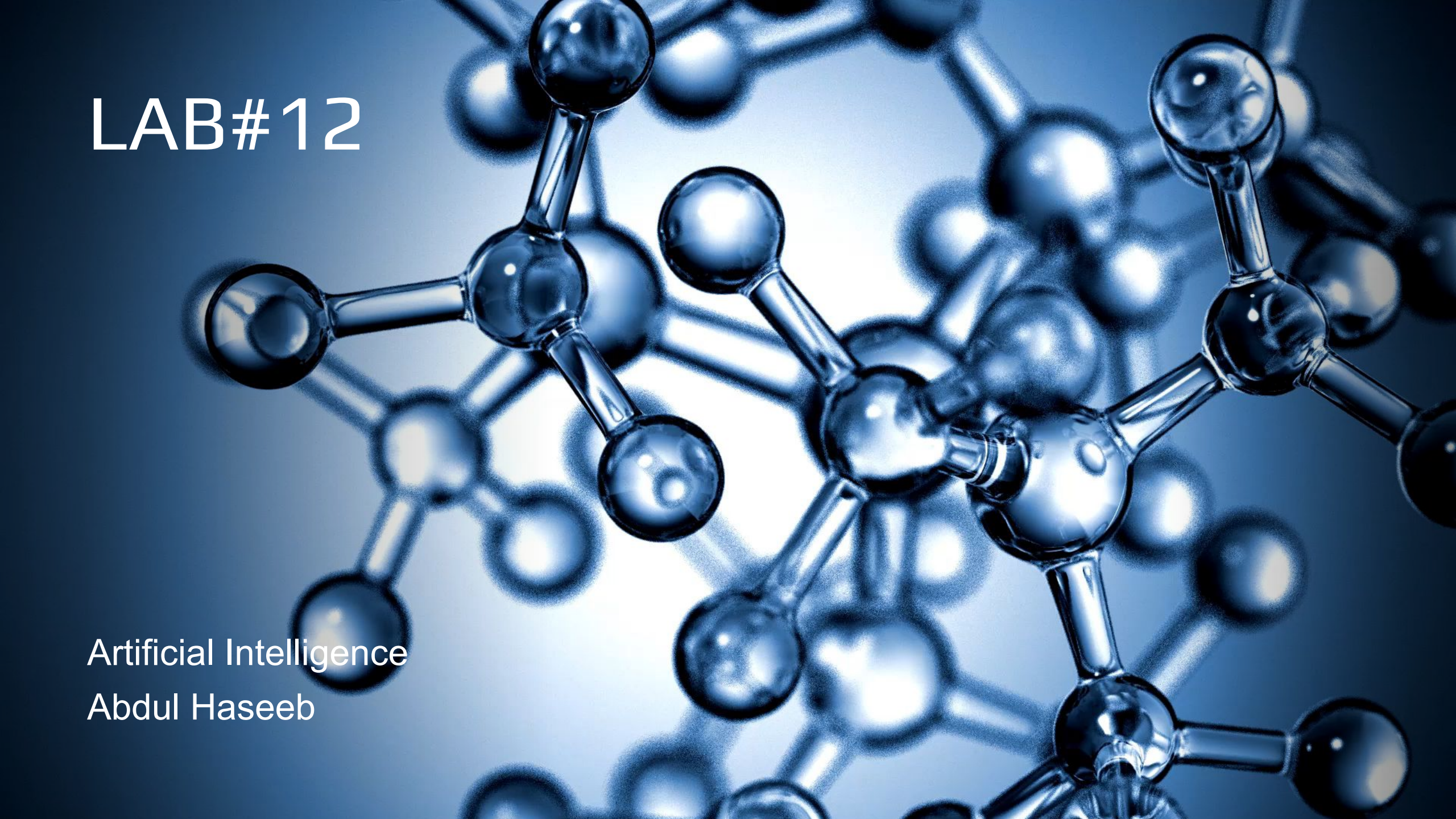


LAB#12

Artificial Intelligence

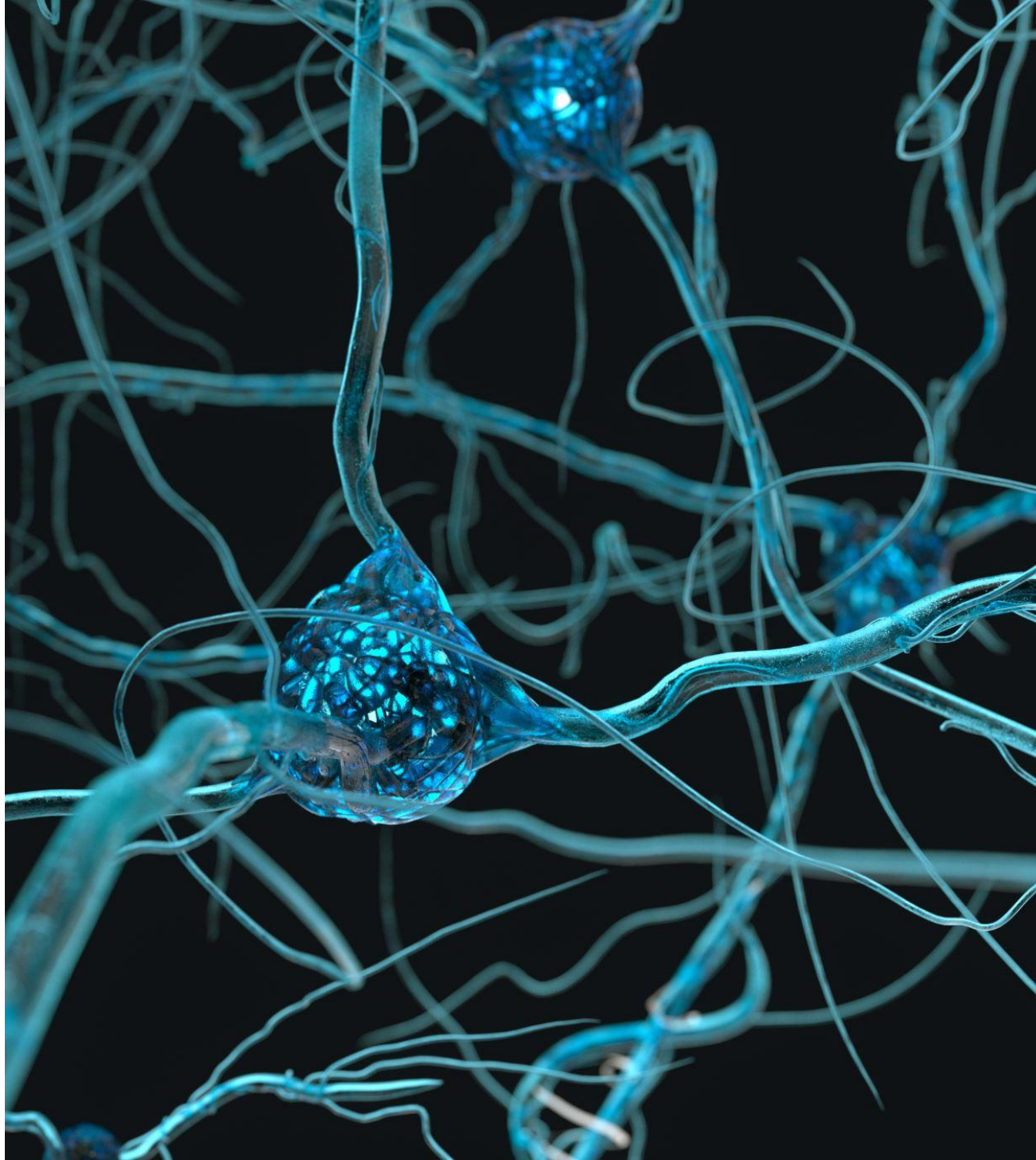
Abdul Haseeb

Lab Objectives

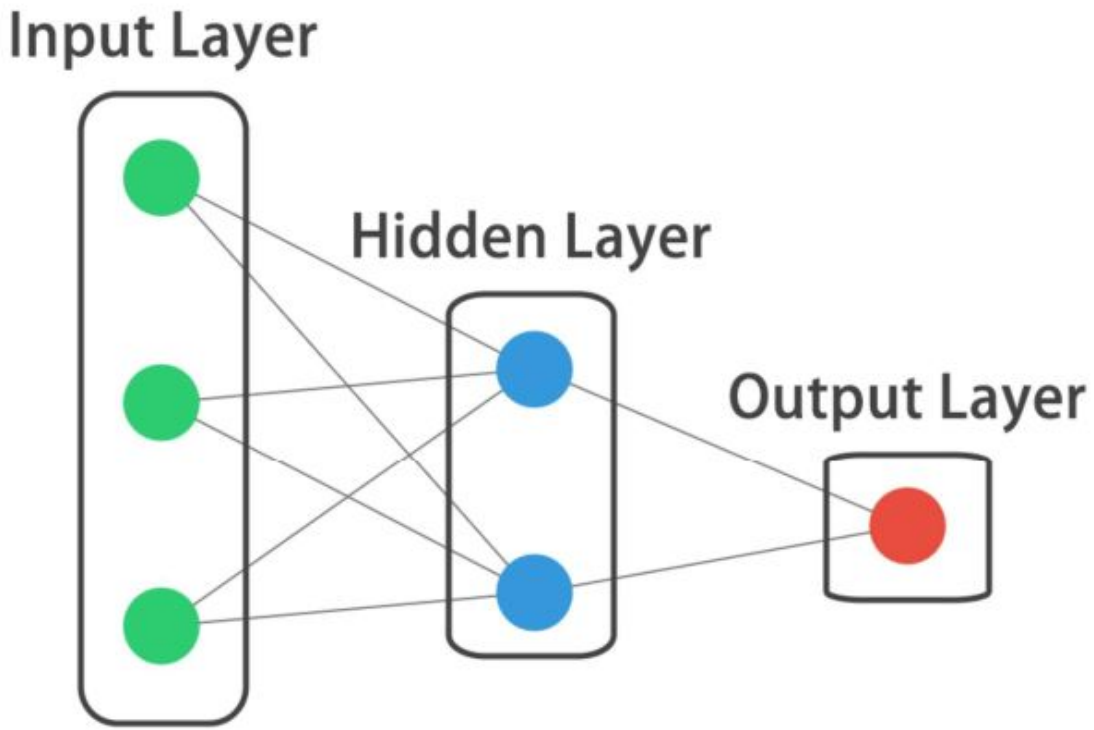
- Implementation of Neural Network from scratch
- Implementation of RELU Activation function
- Implementation of Neural Network with Multiple hidden layers and Relu Activation

Neural Network

- Neural Network is a **Deep Learning Model**
- Makes **decision** in a way like **human brain** does:
  - Mimic the way the **biological neurons work**
- Consists of multiple layers like: **Input layer, hidden layers, output layer**



Neural Network



Layers of Neural Network

Input Layer:

- Used for providing input to the neural network
- Number of neurons depend upon the number of features in the dataset

Hidden Layer:

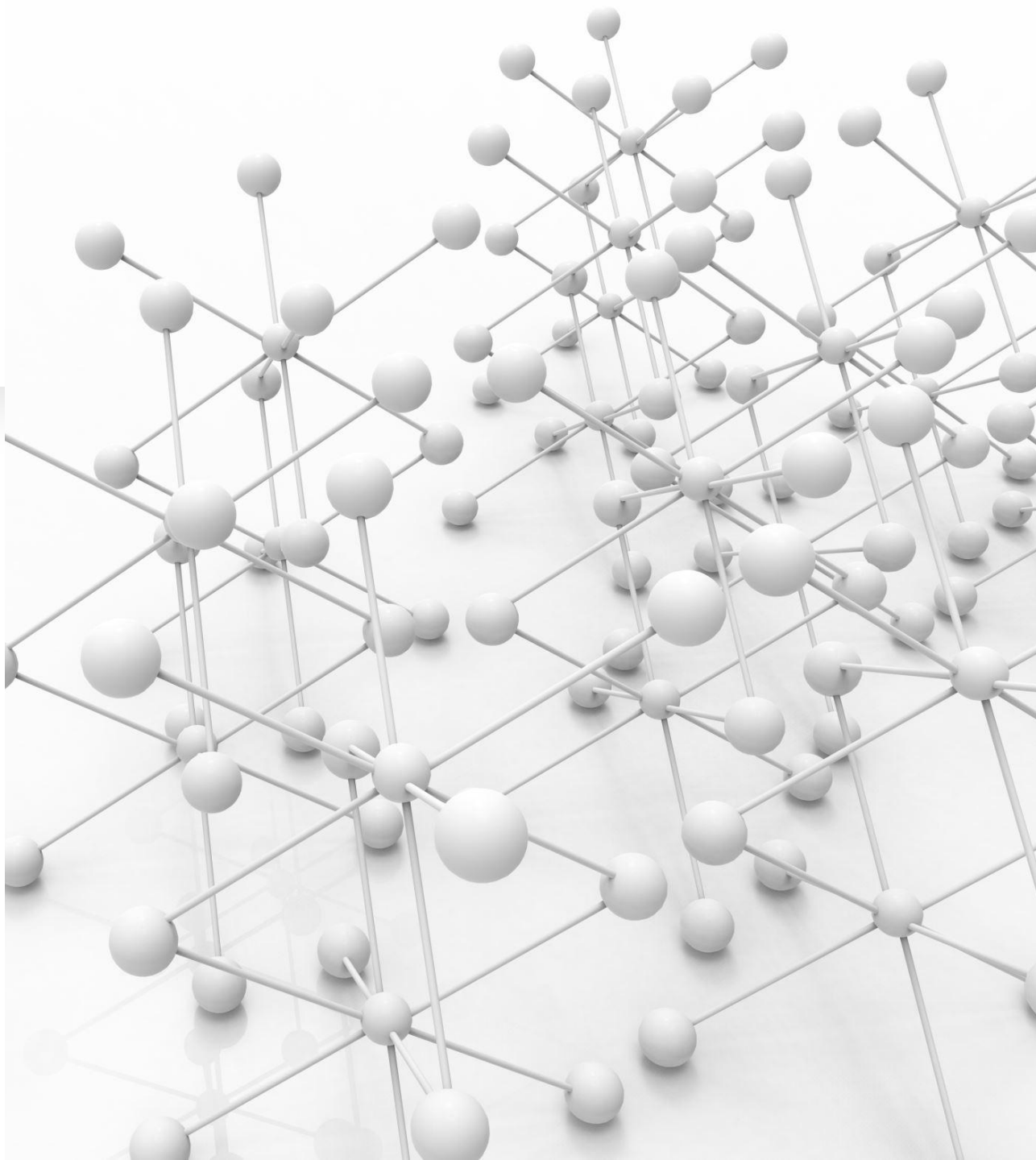
- Used to capture non-linearity (interactions)
- One or More hidden layers, each with one or more neurons
- Absence of hidden layer causes model to act as a Linear Model

Output Layer:

- Produces output from the network
- Number of neurons depend upon the problem

Fully Connected Neural Network (FCN)

- A type of artificial neural network:
  - where the architecture is such that all the nodes, or neurons, in one layer are connected to the neurons in the next layer



Deep Neural Network (DNN)

- An ANN with multiple hidden layers between input and output layer

Deep Fully Connected Neural Networks

- A network which is deep and fully connected

Activation Function

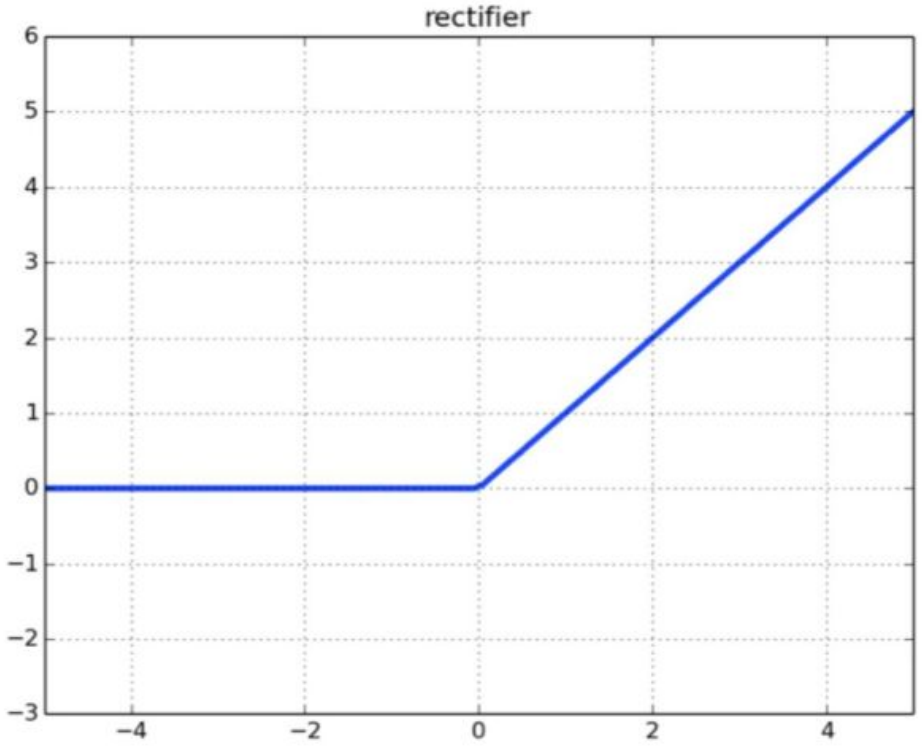
Functions used to capture non-linearity

Can be applied at Hidden Layers and Output layers

At hidden layers they capture non-linearity, at output they help to find the output

Some Examples:

tanh	ReLu	Sigmoid	Softmax

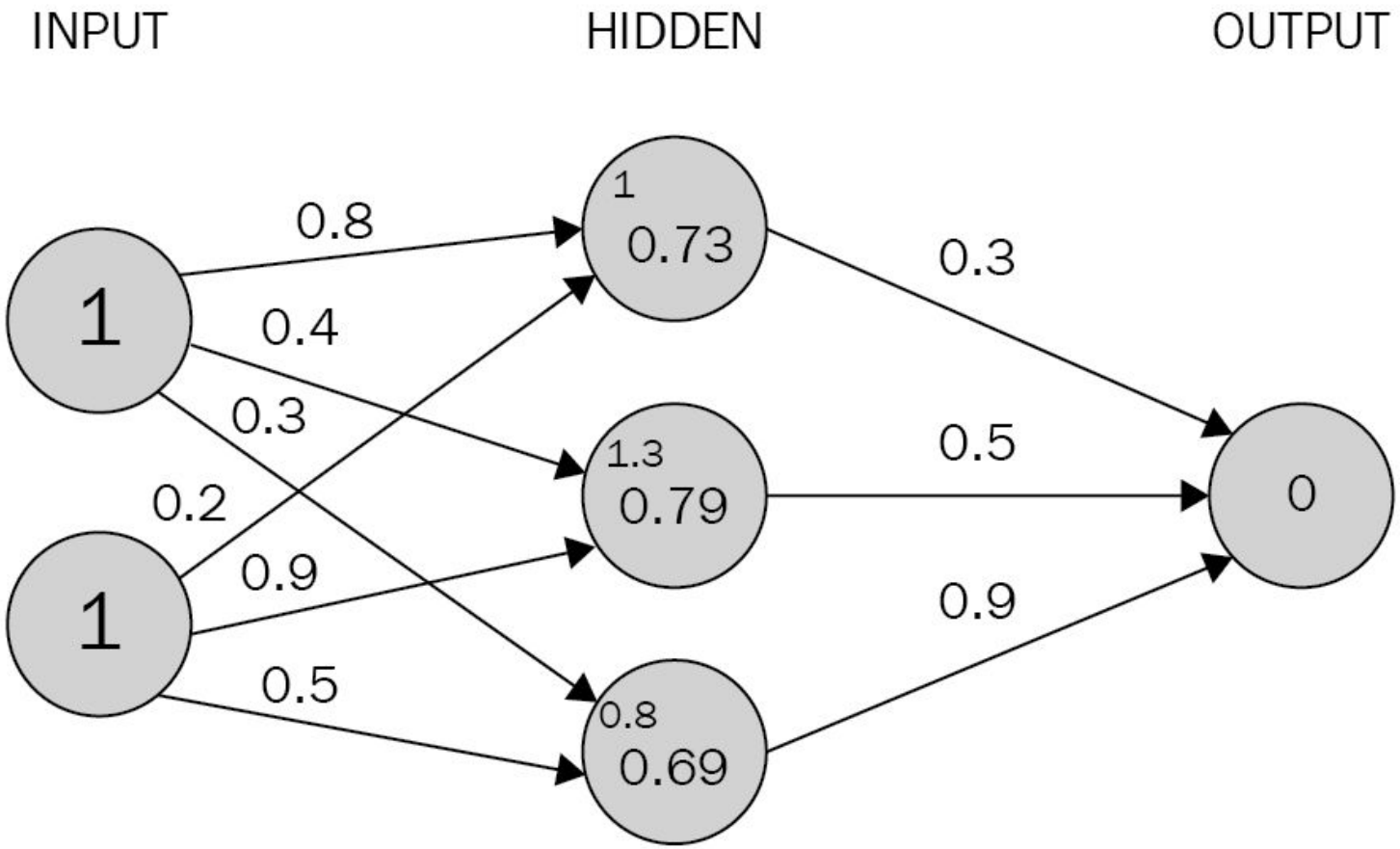


$$RELU(x) = \begin{cases} 0 \ if \ x < 0 \\ x \ if \ x >= 0 \end{cases}$$

RELU Activation

Outputs the input value if input is greater than or equal to zero, and zero otherwise

Task#01 Implement the following neural network from scratch



Task#02 Implementing Neural Network with Multiple Hidden Layers and Predicting Multiple Observations using ReLu Activation

- Implement a Neural Network with following Specifications:
  - Input layer with three features and five examples containing the following data:
    - [[2,3],[3,4],[5,6]]
  - Two hidden layers, each with four neurons, and using RELU Activation function
  - One output layer with one neuron
  - Specify following weights:
    - First: [1,1,1,1],[1,2,-1,1],[3,-2,1,-1],[1,-1,-1,1]
    - Second: [2,1,2,1],[1,2,-1,2],[1,-2,1,-2],[1,-1,-1,1]
    - Output:[1,3,2,1]