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Object Detection Using Deep Learning

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ABSTRACT: Artificial intelligence is the simulation of human cognitive abilities using computer-like machines. There are a lot of different kinds of techniques in artificial intelligence. In that, the most popular manner is the machine learning application. Deep learning is the advancement of machine learning. Perceptron is a mathematical imitation of relating to biology neuron. These three types of learning methods are utilized to classify and divide an image. These algorithms can be utilized for many applications such as Image authentication, Image refurbishment, Medical Image Analysis, Natural image processing, visual art processing, Bioinformatics, Customer relationship management, Mobile advertising, financial fraud detection, Recommendation systems, Military, toxicology and Drug discovery. So this current paper has implemented algorithms such as deep learning, perceptron learning, and machine learning. All three have been proposed using data and neural network. These three algorithms are implemented in TensorFlow library, which is used for applications such as Classification, Understanding, Perception, Creation, Discovering, and Prediction.

KEYWORDS: Machine Learning, Deep Learning, Perceptron Learning, Tensorflow, Neural Network, Data.

I. INTRODUCTION

In today's world, the most famous and deepest learning library in the world is Google's Tensorflow. Google uses machine learning to improve its all products, such as search mechanism, image direction or captioning, translation. In [1], The Perceptron system has been used to classify existing, deep learning. Then they compare that deep method with the machine learning method that is usually used. But in this proposed method, we have used the ON method instead of the perceptron algorithm. This is because the current paper has been developed to prove that the ANN method is better than the perceptron method.

Machine learning algorithm

Machine learning is a type of algorithm. This allows software applications to be accurate in predicting output, rather than explicitly performing their functions. The basis of machine learning is developing methods for obtaining internal data and the point is to use statistical analysis to predict output when new data is available.

There are three types of algorithms in machine learning, and they are given below.

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning

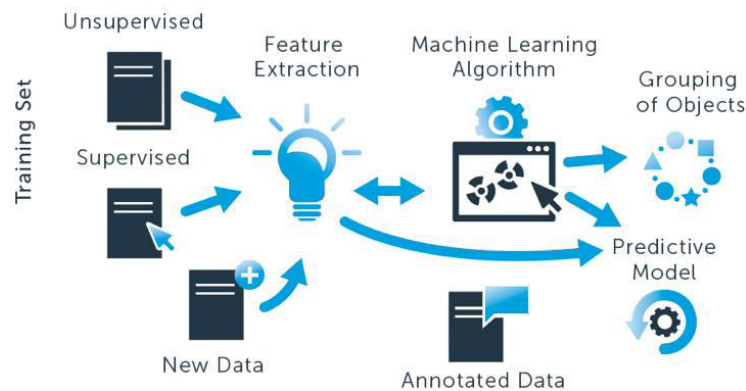


Fig.1.1: Process of machine learning algorithm

Supervised Learning

An artificial intelligence system in supervised learning is provided with named data. That means each and every data's are labeled with correctly.

Kinds of Supervised Learning

1. Classification

The system program learns from the given data input. Then this learning is used to classify new data.

2. Regression

The purpose of the regression is for a certain number of features, And to model the relationships between continuous target variable.

Unsupervised Learning

In this case, an artificial intelligence system is provided with unclassified and unnamed data, and in which the manners of the method have not been pre trained, process in the data. The outputs of this system depend on the naming mechanism.

Kinds of Unsupervised Learning

1. Clustering

It will together similar data.

2. Association

Association means finding relationships from large data sets.

Reinforcement Learning

Machines and Software Agents to Improve Its Performance, Allows to automatically determining the best behavior in a given environment.

Deep Learning Algorithm

Deep learning is a Sub-section of machine learning which is totally depends on artificial neural networks. The neural network is a fully artificial replica of the human brain. So deep learning will also have human brain functions. In deep learning, and there is no need to program it explicitly.

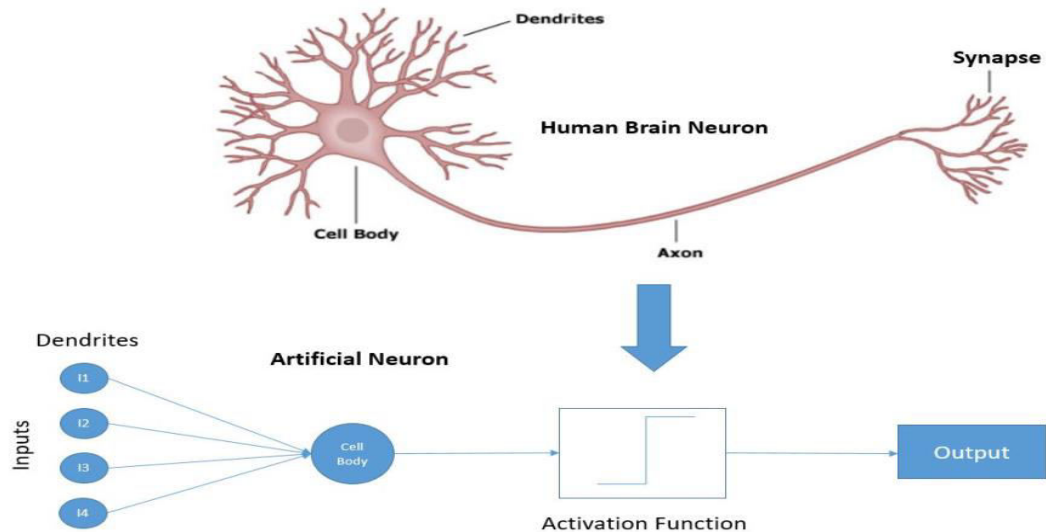


Fig.1.2: Process of deep learning

Features

- It decreases unnecessary costs.
- Reduces the need for separation of features.
- It will detect problems very quickly that are difficult to diagnose.

Applications

- Automatic Text Generation
- Healthcare
- Automatic Machine Translation
- Image Recognition
- Predicting Earthquakes

Perceptron Learning Algorithm

Perceptron is a means of unsupervised learning of binary classifiers. This is a sequential classifier. That is, tethering the set of weights with the feature vector, based on the linear predictor function.

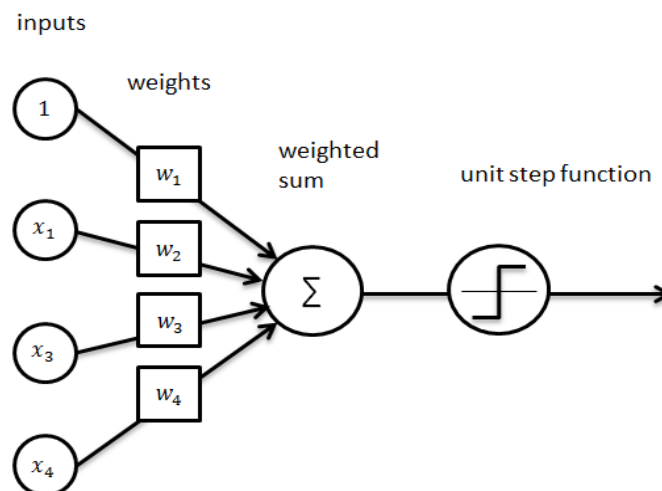


Fig.1.3: Process of Perceptron Learning Algorithm

II. LITERATURE SURVEY

In [2], White cells play an important role in human health, to detect the disease caused by abnormalities in white blood cells, using the classification of white blood cells by psychiatrist. If the doctor diagnoses this, it may lead to errors. In this, the author proposes a deep learning method to classify white blood cells. He said that this is the most basic separation and that accurate results are obtained. This is accurate compared to other the three machine learning method commonly used, outcome of this deep learning process. The best result of this is 0.995. The purpose of this author is to classify two white blood cells. What the author wants to say in this study is that the deep learning system is very effective.

In [3], two types of algorithms have been used in this paper. They find energy consumption from both of these methods and analyze which of them is accurately calculated. Those are the two types of structures, deep learning application and machine learning. Although machine learning is widely used in the world its purpose is to compare its role with the deep learning system considered. In this, Multi-Layer Perceptron was implemented with my deep learning system. And its effectiveness is compared to that of machine learning. In this paper, nine types of prediction methods are compared. But it did not succeed. The predictive capabilities of MLP have been studied under various systems. MLP has been utilized to get the outcome of this study accurately and quickly. There is, however, an open challenge for MLP. What it does is find parameters that are relevant to the stool model.

In [4], Human face identification is a demanding field in the computer machine. An important process and extraction of features requires more data and time. That means you have to learn about it in order to make a system, but it requires a lot of data and time. So deep learning method is ideal for such problems. When you cut up the features of an image you get big data, in such a situation, deep learning make easier. However, identifying a face is not so easy. If the data is small, it can be easily identified. In this, modified learning is modeled for feature extraction; the face is identified utilizing a pre-trained CNN. Two common well-known data bases were used to evaluate the effectiveness of the modified learning model. Although there are many classes, they have a small sample size per class in face recognition. Based on tests, it can be assumed that the learning method has given satisfactory results. The performance modified learning method is better than the traditional learning method.

In [5], in computer analysis, predictive models of fire are increasing. Make late advances in deep learning techniques have caused people to be unprecedented. In most cases, however, conventional methods are limited to single structured images. More memory is needed for continuous data. This increases the computation time. Thus they propose an effective method. CNN and RNN are used in this paper. LSDM is considered best when compared to other RNN methods. The tests included fire-free videos and fire-proof videos.

III. PROPOSED METHODOLOGY

Machine Learning Algorithm

In this machine learning, we use a supervised learning method. In this supervised learning mode, there are two steps. One is the feature extraction and the other is classification. First, the features of the image that go into the input are extracted, and then we categorize the extracted features and then output it to us.



Feature Extraction

Here we use the Histogram of Oriented Gradients (HOG) system to extract the characteristics of the image.

Histogram of Oriented Gradients (HOG)

HOG is feature description; it is utilized for image processing and for detecting objects in the system. The HOG narration technique is, Calculates the incidence of slope orientation in the localized areas of an image.

The HOG descriptor should be performed as follows:

Step 1: The image should be divided into smaller parts that are cells. Each of them must be connected. For each cell a HOG has to calculate the edges or directions. This means that have to calculate the orientations of the edges for the pixels in each period.

Step 2: Adjust the slope orientation each cell Split into as angled troughs.

Step 3: With the pixels of each cell, in the corresponding angular bin Contributes to the weighted slope.

Step 4: The normalized group of histograms is symbolize the block of histogram. This module, Refers to the descriptor of the histogram.

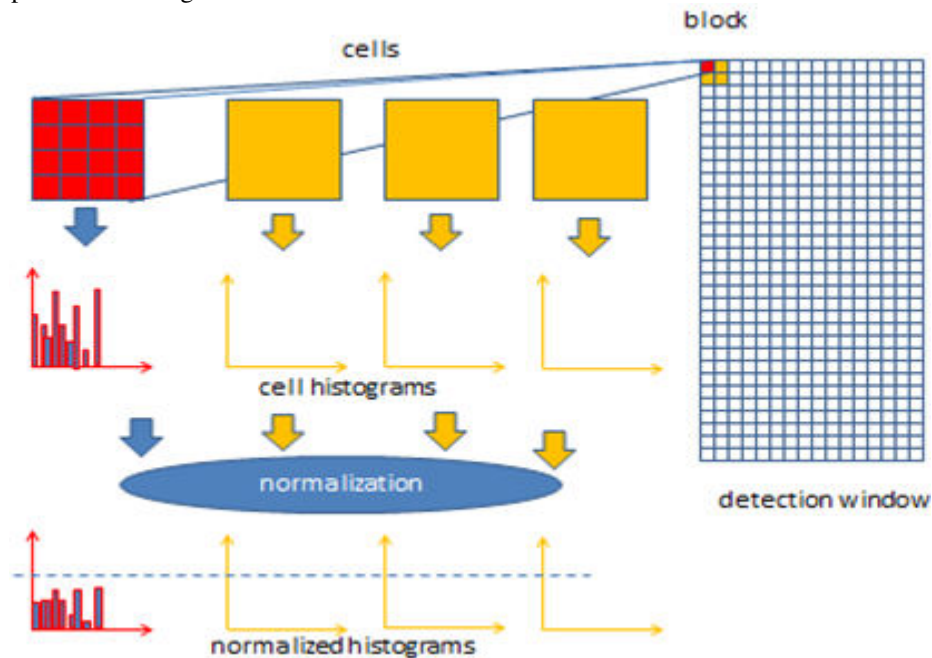


Fig.3.2: The HOG method demonstrates the implementation plan.

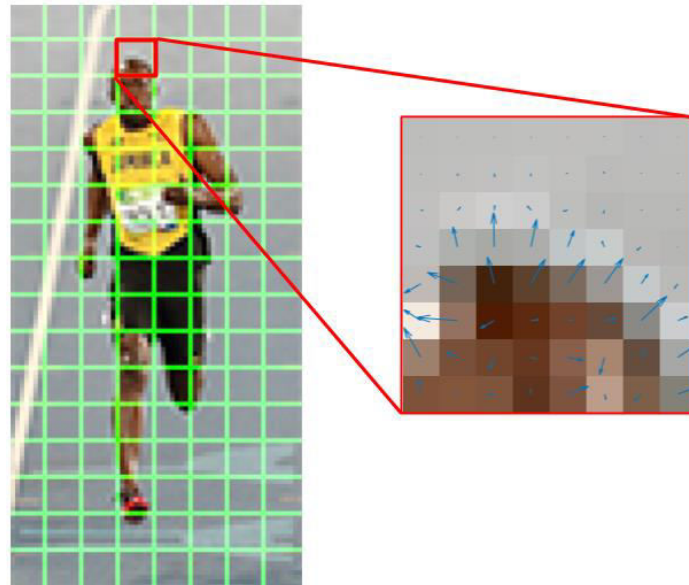


Fig.3.3: RGB gradient and linkage Represented by the arrows

Classification

Here the SVM algorithm is used to classify an image.

SVM (Support Vector Machine)

SVM is the means of supervised machine learning. This can be used for regression or classification. However, it is often used for classification. In this manner, each data is served as a point in the n-dimensional space. The value of each feature, is the evaluate of a particular interaction. Then best distinguish the two classes, the classification is done by detecting the hyperplane.

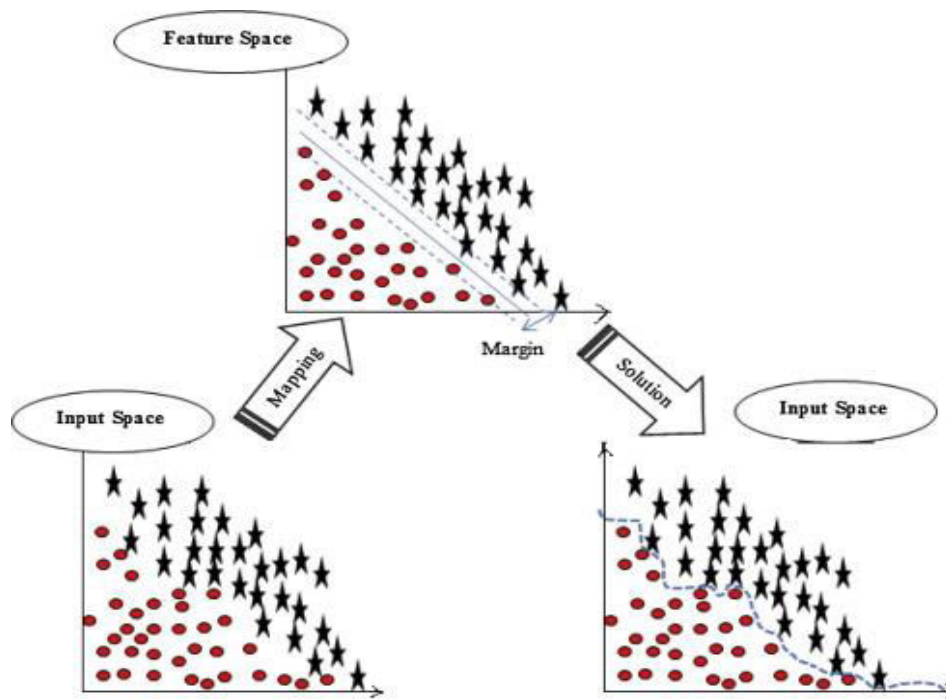


Fig.3.4: SVM Classifier

Deep Learning Algorithm

In this deep learning method, the same methodology is utilized for the separation and classification of features. Here, we use the ANN method to classify and segregate the features of an image.

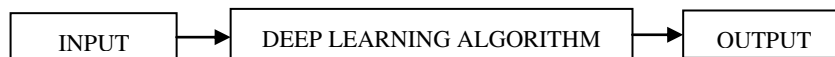


Fig.3.5: Block diagram of deep learning algorithm

ANN (Artificial Neural Network)

ANN's simple neurons can be made from all three layers. Those three layers are input, output and hidden layer. In this, the data's proceed from the input layer to the hidden layer and then through the output layer.

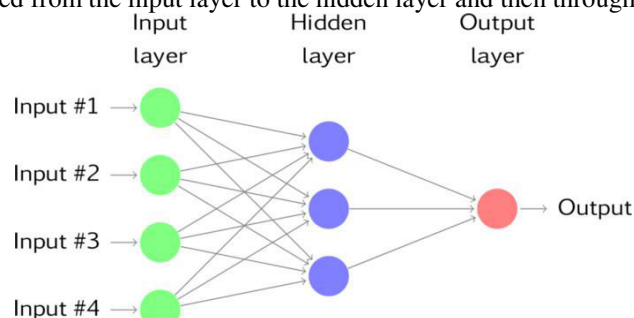


Fig.3.6: Basic structure of ANN

The ANN functions are given in the following steps:

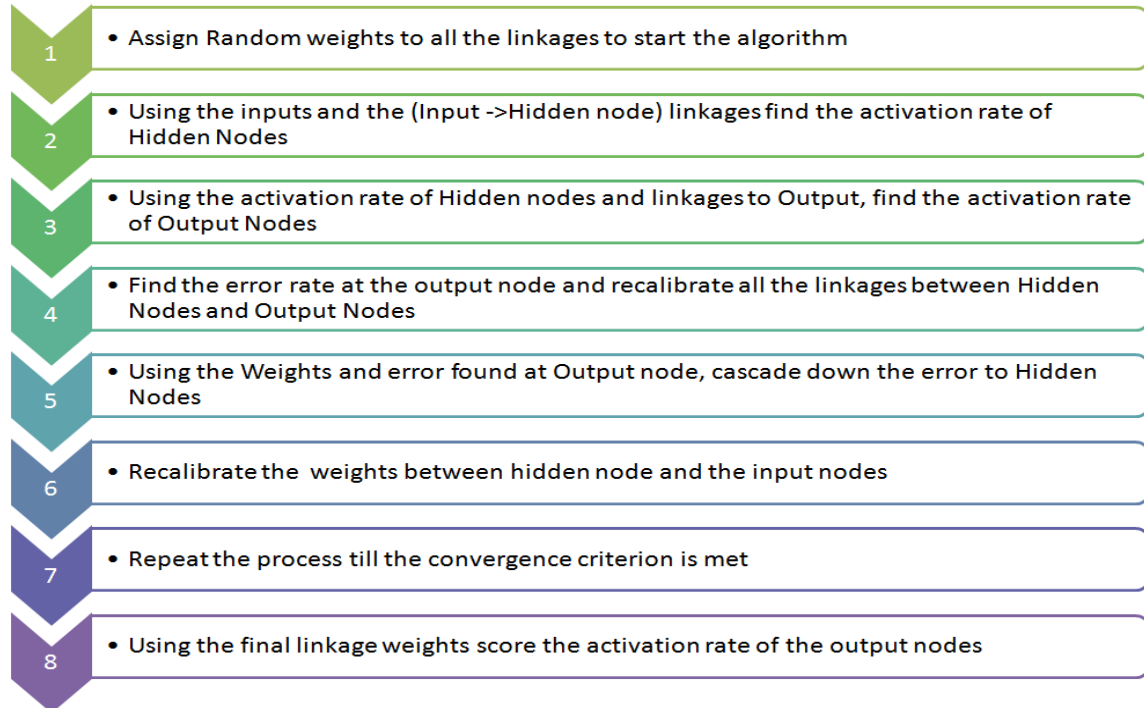


Fig.3.7: Steps for ANN algorithm

The mathematical equations are,

I_0, I_1 and I_2 defined as input layer, H_0, H_1, H_2 and H_3 defined as hidden layer and take the outputs as O_0 and O_1 . The weight of the relationships should be indicated by the formulae given below.

$W(I_0.H_0)$ - The weight of the link between I_0 and H_0 .

Equations must be developed to detect the activation rate of H_1 .

$$\text{Logit}(H_0) = W(I_0.H_0) * I_0 + W(I_1.H_0) * I_1 + W(I_2.H_0) * I_2 + \text{Constant} = f$$

$$= > P(H_0) = 1 / (1 + e^{(-f)}).$$

Perceptron Learning Algorithms

Perceptron is a common computational method. It takes an input and aggregates it, and returns 1 only if the accumulated sum exceeds some other threshold.

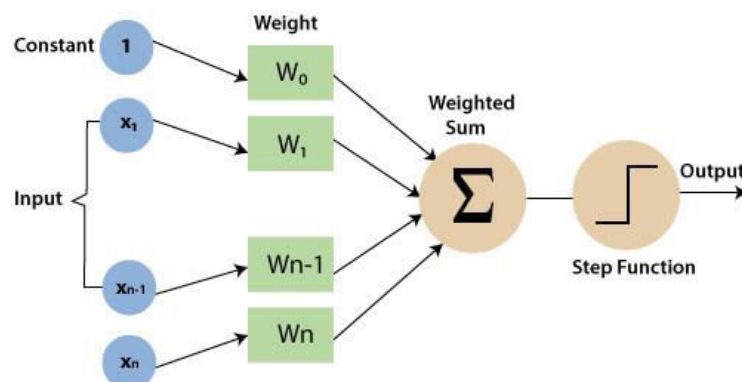


Fig.3.8: Structure of Perceptron Learning Algorithm

A neuron, via its dendrites Accepts input signals. It sends electrical signals to the cells in the body. This process is known as activation in the perceptron learning algorithm.

$$\text{Activation} = \sum (\text{weight}_i * x_i) + \text{bias}$$

This activation is then converted to prediction using the exchange function.

$$\text{Prediction} = 1.0 \text{ if activation } \geq 0.0 \text{ else } 0.0$$

IV. RESULTS AND DISCUSSION

This proposed method has implemented three types of algorithms: Perceptron learning, machine learning, and deep learning. You can see in the chart below which of the three is the process of best. In this chart, each of the operation of all algorithms shows the best of some steps.

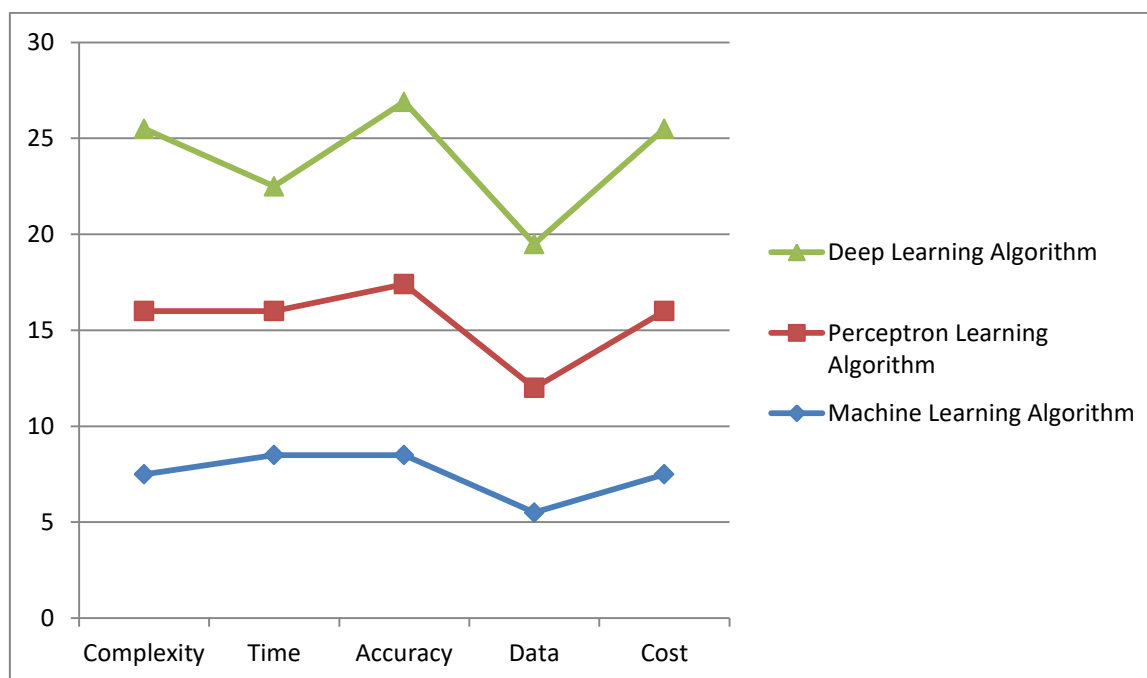


Fig.4.1: Chart for performance of the proposed method

V. CONCLUSION

In this proposed method, three types of algorithms are implemented, which distinguish them in terms of functionality. First in machine learning, there were two steps. One is the segregation of features and the other is the classification or regression. We used the HOG to separate the features, and the SVM to categorize. Then in deep learning, we used only one algorithm, thus increasing speed and accuracy. And the cost will decrease. It has proven to be better than the existing method when differentiated. This is because, in deep learning, they have used the perceptron learning method. But in this proposed method, we use ANN. Thus, the ANN algorithm is much more correct and accurate than the Perceptron algorithm and output is faster. So the deep learning method used by the ANN method is better than the other learning method.

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