Classification and Clustering

Differences

- Classification is used for supervised learning whereas clustering is used for unsupervised learning.
- The process of classifying the input instances based on their corresponding class labels is known as **classification** whereas grouping the instances based on their similarity without the help of class labels is known as **clustering.**

- As Classification have labels so there is need of training and testing dataset for verifying the model created but there is no need for training and testing dataset in clustering.
- Classification is more complex as compared to clustering as there are many levels in classification phase whereas only grouping is done in clustering.
- Classification examples are Logistic regression, Naive Bayes classifier, Support vector machines etc. Whereas clustering examples are k-means clustering algorithm, Fuzzy c-means clustering algorithm, Gaussian (EM) clustering algorithm etc.

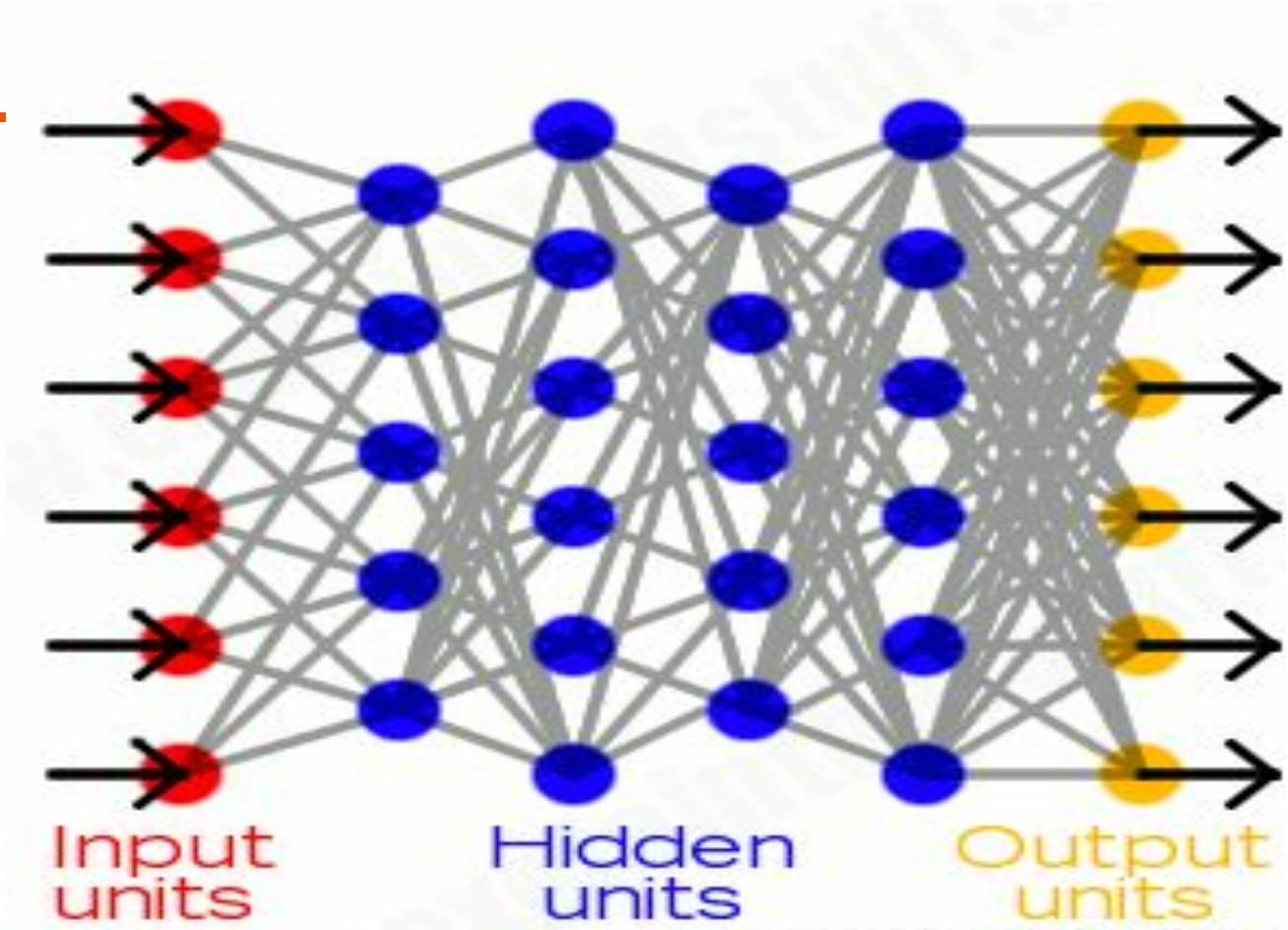
Neural Networks

What are Neural Networks?

- The basic idea behind a neural network is to simulate (copy in a simplified but reasonably faithful way) lots of densely interconnected brain cells inside a computer so you can get it to learn things, recognize patterns, and make decisions in a humanlike way.
- But it isn’t a brain, they're made by programming very ordinary computers, working in a very traditional fashion with their ordinary transistors and serially connected logic gates, to behave as though they're built from billions of highly interconnected brain cells working in parallel.

What does Neural Network consist of?

A typical neural network has anything from a few dozen to hundreds, thousands, or even millions of artificial neurons called units arranged in a series of layers, each of which connects to the layers on either side.


Input
units
Hidden
units
Output
units

Input Unit

Input units, are designed to receive various forms of information from the outside world that the network will attempt to learn about, recognize, or otherwise process.

Output Units

Other units sit on the opposite side of the network and signal how it responds to the information it's learned.

Hidden units

In between the input units and output units are one or more layers of hidden units, which, together, form the majority of the artificial brain.

How does it works?

Feedforward: Process in which it's learning (being trained) or operating normally (after being trained), patterns of information are fed into the network via the input units, which trigger the layers of hidden units, and these in turn arrive at the output units.

Backward Propogation: A feedback process that involves comparing the output a network produces with the output it was meant to produce, and using the *difference* between them to modify the weights of the connections between the units in the network, working from the output units through the hidden units to the input units.

Applications

1. Airplanes: Use of neural network as a basic autopilot, with input units reading signals from the various cockpit instruments and output units modifying the plane's controls appropriately to keep it safely on course.

2. Quality Control: For e.g. you're producing clothes washing detergent in some giant, convoluted chemical process. You could measure the final detergent in various ways (its color, acidity, thickness, or whatever), feed those measurements into your neural network as inputs, and then have the network decide whether to accept or reject the batch.

3. Recognizing patterns and using them to make decisions: They can help us forecast the stockmarket or the weather, operate radar scanning systems that automatically identify enemy aircraft or ships, and even help doctors to diagnose complex diseases on the basis of their symptoms.

4. Cellphone apps that recognize your handwriting on a touchscreen.

5. Voice Recognition Software

6. Some of the email programs that automatically differentiate between genuine emails and spam