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DEEP LEARNING AND NEURAL NETWORKS FOR ROADS

Diya Rajesh Doshi
B.K Gadia 'A' Level Junior College
diyadoshi661@gmail.com

Abstract

With urbanisation happening at such a rapid pace and migration from rural areas into the city, traffic congestion in cities like Mumbai is proliferating. This paper aims to research on how to efficiently manage the traffic flow by detecting and showing the traffic to commuters who are planning to use the road and also operate signals according to the congestion so that people do not have to wait unnecessarily.

Keywords: *Deep Learning, Neural Networks, Global positioning system(GPS), traffic, neurons*

INTRODUCTION

Deep learning, a subset of artificial and machine learning, is becoming increasingly popular. Deep learning enables machines to mimic human behaviour. While imitating human behaviour, machines can process and store information like a human brain by using artificial Neural Networks. In the case of deep learning, distinguishable features are identified without human intervention by the neural networks itself. For example, Google Tulip fostered in the Netherlands acts as a link between Tulips and humans for communication. By this technology, humans know when tulips need sunlight, water or some other essential element. It is a technique by which engineers expect an output through algorithms trained with data. Using deep learning for roads can help Maps navigate areas with high traffic, notify police when an accident takes place and can also warn the civil department if there are any cracks on the roads.

THEORY

In machine learning each information has to be individually fed to the computer for it to process. However, in deep learning computers learn to think using structures called artificial Neural Networks. These networks are typically trained by backpropagation in a batch learning setting, which requires the entire training data to be made available prior to the learning task.[1]

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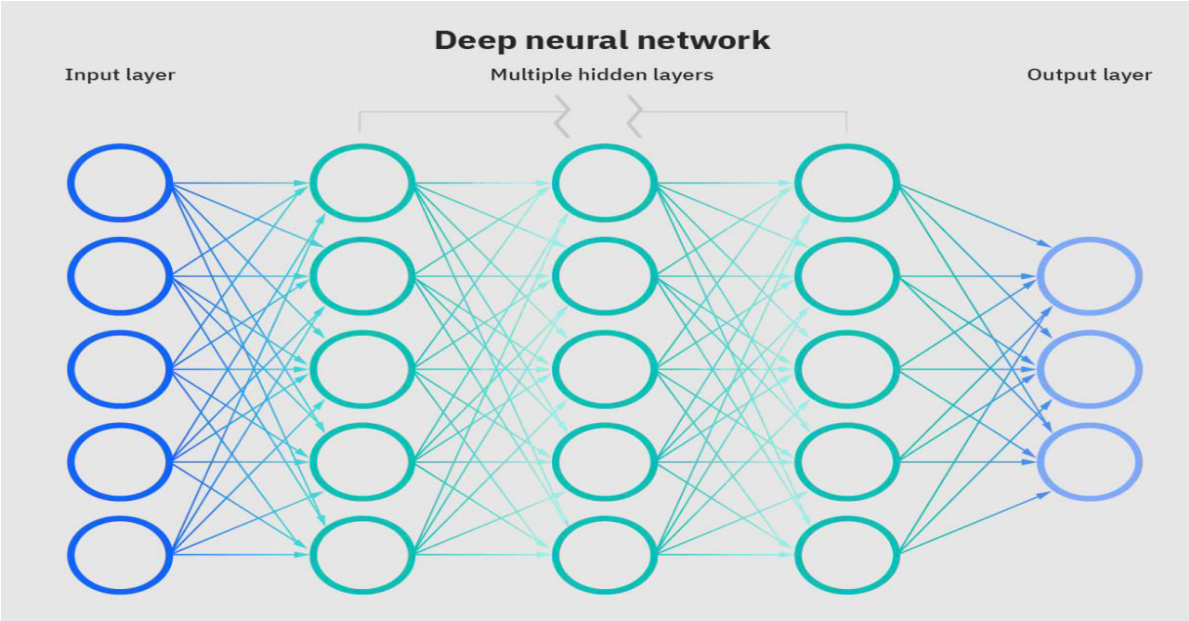

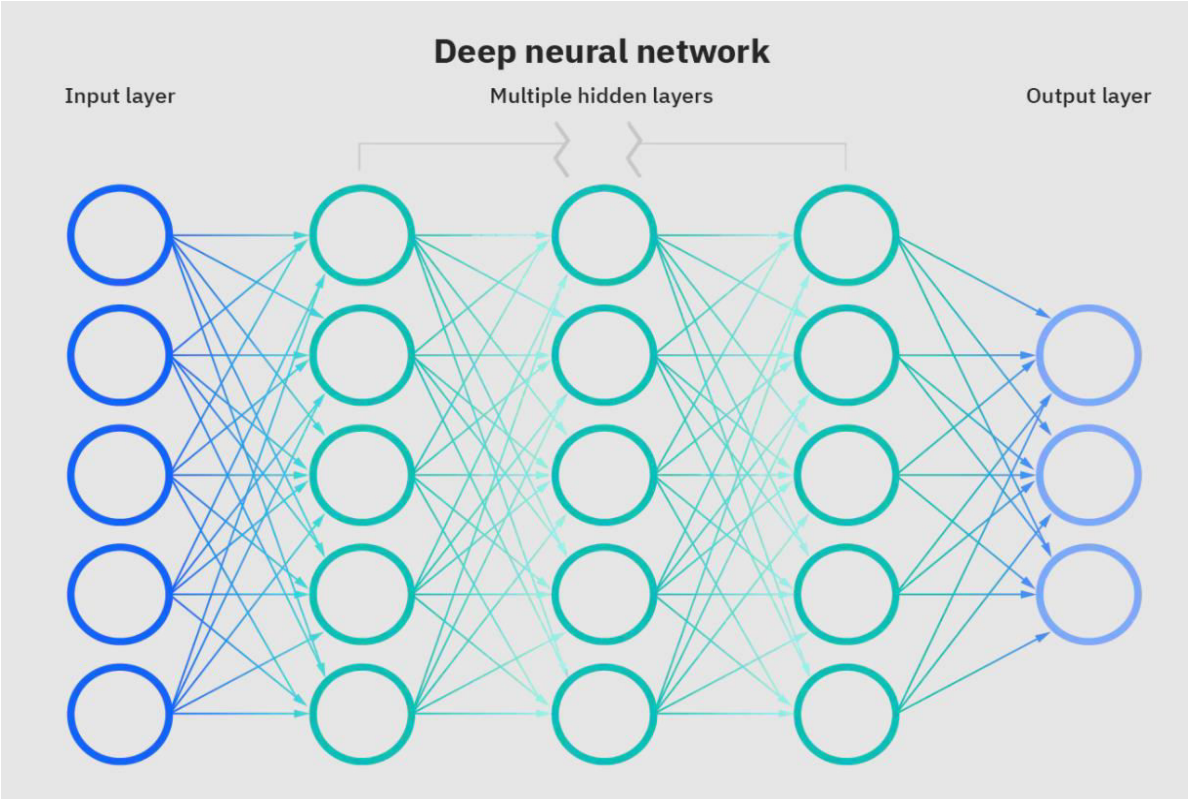

In the picture above is an artificial neural network. Neural Networks consist of slabs of neurons which are the primary processing units of the network. First, we have the input layer which receives the input of data, it is distinctively coloured in dark blue in the picture given above. Next, the last layer in the diagram is the output layer. The hidden layers in between perform most of the computation required for our calculation. Each neuron in the input layer receives one pixel from the image. Each neuron is connected to the neurons in another layer by channels and a numerical value called bias is passed on to the next neurons. The value of those neurons is filtered by an activation function and those who pass successfully channel the values to the next layer. The output is determined when the second last layer sends the highest values to the output layer by forward propagation.[2]

If the output which is shown is false and wrongly predicted by the neural network, it is then compared to the real output entered by the programmer which exists because the neural network is still in the training stage. Then, by backpropagation, the rectified direction and magnitude of change is then transferred backward through the network. By doing this, the weights are adjusted and the process is continuously repeated until errors are almost impossible.[3]

Experimental https://core.ac.uk/download/pdf/286357582.pdf

My experiment is based on how deep learning can help in analysing the traffic for GPS. A study [4] points out that people on average spend more than 75% extra travel time in traffic congestion. By deep learning, machines can be trained to detect the number of cars on road. This can then be used by GPS to show commuters a delay in their route. Also, detecting the number of cars on road, can send signals to traffic signals to change colours, which is especially useful in a four-way road. Rather than opening each way consecutively for 1-2 mins and keeping other lanes on hold, using deep learning to operate signals can reduce wait times of vehicles and can clear long miles of traffic congestion in one go. This can work on the concept where lane with the most traffic is opened first and for the longest time, and the one with only a few can only be opened for 10-15 seconds.

Results

The experimental results include vehicle identifying, traffic measurement metric, and traffic congestion analysis. [4]

Conclusion

This deep learning technique when implemented in real life can also help detect ambulance and turn the signal green for that lane so that the ambulance can move with ease and reach its destination fast.

References

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[3]https://www.ibm.com/cloud/learn/neural-networks
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