MEE 3033: KEPINTARAN BUATAN / *ARTIFICIAL INTELLIGENCES*

SESI PENGAJIAN: SEM 2 (2021/2022)

KUMPULAN KULIAH MEE 3033 (A211): A

(*EXERCISE 2*)

NEURAL NETWORK

https://www.simplilearn.com/neural-network-for-beginners?referrer=search&tag=neural%20networks#

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The Neural Network is a collection of algorithms that verify the underlying relationship in a piece of data that resembles the human brain. The name 'Neural' comes from the basic functional unit of the human or animal nervous system, the 'Neuron' or nerve cells found in the brain and other parts of the human or animal body. The neural network assists in changing the input so that the network can provide the optimal result without having to rewrite the output technique. This neural network is similar to the Artificial Neural Network in appearance. Artificial neural networks are computational models that are modelled after the human brain. Face recognition, voice recognition, picture identification, and robotics utilising artificial neural networks are just a few of the latest developments in artificial intelligence. In general, Artificial Neural Networks (ANNs) are a biologically inspired network of artificial neurons that are programmed to accomplish certain tasks. These biological computing approaches are thought to be the next big thing in the computer world.

HOW DOES NEURAL NETWORK WORK?

The Neural Network is made up of three layers: an input layer, an output layer, and a hidden layer in between. The layers are linked together by nodes, which constitute a 'Network.'

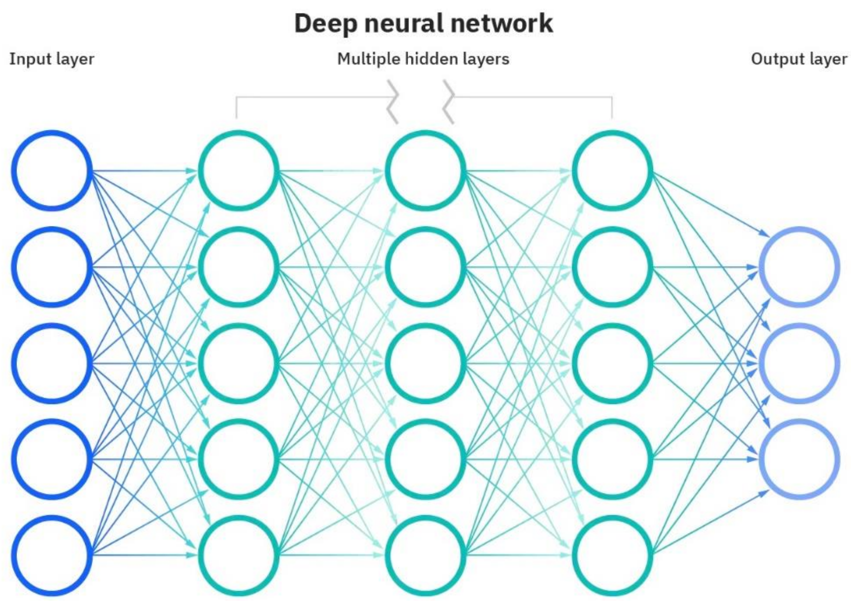

Photo 1 : How Neural Network Work

Simply said, data is delivered into a neural network via an input layer that communicates with hidden layers. A set of weighted connections is used to process data in the hidden layers. The hidden layer's nodes then mix data from the input layer with a set of coefficients and apply weights to the inputs. The total of these input-weight products is then calculated. The sum is transmitted via the activation function of a node, which specifies how far a signal must travel through the network to effect the final output. Finally, the output layer connects the hidden layers to the output layer, which is where the outputs are collected.

NEURAL NETWORK ON FACE RECOGNITION

1. Geometrical Features

Many individuals have looked at facial recognition algorithms based on geometrical features. This feature, which uses precisely determined distances between attributes to locate plausible matches in a huge mugshot database, may be very valuable. Automatic identification of these spots would be necessary for additional applications, and the final system would be reliant on the feature locating algorithm's correctness. Current techniques for automatically locating feature points do not give great accuracy and demand a lot of computing power.

2. Eigenface

In the Marr paradigm, which progresses from pictures to surfaces to three-dimensional models to matched models, high-level recognition tasks are often described with multiple steps of processing. Turk and Pentland, on the other hand, believe that an identification method based on low-level, two-dimensional image processing is plausible. Their case is founded on human face recognition's early development and quickness, as well as physiological investigations in monkey brain that claim to have isolated neurons that respond preferentially to faces.

In conclusion, Eigenfaces looks to be a quick, simple, and useful approach. It may, however, be restricted since optimal performance necessitates a high degree of correlation between the training and test pictures' pixel intensities. This constraint was overcome by applying substantial preprocessing to the photos in order to normalise them.

3. Template Matching

Methods like use direct correlation of image segments to perform template matching. The query images must have the same scale, orientation, and illumination as the training images for template matching to work.

4. Graph Matching

The well-known method of Graph Matching is another approach to facial recognition. Present a Dynamic Link Architecture that uses elastic graph matching to identify the nearest stored graph for distortion invariant object detection. Objects are represented as sparse graphs with multi-resolution descriptions in terms of a local power spectrum at their vertices and geometrical distances at their edges. With a database of 87 persons and test photos made of various emotions and faces twisted 15 degrees, they demonstrate promising findings. When employing a parallel computer with 23 processors, the matching procedure is computationally intensive, requiring around 25 seconds to compare a picture with 87 recorded items.

BACKPROPAGATION & GRADIENT DESCENT ON FACE RECOGNITION

The current Face Recognition method uses a scattering convolutional network, which is a flaw in the system. Scattering characteristics are invariant locally and convey a lot of high-frequency data. PCA (Principle Component Analysis) is used to minimise dimensionality after feature extraction. Recognition is carried out using the multi-class SVM method. EdgeMap, EigenFaces, and SRC are three well-known datasets that have been used to test this approach. Simply put, the old method has a lower accuracy rate of just around 93.1 percent, is less secure, and is less efficient.

A neural network has three primary learning approaches, each of which relates to a distinct style of learning. Supervised learning, unsupervised learning, and reinforcement learning are the three types of learning. We will concentrate on the gradient descent technique and error back propagation approaches in supervised learning methods in this research. Multilayer perceptrons, also known as error back propagation networks, are supervised learning artificial neural networks that are made up of feed forward networks with unique input, output, and hidden layers. The units are similar to perceptrons in function, but the transition (output) rule and weight update (learning) methods are more complicated. Any hidden layer can have any number of hidden units, and any hidden layer can have any number of hidden units. In feed forward activation, the first hidden layer's units compute their activation and output values and pass them on to the next layer, and so on, until the network's real reaction to the current input supplied to the input layer is created by the output units. The network's response is compared to the desired output that goes along with the training pattern once activation has been passed forward all the way to the output units. There are two kinds of mistakes. The first error is the output layer error, which may be readily determined. The second type of mistake is the error at the hidden layers, which cannot be estimated directly since no information about the hidden layers' expected outputs is known. The error at the output layer is essentially utilised to calculate the error at the hidden layer immediately before the output layer. The error of the next hidden layer immediately preceding the last hidden layer is then determined using this information. This is repeated until the error at the very first hidden layer, which is determined using the generalised Delta Rule, is computed. In conclusion, the present system's problems will be addressed, resulting in a more sophisticated system with zero errors.