ADUSUMILLI GOPALAKRISHNAIAH & SUGARCANE GROWERS
SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

Vuyyuru-521 165, Krishna District, Andhra Pradesh

An Autonomous College in the Jurisdiction of Krishna University

Accredited by NAAC with "A" Grade

VAD COURSE :MACHINE LEARNING

VAC CODE:MLVAC01

CLASS :| II.B.Com (CA)

DURATION :30 DAYS

DEPARTEMENT OF COMPUTER SCIENCE

www.agsgsc.edu.in

agsgsiddhartha@gmail.com

08676-233267

Address:

Door no 2.391

College Road,Near Kota Complex,

Vuyyuru-521165

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh

(Managed by: Siddhartha Academy of General & Technical Education, Vijayawada-10)

An Autonomous College in the Jurisdiction of Krishna University

Accredited by NAAC with "A" Grade **ISO 9001:2015 Certified Institution**

DEPARTMENT OF COMPUTER SCIENCE

Value Added Course

Title: Machine Learning

Name of the Lecturer	: S.Prabhavathi
Class	: II B.Com(CA)
Duration of the Course	:30 HOURS
VAC Code	:MLVAC01

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course

Title: Machine learning

Objectives : 1) The goal of machine learning is often- Though not always-to train a model on Historical , labelled data.

2) Discuss the terminology used

3) The vision of machine learning lab is to Develop autonomous decision making systems

Methodology : Teacher - Cantered method

Duration : 30 Hours

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course

Title: _Machine Learning

Date: From 14-06-2018 to 15-07-2018

Date	Content	Module No.
14-06-2018	**Introduction to Machine Learning** ML terminologies – Linear Regression: Training and Loss – Loss Reduction techniques – Working with Tensorflow Playground.	I
25-06-2018	**CLASSIFICATION AND CLUSTERING** Logistic regression – Generalization – Regularization - Classification – Clustering: Centroid-based Clustering - Density-based Clustering - Distribution-based Clustering - Hierarchical Clustering	II
03-07-2018	**DEEP NETWORKS** Introduction to Neural networks – Terminology – Working with tensors – Pandas, numpy, matplotlib library – Feed forward networks – Convolutional Neural network – Recurrent neural networks and its variants	III
15-07-2018	**DEEP GENERATIVE MODELS** Restricted Boltzmann Machines – Deep Belief networks – Deep Boltzmann machine – Convolutional Boltzmann machine – Working with Tensorflow Playground	IV

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Value Added Course
Student Enrolment Sheet

Class:II BCom(CA)

S. No	Roll No.	Name of the Student	Signature
1	2052801	Maganti Revathi	Maganti Revathi
2	2052802	Kondaveeti Sarani	kondaveeti sarani
3	2052803	Jogi Gowri Prasanna Kumari	Jogi Gowri Prasanna kumari
4	2052804	Poranki Dharani	Poranki Dharani
5	2052805	Dokku Bhuvaneswari	Dokku Bhuvaneswari
6	2052806	Chaganti Sasank	chaganti Sasank
7	2052807	Boddu Bhagya Sree	Boddu Bhagya sree
8	2052808	Syed Afrin	Syed Afrin
9	2052809	Chakka Anjali	C. Anjali
10	2052810	Karanam Teja Swaroop	Karanam Teja Swaroop
11	2052811	Jarapala Sai Nayak	Jarapala. Sai Nayak
12	2052812	Cheeli Rajitha	Cheeli Rajitha
13	2052813	Devarapalli Sunil	Devarapalli Sunil
14	2052814	Chalapati Deepthi	Chalapathi. Deepthi
15	2052815	Valluru Sumanth	Valluru. Sumanth

16	2052816	Bobbili Purna Kumar	Bobbili Purna kumar
17	2052817	Kanumuri Vasanth Kumar	Kanumuri Vasanth kumar
18	2052818	Orugunti Arun Kumar	Orugunti Arun kumar
19	2052819	Burepalli Abhinav	Burepalli Abhinav
20	2052820	Kolusu Jhansi	Kolusu Jhansi
21	2052821	Akunuri Bhumika	Akunuri Bhumika
22	2052822	Kambham Uday	kambham uday
23	2052823	K. Bharath Kalyan	K. Bharath kalyan
24	2052824	Patan Shaheena	patan shaheena
25	2052825	E. Bindu	E. Bindu
26	2052826	S. Sri Chandana	S. Sri Chandana.
27	2052827	G.Sirisha	G. Sirisha
28	2052828	T.Gopi Chand	T. Gopi Chand
29	2052829	G.Navya	G. Navya.
30	2052830	Kanumuri Sri Ram	kanumuri Sri Ram
31	2052831	N.Haritha Sri	N. Haritha Sri
32	2052832	Shaik Ruksana	Shaik. Ruksana
33	2052833	Lanke Mohan Sai	Lanke mohan sai
34	2052834	K.Anil Kumar	K. Anil Kumar

S. Prabhavathi
Signature of lecturer

Signature of HOD

Signature of Principal

PRINCIPAL
AG & SG Siddhartha Degree College of
Arts&Science (Autonomous), Vijayawada

Machine Learning Tutorial

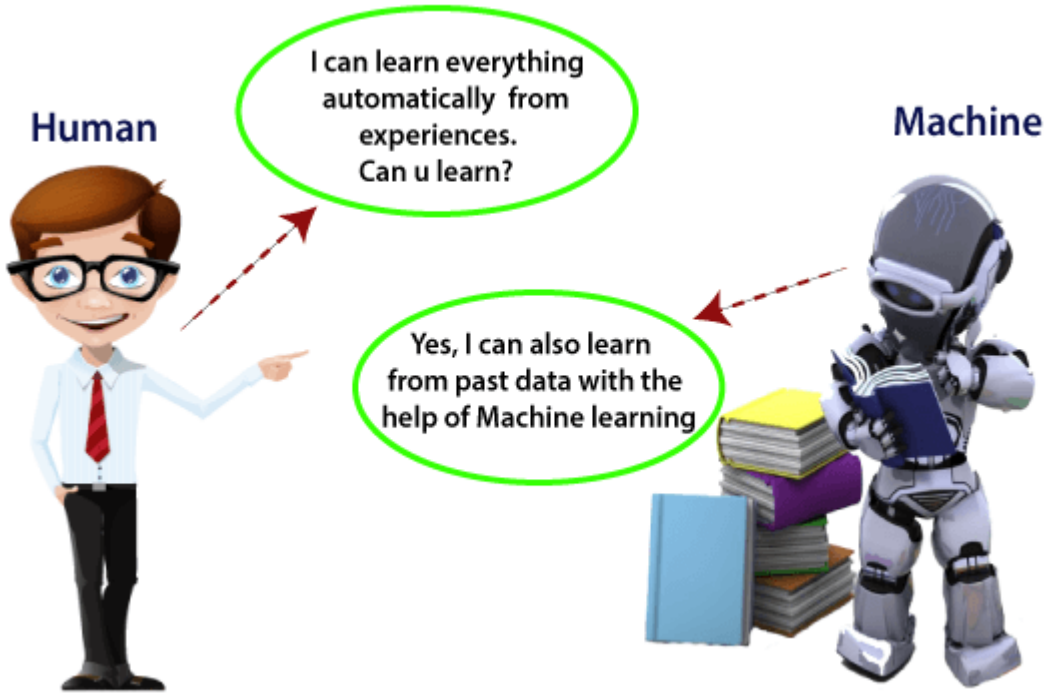
Machine Learning tutorial provides basic and advanced concepts of machine learning. Our machine learning tutorial is designed for students and working professionals. Machine learning is a growing technology which enables computers to learn automatically from past data.

Machine learning uses various algorithms for **building mathematical models and making predictions using historical data or information**. Currently, it is being used for various tasks such as **image recognition**, **speech recognition**, **email filtering**, **Facebook auto-tagging**, **recommender system**, and many more.

This machine learning tutorial gives you an introduction to machine learning along with the wide range of machine learning techniques such as **Supervised**, **Unsupervised**, and **Reinforcement** learning. You will learn about regression and classification models, clustering methods, hidden Markov models, and various sequential models.

What is Machine Learning

In the real world, we are surrounded by humans who can learn everything from their experiences with their learning capability, and we have computers or machines which work on our instructions. But can a machine also learn from experiences or past data like a human does? So here comes the role of **Machine Learning**.



Machine Learning is said as a subset of **artificial intelligence** that is mainly concerned with the development of algorithms which allow a computer to learn from the data and past

experiences on their own. The term machine learning was first introduced by **Arthur Samuel** in **1959**. We can define it in a summarized way as:

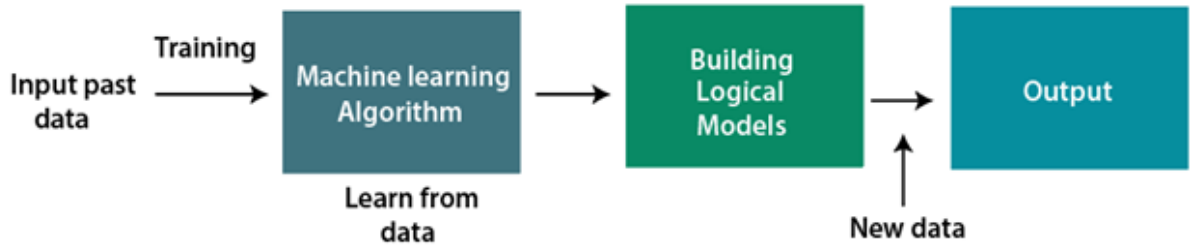
With the help of sample historical data, which is known as **training data**, machine learning algorithms build a **mathematical model** that helps in making predictions or decisions without being explicitly programmed. Machine learning brings computer science and statistics together for creating predictive models. Machine learning constructs or uses the algorithms that learn from historical data. The more we will provide the information, the higher will be the performance.

A machine has the ability to learn if it can improve its performance by gaining more data.

How does Machine Learning work

A Machine Learning system **learns from historical data, builds the prediction models, and whenever it receives new data, predicts the output for it**. The accuracy of predicted output depends upon the amount of data, as the huge amount of data helps to build a better model which predicts the output more accurately.

Suppose we have a complex problem, where we need to perform some predictions, so instead of writing a code for it, we just need to feed the data to generic algorithms, and with the help of these algorithms, machine builds the logic as per the data and predict the output. Machine learning has changed our way of thinking about the problem. The below block diagram explains the working of Machine Learning algorithm:



Features of Machine Learning:

- Machine learning uses data to detect various patterns in a given dataset.
- It can learn from past data and improve automatically.
- It is a data-driven technology.
- Machine learning is much similar to data mining as it also deals with the huge amount of the data.

Need for Machine Learning

The need for machine learning is increasing day by day. The reason behind the need for machine learning is that it is capable of doing tasks that are too complex for a person to

implement directly. As a human, we have some limitations as we cannot access the huge amount of data manually, so for this, we need some computer systems and here comes the machine learning to make things easy for us.

We can train machine learning algorithms by providing them the huge amount of data and let them explore the data, construct the models, and predict the required output automatically. The performance of the machine learning algorithm depends on the amount of data, and it can be determined by the cost function. With the help of machine learning, we can save both time and money.

The importance of machine learning can be easily understood by its uses cases, Currently, machine learning is used in **self-driving cars**, **cyber fraud detection**, **face recognition**, and **friend suggestion by Facebook**, etc. Various top companies such as Netflix and Amazon have build machine learning models that are using a vast amount of data to analyze the user interest and recommend product accordingly.

Following are some key points which show the importance of Machine Learning:

- Rapid increment in the production of data
- Solving complex problems, which are difficult for a human
- Decision making in various sector including finance
- Finding hidden patterns and extracting useful information from data.

Classification of Machine Learning

At a broad level, machine learning can be classified into three types:

1. **Supervised learning**
2. **Unsupervised learning**
3. **Reinforcement learning**

1) Supervised Learning

Supervised learning is a type of machine learning method in which we provide sample labeled data to the machine learning system in order to train it, and on that basis, it predicts the output.

The system creates a model using labeled data to understand the datasets and learn about each data, once the training and processing are done then we test the model by providing a sample data to check whether it is predicting the exact output or not.

The goal of supervised learning is to map input data with the output data. The supervised learning is based on supervision, and it is the same as when a student learns things in the supervision of the teacher. The example of supervised learning is **spam filtering**.

Supervised learning can be grouped further in two categories of algorithms:

- **Classification**
- **Regression**

2) Unsupervised Learning

Unsupervised learning is a learning method in which a machine learns without any supervision.

The training is provided to the machine with the set of data that has not been labeled, classified, or categorized, and the algorithm needs to act on that data without any supervision. The goal of unsupervised learning is to restructure the input data into new features or a group of objects with similar patterns.

In unsupervised learning, we don't have a predetermined result. The machine tries to find useful insights from the huge amount of data. It can be further classifieds into two categories of algorithms:

- **Clustering**
- **Association**

3) Reinforcement Learning

Reinforcement learning is a feedback-based learning method, in which a learning agent gets a reward for each right action and gets a penalty for each wrong action. The agent learns automatically with these feedbacks and improves its performance. In reinforcement learning, the agent interacts with the environment and explores it. The goal of an agent is to get the most reward points, and hence, it improves its performance.

The robotic dog, which automatically learns the movement of his arms, is an example of Reinforcement learning.

History of Machine Learning

Before some years (about 40-50 years), machine learning was science fiction, but today it is the part of our daily life. Machine learning is making our day to day life easy from **self-driving cars** to **Amazon virtual assistant "Alexa"**. However, the idea behind machine

learning is so old and has a long history. Below some milestones are given which have occurred in the history of machine learning:

The early history of Machine Learning (Pre-1940):

- **1834:** In 1834, Charles Babbage, the father of the computer, conceived a device that could be programmed with punch cards. However, the machine was never built, but all modern computers rely on its logical structure.
- **1936:** In 1936, Alan Turing gave a theory that how a machine can determine and execute a set of instructions.

The era of stored program computers:

- **1940:** In 1940, the first manually operated computer, "ENIAC" was invented, which was the first electronic general-purpose computer. After that stored program computer such as EDSAC in 1949 and EDVAC in 1951 were invented.
- **1943:** In 1943, a human neural network was modeled with an electrical circuit. In 1950, the scientists started applying their idea to work and analyzed how human neurons might work.

Computer machinery and intelligence:

- **1950:** In 1950, Alan Turing published a seminal paper, "**Computer Machinery and Intelligence**," on the topic of artificial intelligence. **In his paper, he asked, "Can machines think?"**

Machine intelligence in Games:

- **1952:** Arthur Samuel, who was the pioneer of machine learning, created a program that helped an IBM computer to play a checkers game. It performed better more it played.
- **1959:** In 1959, the term "Machine Learning" was first coined by **Arthur Samuel**.

The first "AI" winter:

- The duration of 1974 to 1980 was the tough time for AI and ML researchers, and this duration was called as **AI winter**.
- In this duration, failure of machine translation occurred, and people had reduced their interest from AI, which led to reduced funding by the government to the researches.

Machine Learning from theory to reality

- **1959:** In 1959, the first neural network was applied to a real-world problem to remove echoes over phone lines using an adaptive filter.

- **1985:** In 1985, Terry Sejnowski and Charles Rosenberg invented a neural network **NETtalk**, which was able to teach itself how to correctly pronounce 20,000 words in one week.
- **1997:** The IBM's **Deep blue** intelligent computer won the chess game against the chess expert Garry Kasparov, and it became the first computer which had beaten a human chess expert.

Machine Learning at 21st century

- **2006:** In the year 2006, computer scientist Geoffrey Hinton has given a new name to neural net research as "**deep learning**," and nowadays, it has become one of the most trending technologies.
- **2012:** In 2012, Google created a deep neural network which learned to recognize the image of humans and cats in YouTube videos.
- **2014:** In 2014, the Chabot "**Eugen Goostman**" cleared the Turing Test. It was the first Chabot who convinced the 33% of human judges that it was not a machine.
- **2014: DeepFace** was a deep neural network created by Facebook, and they claimed that it could recognize a person with the same precision as a human can do.
- **2016: AlphaGo** beat the world's number second player **Lee sedol** at **Go game**. In 2017 it beat the number one player of this game **Ke Jie**.
- **2017:** In 2017, the Alphabet's Jigsaw team built an intelligent system that was able to learn the **online trolling**. It used to read millions of comments of different websites to learn to stop online trolling.

Machine Learning at present:

Now machine learning has got a great advancement in its research, and it is present everywhere around us, such as **self-driving cars**, **Amazon Alexa**, **Catboats**, **recommender system**, and many more. It includes **Supervised**, **unsupervised**, and **reinforcement learning with clustering**, **classification**, **decision tree**, **SVM algorithms**, etc.

Modern machine learning models can be used for making various predictions, including **weather prediction**, **disease prediction**, **stock market analysis**, etc.

Prerequisites

Before learning machine learning, you must have the basic knowledge of followings so that you can easily understand the concepts of machine learning:

- Fundamental knowledge of probability and linear algebra.
- The ability to code in any computer language, especially in Python language.

- Knowledge of Calculus, especially derivatives of single variable and multivariate functions.

Audience

Our Machine learning tutorial is designed to help beginner and professionals.

Problems

We assure you that you will not find any difficulty while learning our Machine learning tutorial. But if there is any mistake in this tutorial, kindly post the problem or error in the contact form so that we can improve it

Clustering in Machine Learning

Clustering or cluster analysis is a machine learning technique, which groups the unlabelled dataset. It can be defined as ***"A way of grouping the data points into different clusters, consisting of similar data points. The objects with the possible similarities remain in a group that has less or no similarities with another group."***

It does it by finding some similar patterns in the unlabelled dataset such as shape, size, color, behavior, etc., and divides them as per the presence and absence of those similar patterns.

It is an unsupervised learning method, hence no supervision is provided to the algorithm, and it deals with the unlabeled dataset.

After applying this clustering technique, each cluster or group is provided with a cluster-ID. ML system can use this id to simplify the processing of large and complex datasets.

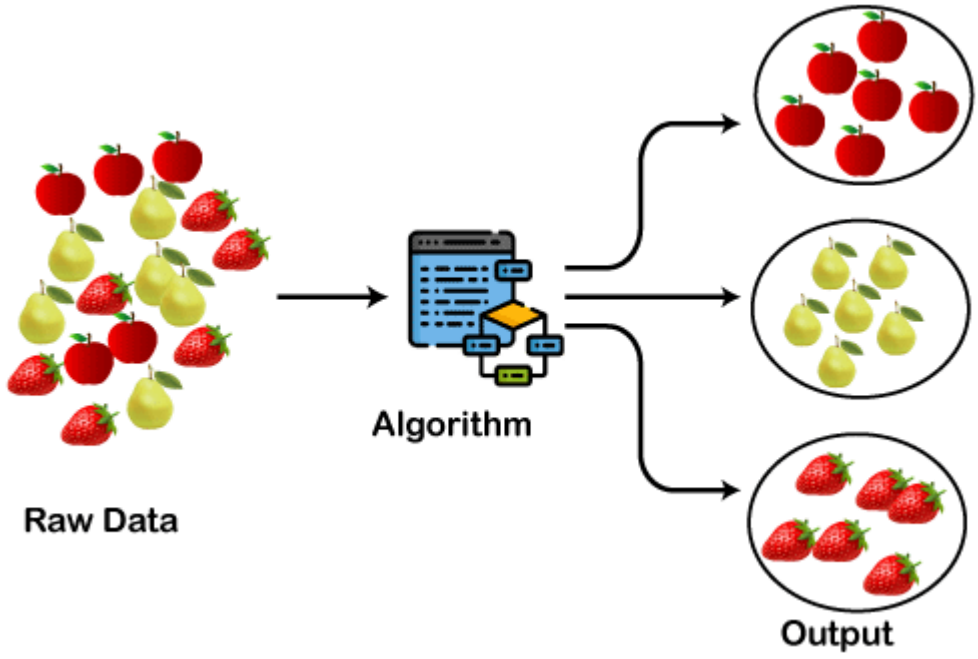
Example: Let's understand the clustering technique with the real-world example of Mall: When we visit any shopping mall, we can observe that the things with similar usage are grouped together. Such as the t-shirts are grouped in one section, and trousers are at other sections, similarly, at vegetable sections, apples, bananas, Mangoes, etc., are grouped in separate sections, so that we can easily find out the things. The clustering technique also works in the same way. Other examples of clustering are grouping documents according to the topic.

The clustering technique can be widely used in various tasks. Some most common uses of this technique are:

- Market Segmentation
- Statistical data analysis
- Social network analysis
- Image segmentation
- Anomaly detection, etc.

Apart from these general usages, it is used by the **Amazon** in its recommendation system to provide the recommendations as per the past search of products. **Netflix** also uses this technique to recommend the movies and web-series to its users as per the watch history.

The below diagram explains the working of the clustering algorithm. We can see the different fruits are divided into several groups with similar properties.



Types of

Clustering Methods

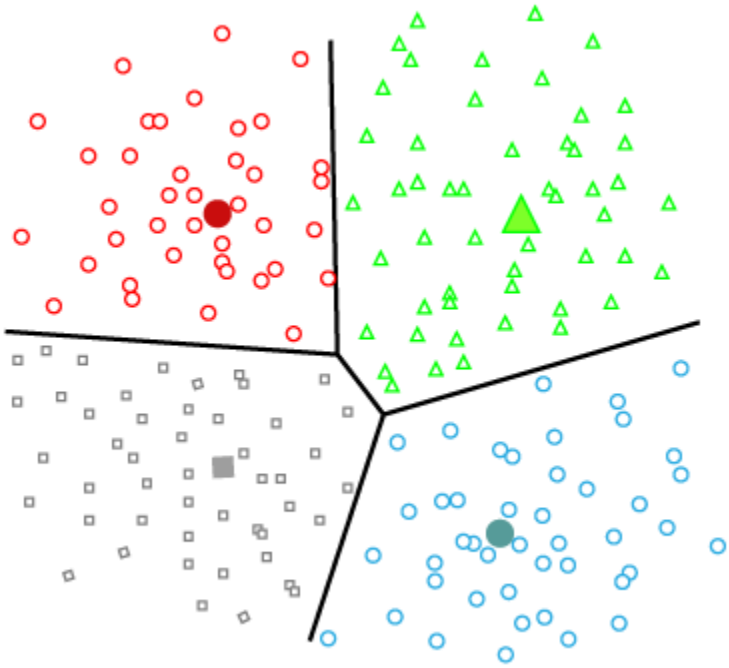
The clustering methods are broadly divided into **Hard clustering** (datapoint belongs to only one group) and **Soft Clustering** (data points can belong to another group also). But there are also other various approaches of Clustering exist. Below are the main clustering methods used in Machine learning:

1. **Partitioning Clustering**
2. **Density-Based Clustering**
3. **Distribution Model-Based Clustering**
4. **Hierarchical Clustering**
5. **Fuzzy Clustering**

Partitioning Clustering

It is a type of clustering that divides the data into non-hierarchical groups. It is also known as the **centroid-based method**. The most common example of partitioning clustering is the **K-Means Clustering algorithm**.

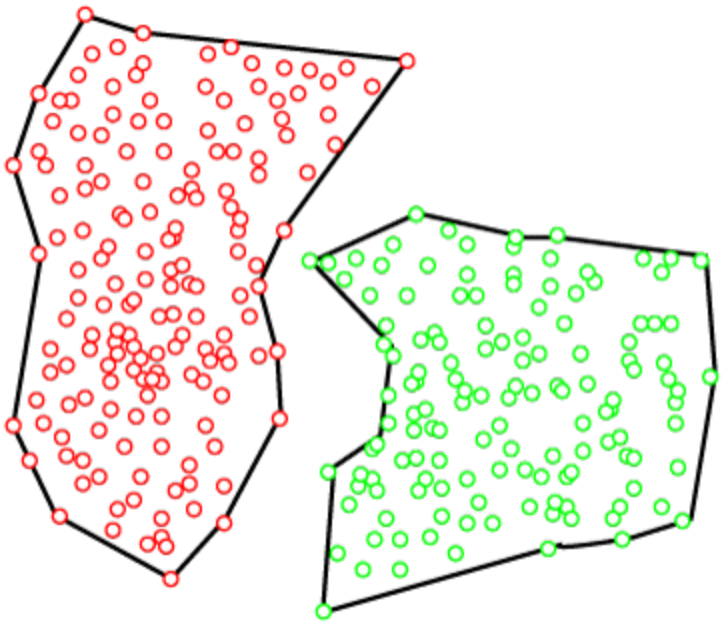
In this type, the dataset is divided into a set of k groups, where K is used to define the number of pre-defined groups. The cluster center is created in such a way that the distance between the data points of one cluster is minimum as compared to another cluster centroid.



Density-Based Clustering

The density-based clustering method connects the highly-dense areas into clusters, and the arbitrarily shaped distributions are formed as long as the dense region can be connected. This algorithm does it by identifying different clusters in the dataset and connects the areas of high densities into clusters. The dense areas in data space are divided from each other by sparser areas.

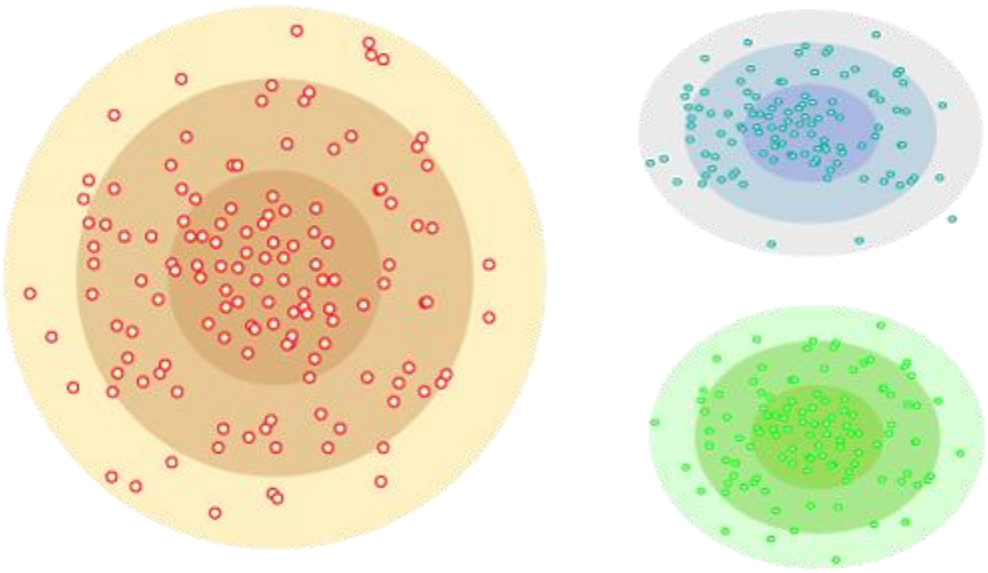
These algorithms can face difficulty in clustering the data points if the dataset has varying densities and high dimensions.



Distribution Model-Based Clustering

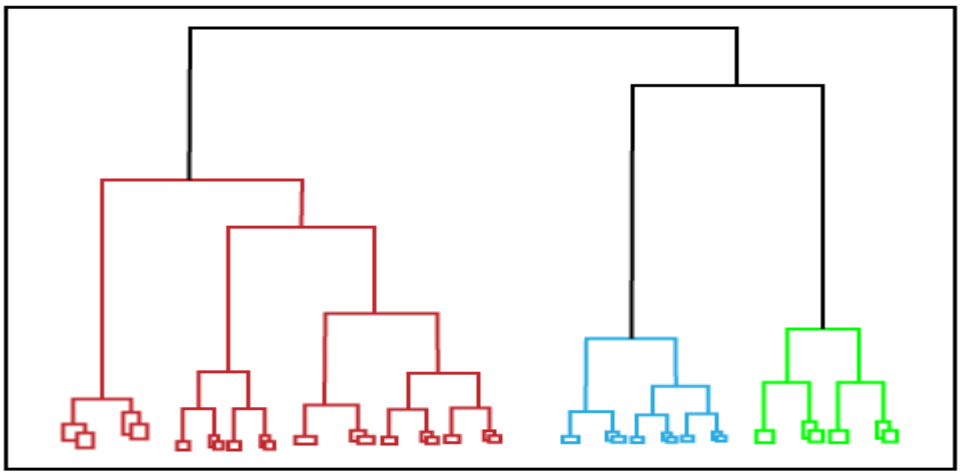
In the distribution model-based clustering method, the data is divided based on the probability of how a dataset belongs to a particular distribution. The grouping is done by assuming some distributions commonly **Gaussian Distribution**.

The example of this type is the **Expectation-Maximization Clustering algorithm** that uses Gaussian Mixture Models (GMM).



Hierarchical Clustering

Hierarchical clustering can be used as an alternative for the partitioned clustering as there is no requirement of pre-specifying the number of clusters to be created. In this technique, the dataset is divided into clusters to create a tree-like structure, which is also called a **dendrogram**. The observations or any number of clusters can be selected by cutting the tree at the correct level. The most common example of this method is the **Agglomerative Hierarchical algorithm**.



Fuzzy Clustering

Fuzzy clustering is a type of soft method in which a data object may belong to more than one group or cluster. Each dataset has a set of membership coefficients, which depend on the degree of membership to be in a cluster. **Fuzzy C-means algorithm** is the example of this type of clustering; it is sometimes also known as the Fuzzy k-means algorithm.

Clustering Algorithms

The Clustering algorithms can be divided based on their models that are explained above. There are different types of clustering algorithms published, but only a few are commonly used. The clustering algorithm is based on the kind of data that we are using. Such as, some algorithms need to guess the number of clusters in the given dataset, whereas some are required to find the minimum distance between the observation of the dataset.

Here we are discussing mainly popular Clustering algorithms that are widely used in machine learning:

1. **K-Means algorithm:** The k-means algorithm is one of the most popular clustering algorithms. It classifies the dataset by dividing the samples into different clusters of equal variances. The number of clusters must be specified in this algorithm. It is fast with fewer computations required, with the linear complexity of **O(n).**
2. **Mean-shift algorithm:** Mean-shift algorithm tries to find the dense areas in the smooth density of data points. It is an example of a centroid-based model, that works on updating the candidates for centroid to be the center of the points within a given region.
3. **DBSCAN Algorithm:** It stands **for Density-Based Spatial Clustering of Applications with Noise**. It is an example of a density-based model similar to the mean-shift, but with some remarkable advantages. In this algorithm, the areas of high density are separated by the areas of low density. Because of this, the clusters can be found in any arbitrary shape.
4. **Expectation-Maximization Clustering using GMM:** This algorithm can be used as an alternative for the k-means algorithm or for those cases where K-means can be failed. In GMM, it is assumed that the data points are Gaussian distributed.
5. **Agglomerative Hierarchical algorithm:** The Agglomerative hierarchical algorithm performs the bottom-up hierarchical clustering. In this, each data point is treated as a single cluster at the outset and then successively merged. The cluster hierarchy can be represented as a tree-structure.

6. **Affinity Propagation:** It is different from other clustering algorithms as it does not require to specify the number of clusters. In this, each data point sends a message between the pair of data points until convergence. It has $O(N^2T)$ time complexity, which is the main drawback of this algorithm.

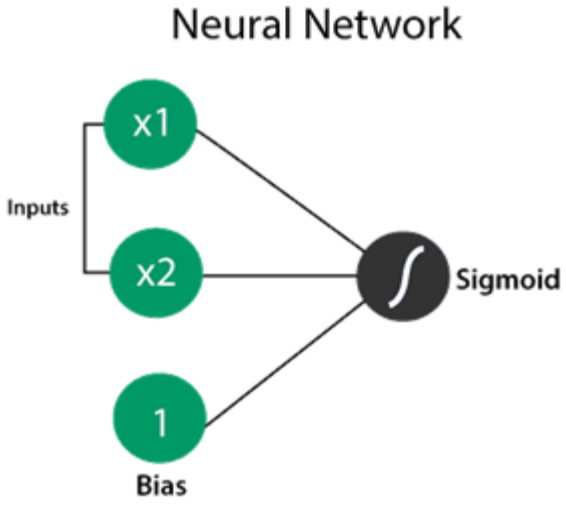
Applications of Clustering

Below are some commonly known applications of clustering technique in Machine Learning:

- **In Identification of Cancer Cells:** The clustering algorithms are widely used for the identification of cancerous cells. It divides the cancerous and non-cancerous data sets into different groups.
- **In Search Engines:** Search engines also work on the clustering technique. The search result appears based on the closest object to the search query. It does it by grouping similar data objects in one group that is far from the other dissimilar objects. The accurate result of a query depends on the quality of the clustering algorithm used.
- **Customer Segmentation:** It is used in market research to segment the customers based on their choice and preferences.
- **In Biology:** It is used in the biology stream to classify different species of plants and animals using the image recognition technique.
- **In Land Use:** The clustering technique is used in identifying the area of similar lands use in the GIS database. This can be very useful to find that for what purpose the particular land should be used, that means for which purpose it is more suitable.

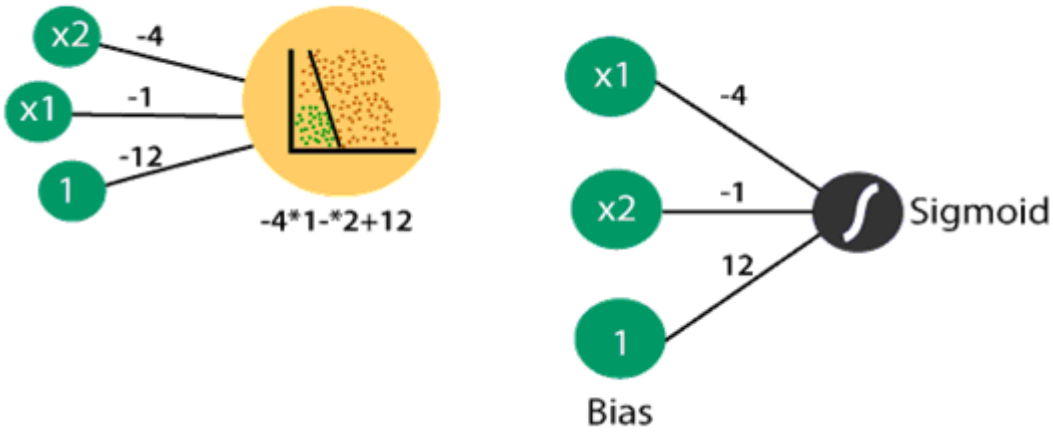
Architecture of Neural Networks

We found a non-linear model by combining two linear models with some equation, weight, bias, and sigmoid function. Let start its better illustration and understand the architecture of **Neural Network** and **Deep Neural Network**.



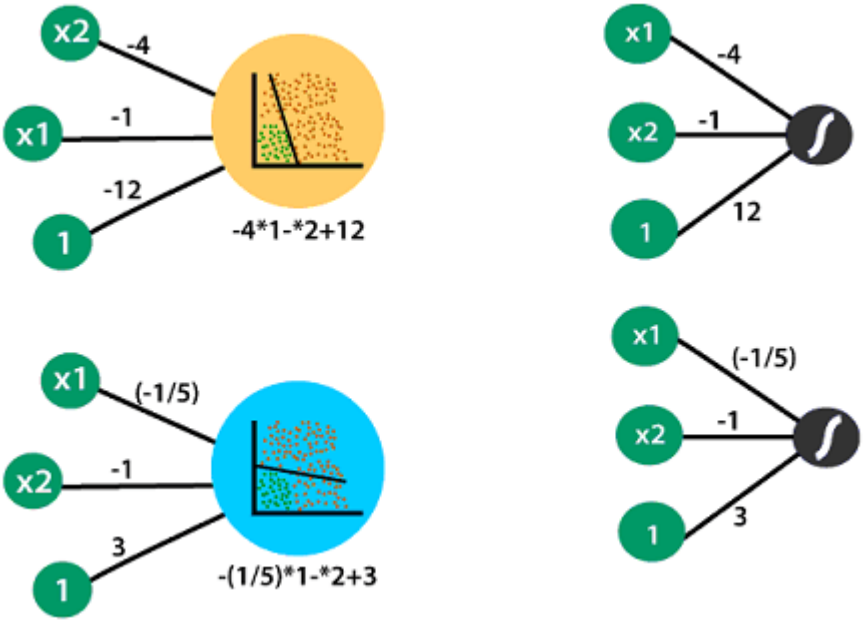
Let see an example for better understanding and illustration.

Suppose, there is a linear model whose line is represented as-$4x_1$-x_2+12. We can represent it with the following perceptron.

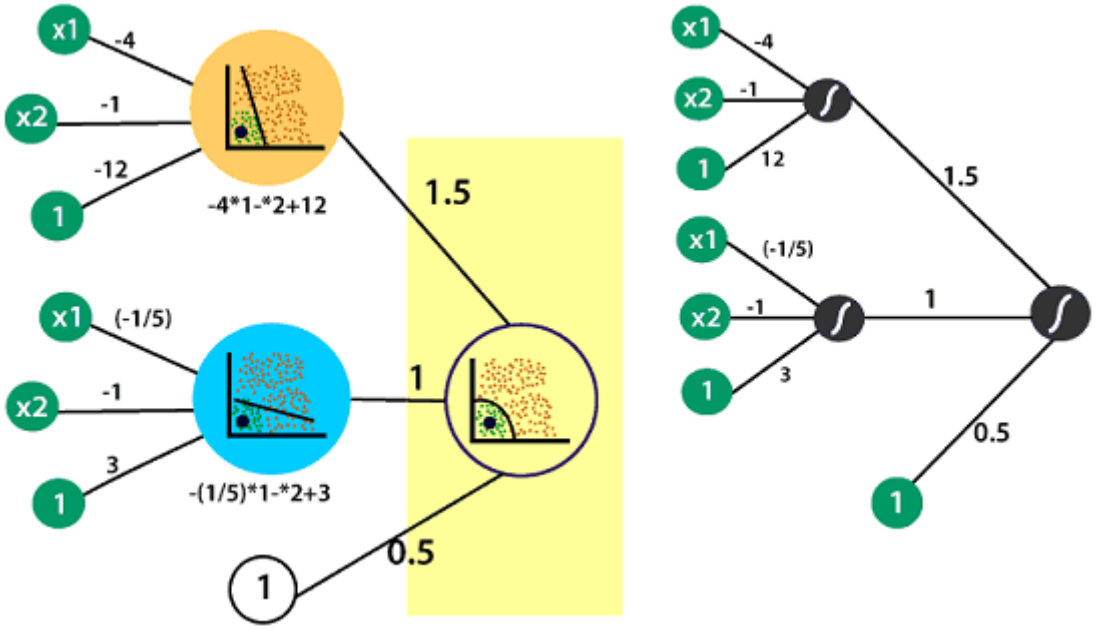


The weight in the input layer is -4, -1 and 12 represent the equation in the linear model to which input is passed in to obtain their probability of being in the positive region.

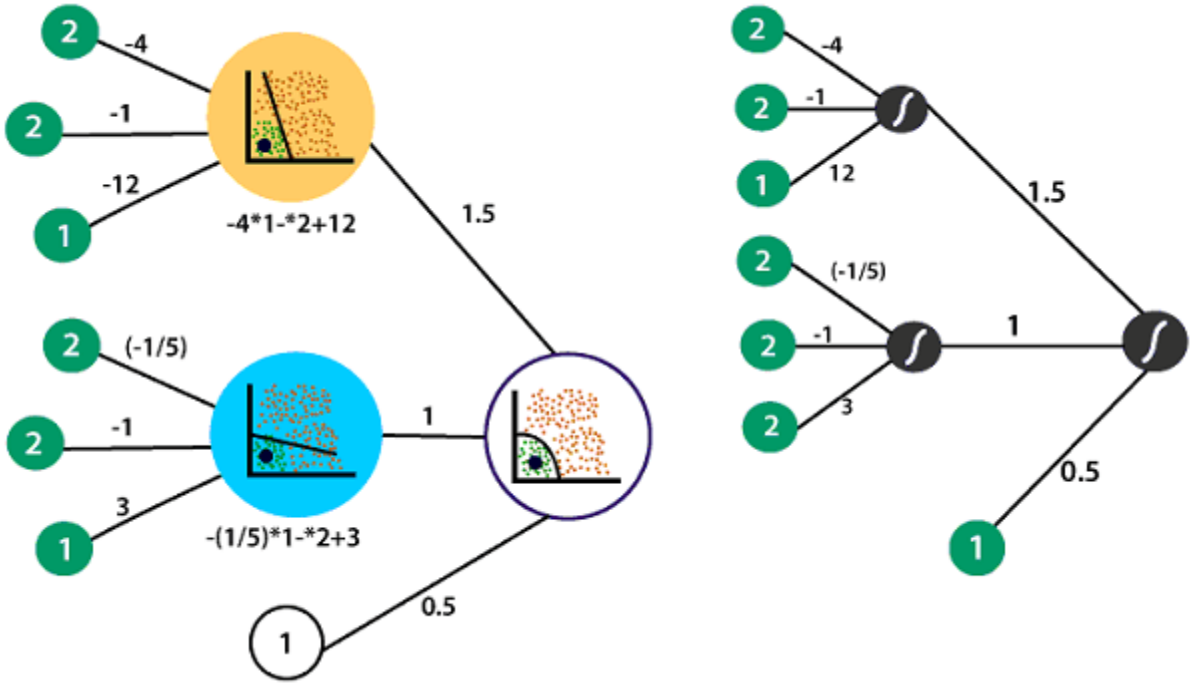
Take one more model whose line is represented as- $\frac{1}{5}$ x_1-x_2+3. So the expected perceptron through which we can represent it as follows:



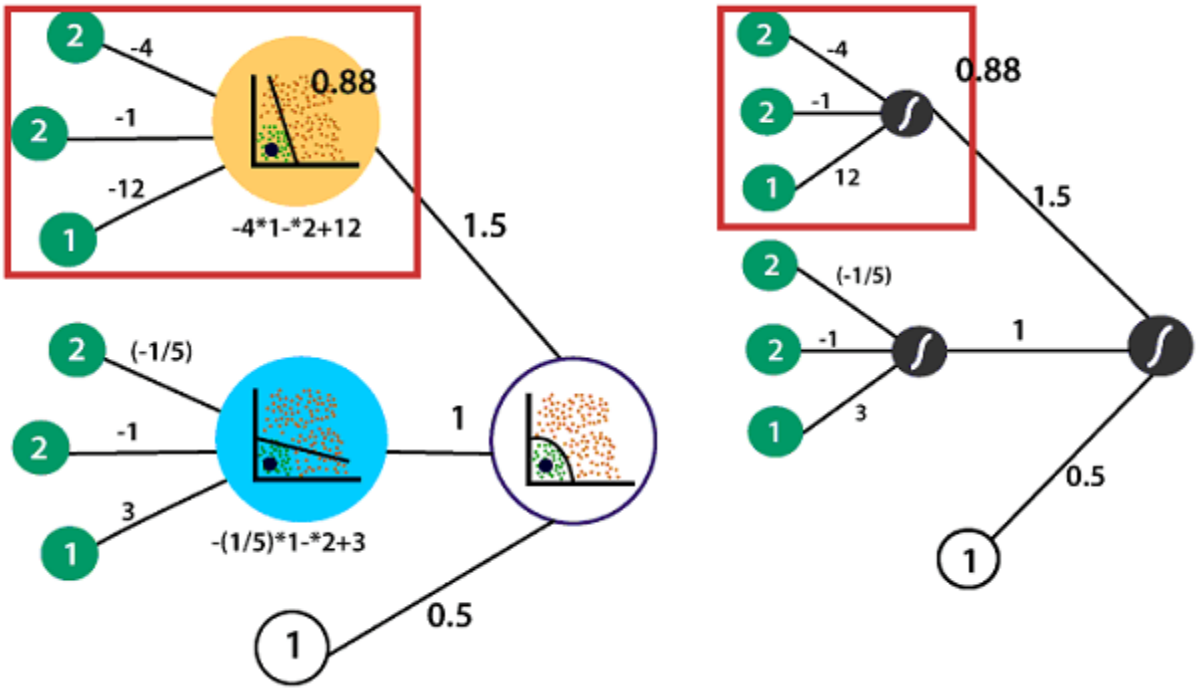
Now, what we have to do, we will combine these two perceptrons to obtain a non-linear perceptron or model by multiplying the two models with some set of weight and adding biased. After that, we applied sigmoid to obtain the curve as follows:



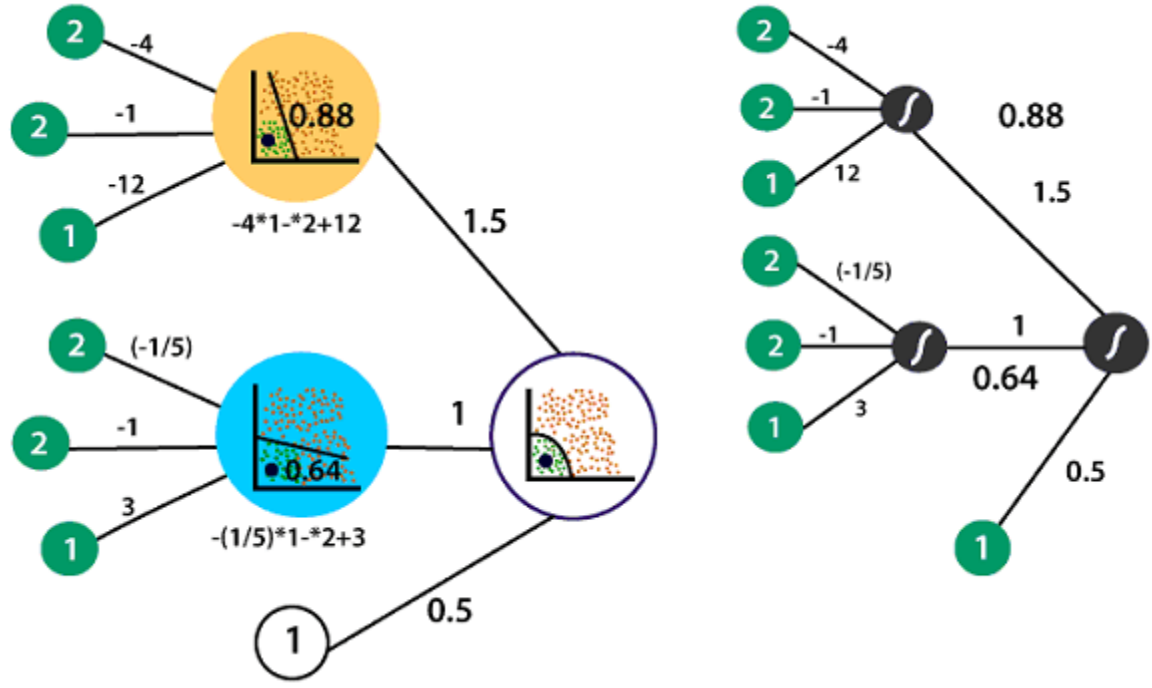
In our previous example, suppose we had two inputs x1 and x2. These inputs represent a single point at coordinates (2, 2), and we want to obtain the probability of the point being in the positive region and the non-linear model. These coordinates (2, 2) passed into the first input layer, which consists of two linear models.



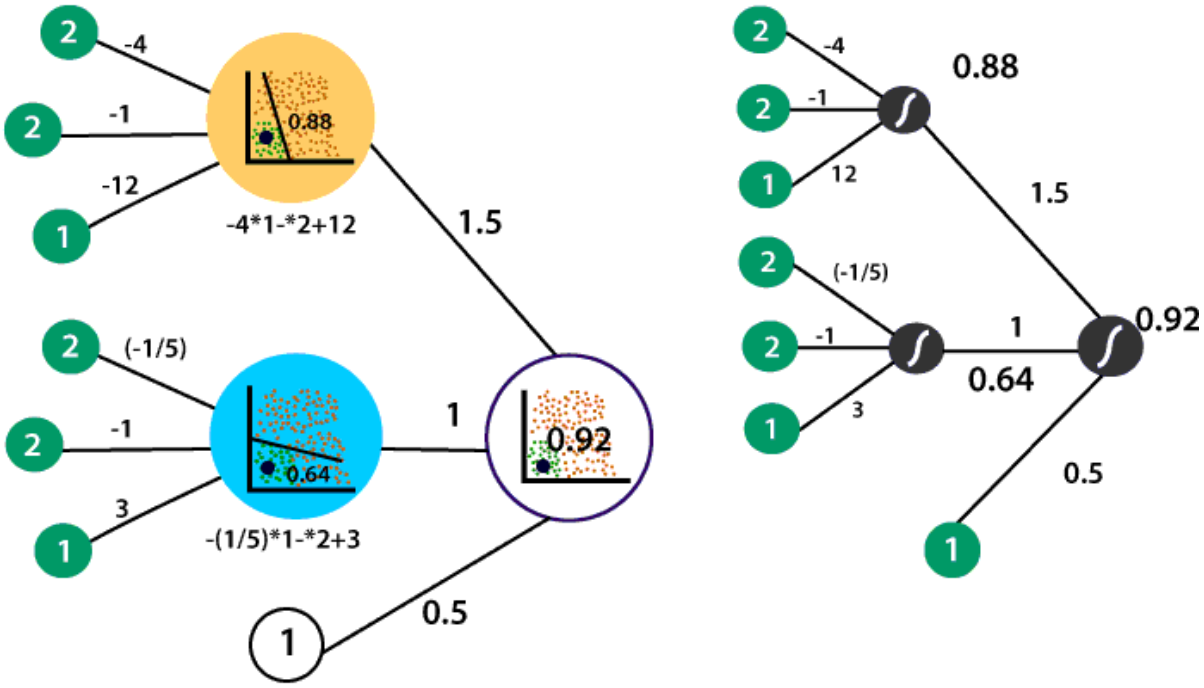
The two inputs are processed in the first linear model to obtain the probability of the point being in the positive region by taking the inputs as a linear combination based on weights and bias of the model and then taking the sigmoid and obtain the probability of point 0.88.



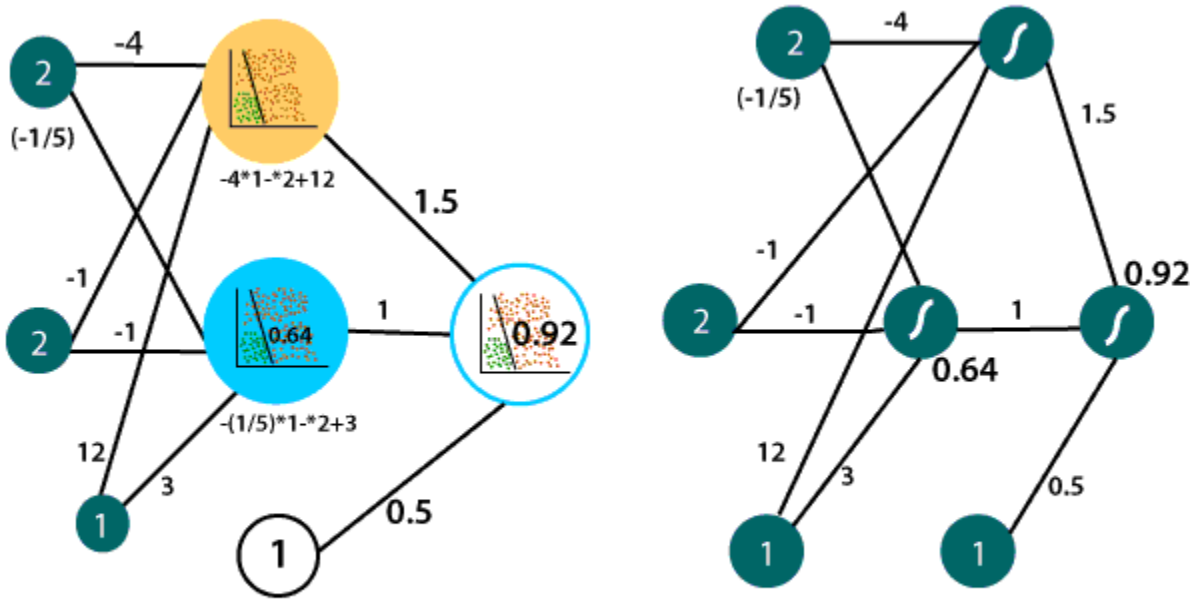
In the same way, we will find the probability of the point is in the positive region in the second model, and we found the probability of point 0.64.



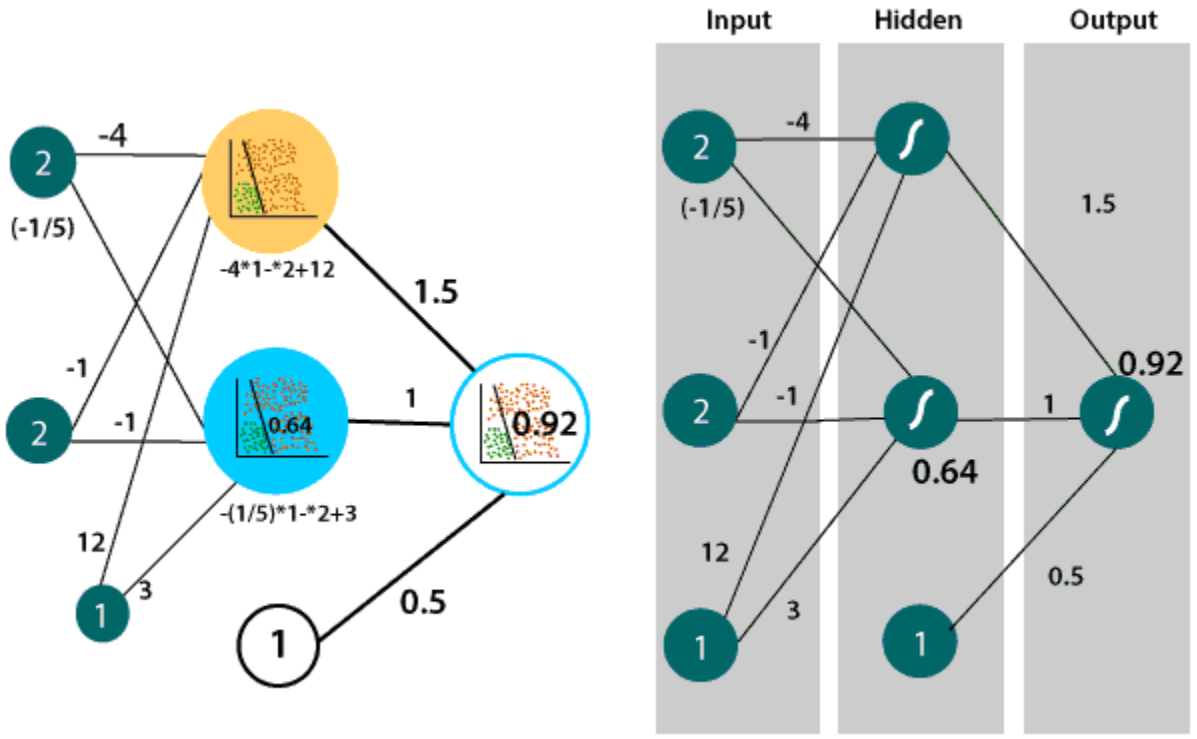
When we combine both models, we will add the probabilities together. We will take the linear combination with respect to weights 1.5, 1, and bias value 0.5. We will multiply the first model with the first weight and the second model with a second weight and adding everything along with the bias to obtain the score since we will take sigmoid of the linear combination of both our models which obtain a new model. We will do the same thing for our points, which converts it to a 0.92 probability of it being in the positive region and the non-linear model.



It is a feed forward process of deep neural network. For more efficiency, we can rearrange the notation of this neural network. Instead of representing our point as two distinct x1 and x2 input node we represent it as a single pair of the x1 and x2 node as



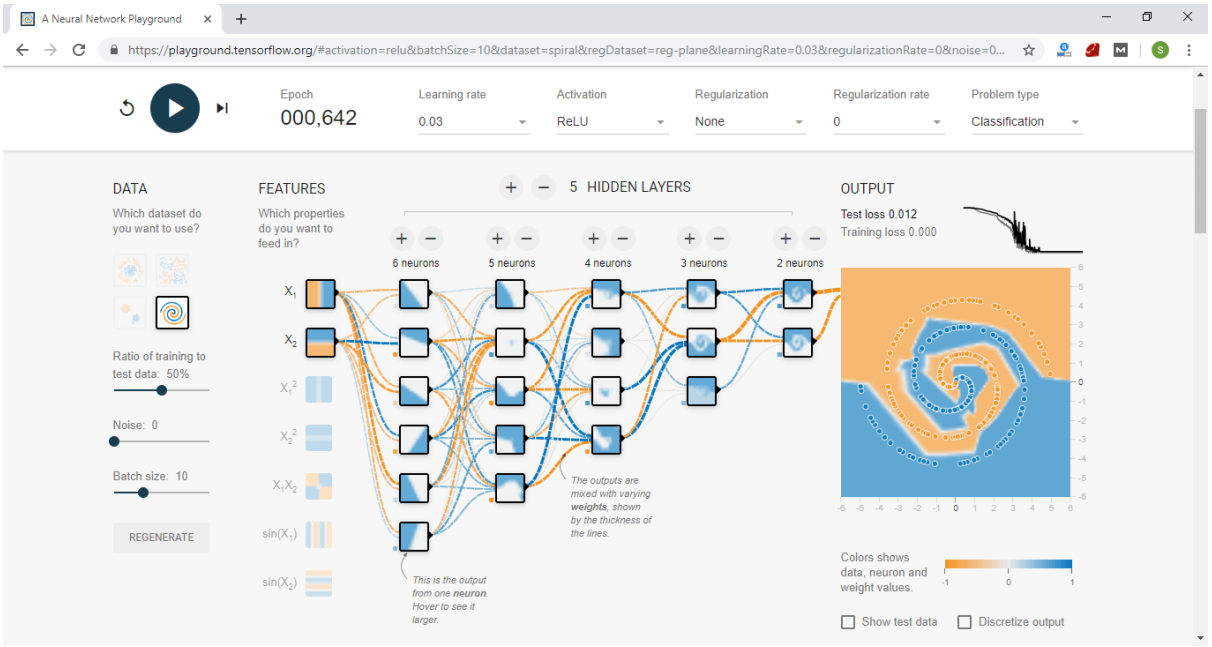
This illustrates the unique architecture of a neural network. So there is an input layer which contains the input, the second layer which is set of the linear model and the last layer is the output layer which resulted from the combination of our two linear models to obtain a non-linear model.



Deep Neural Network

We will use the models and the hidden layers to combine them and create non-linear models which best classify our data. Sometimes our data is too complex and to classify that we will have to combine non-linear models to create even more non-linear model.

We can do this many times with even more hidden layers and obtain highly complex models as



To classify this type of data is more complex. It requires many hidden layers of models combining into one another with some set of weight to obtain a model that perfectly classify this data.

After that, we can produce some output through a feed-forward operation. The input would have to go through the entire depth of the neural network before producing an output. It is just a multilayered perceptron. In a deep neural network, our data's trend is not straight forward, so this non-linear boundary is only an accurate model that correctly classifies a very complex set of data.

Many hidden layers are required to obtain this non-linear boundary and each layer containing models which are combined into one another to produce this very complex boundary which classifies our data.

The deep neural networks can be trained with more complex function to classify even more complex data.

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Value Added Course

Title: Machine Learning

Test Exercise:

1. **Machine learning is an application of_____**
2. **Applications of machine learning is _____**
3. **The term machine learning was coined in which year?**
4. **Machine learning approaches can be traditionally categorized into_____ categories.**
5. **The categories in which machine learning approaches can be traditionally categorized are ____**
6. **What is machine learning?**
7. **_____ is the machine learning algorithms that can be used with labelled data.**
8. **_____ is the machine learning algorithms that can be used with un-labelled data.**
9. **The Real-World machine learning use cases are _____.**

10. **Which among the following algorithms are used in machine learning?**

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Value Added Course

Title: Machine Learning

Key:

1. **Artificial Intelligence**
2. **Email filtering ,face recognization**
3. **1959**
4. **3**
5. **Supervised learning , unsupervised learning**
6. **Machine learning is a form of AI that enables a system to learn from data**
7. **Regression algorithms**
8. **Clustering algorithms**
9. **Digital assistants , chatbots**
10. **Naive Bayes , Support Vector Machines**

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh

Department of COMPUTER SCIENCE

Value Added Course
Title: Machine Learning

Marks List

Class: IIBCom(C.A)

S. No	Roll No.	Name of the Student	Marks
1	2052801	Maganti Revathi	08
2	2052802	Kondaveeti Sarani	08
3	2052803	Jogi Gowri Prasanna Kumari	09
4	2052804	Poranki Dharani	08
5	2052805	Dokku Bhuvaneswari	09
6	2052806	Chaganti Sasank	08
7	2052807	Boddu Bhagya Sree	09
8	2052808	Syed Afrin	10
9	2052809	Chakka Anjali	10
10	2052810	Karanam Teja Swaroop	10
11	2052811	Jarapala Sai Nayak	09
12	2052812	Cheeli Rajitha	08
13	2052813	Devarapalli Sunil	08
14	2052814	Chalapati Deepthi	09
15	2052815	Valluru Sumanth	08

16	2052816	Bobbili Purna Kumar	09
17	2052817	Kanumuri Vasanth Kumar	08
18	2052818	Oruganti Arun Kumar	09
19	2052819	Burepalli Abhinav	08
20	2052820	Kolusu Jhansi	08
21	2052821	Akunuri Bhumika	09
22	2052822	Kambham Uday	09
23	2052823	K. Bharath Kalyan	10
24	2052824	Patan Shaheena	09
25	2052825	E. Bindu	08
26	2052826	S. Sri Chandana	09
27	2052827	G.Sirisha	09
28	2052828	T.Gopi Chand	08
29	2052829	G.Navya	09
30	2052830	Kanumuri Sri Ram	08
31	2052831	N.Haritha Sri	09
32	2052832	Shaik Ruksana	08
33	2052833	Lanke Mohan Sai	08
34	2052834	K.Anil Kumar	09

S. Prabhavathi
Signature of Lecturer

Signature of HOD

PRINCIPAL
AG & SG Siddhartha Degree College of Arts&Science (Autonomous), Vijayawada
Signature of Principal

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh

Department of COMPUTER SCIENCE

Value Added Course
Title: Machine Learning

Feed Back Form

1. Is the programme interested to you (Yes/No)
2. Have you attended all the session (Yes/No)
3. Is the content of the program is adequate (Yes/No)
4. Have the teacher covered the entire syllabus? (Yes/No)
5. Is the number of hours adequate? (Yes/No)
6. Do you have any suggestions for enhancing or reducing the number of weeks designed for the program? (Yes/No)
7. On the whole, is the program useful in terms of enriching your knowledge? (Yes/No)
8. Do you have any suggestions on the program? (Yes/No)

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course / Certificate Course - Attendance Register

Class / Section: IIBcom(CA) Year: II Department of: Computer Science Paper: Machine Learning Lecturer: S. Prabhavathi

Sl. No	Roll No	Student Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2052801	Maganti Revathi	P	P	P	P	P	P	P	A	P	P	P	P	P	A	P	
2	2052802	Kondaveeti Sarani	P	P	P	P	P	A	P	P	P	A	P	P	A	P	P	
3	2052803	Jogi Gowri Prasanna Kumari	P	P	P	P	P	P	A	P	P	P	P	P	P	A	P	
4	2052804	Poranki Dharani	P	P	P	P	P	P	P	A	P	P	P	A	P	P	P	
5	2052805	Dokku Bhuvaneswari	P	P	P	P	P	P	A	P	P	A	P	P	A	P	A	
6	2052806	Chaganti Sasank	P	P	P	P	P	A	P	P	P	P	A	P	P	P	P	
7	2052807	Boddu Bhagya Sree	P	P	A	P	P	P	P	P	P	P	A	P	P	P	P	
8	2052808	Syed Afrin	P	P	P	A	P	P	P	A	P	P	P	P	P	A	P	
9	2052809	Chakka Anjali	P	P	P	P	P	P	A	P	P	P	P	A	P	P	A	
10	2052810	Karanam Teja Swaroop	P	P	P	P	A	P	P	P	P	P	A	P	P	P	A	
11	2052811	Jarapala Sai Nayak	P	P	P	P	P	P	P	A	P	P	P	P	A	P	P	
12	2052812	Cheeli Rajitha	P	P	P	P	A	P	P	P	P	A	P	P	P	P	P	
13	2052813	Devarapalli Sunil	P	P	P	P	A	P	P	P	P	P	P	P	P	P	A	
14	2052814	Chalapati Deepthi	P	P	P	P	P	P	P	P	P	P	P	A	P	P	A	
15	2052815	Valluru Sumanth	P	P	P	P	P	A	P	P	P	P	P	P	P	P	A	
16	2052816	Bobbili Purna Kumar	P	P	P	P	P	A	P	P	P	P	A	P	P	P	A	

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Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course / Certificate Course - Attendance Register

Class / Section: II B.Com (A) Year: II Department of: Computer Science Paper: Machine learning Lecturer: S. prabhavathi

Sl. No	Roll No	Student Name	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
1	2052801	Maganti Revathi	P	P	P	P	A	P	P	A	P	P	A	P	P	P	A	
2	2052802	Kondaveeti Sarani	P	P	P	A	P	P	P	P	A	P	P	P	P	P	P	
3	2052803	Jogi Gowri Prasanna Kumari	P	P	P	P	A	P	P	A	P	P	A	P	P	P	P	
4	2052804	Poranki Dharani	P	P	P	P	P	A	P	P	P	A	P	P	P	P	A	
5	2052805	Dokku Bhuvaneswari	P	P	P	P	P	P	P	P	A	P	P	A	P	P	A	
6	2052806	Chaganti Sasank	P	P	P	A	P	P	P	P	A	P	P	P	P	P	P	
7	2052807	Boddu Bhagya Sree	P	P	P	P	P	P	A	P	P	P	P	P	A	P	P	
8	2052808	Syed Afrin	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	
9	2052809	Chakka Anjali	P	P	P	P	P	P	P	P	P	P	A	P	P	P	A	
10	2052810	Karanam Teja Swaroop	P	P	P	P	P	P	A	P	P	P	P	A	P	P	A	
11	2052811	Jarapala Sai Nayak	P	P	P	A	P	P	P	P	P	P	P	P	P	P	P	
12	2052812	Cheeli Rajitha	P	P	P	P	P	P	P	A	P	P	P	P	A	P	P	
13	2052813	Devarapalli Sunil	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	
14	2052814	Chalapati Deepthi	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
15	2052815	Valluru Sumanth	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	
16	2052816	Bobbili Purna Kumar	P	P	P	P	P	P	P	P	A	P	P	A	P	P	P	

S. prabhavathi
Signature of Lecturer

Signature of HOD

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Arts&Science (Autonomous), Vuyyuru

A.G. & S.G. Siddhartha Degree College of Arts & Science

Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course / Certificate Course - Attendance Register

Class / Section: II BCom (CA) **Year:** II **Department of:** Computer Science **Paper:** Machine Learning **Lecturer:** S. Prabhavathi

Sl. No	Roll No	Student Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	2052817	Kanumuri Vasanth Kumar	P	P	P	P	P	A	P	P	P	P	P	P	A	P	P	
2	2052818	Orugunti Arun Kumar	P	P	P	P	P	P	A	P	P	P	P	A	P	P	P	
3	2052819	Burepalli Abhinav	P	P	P	P	P	A	P	P	P	P	P	A	P	P	P	
4	2052820	Kolusu Jhansi	P	P	P	P	A	P	P	P	P	P	P	A	P	P	P	
5	2052821	Akunuri Bhumika	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	
6	2052822	Kambham Uday	P	P	P	P	A	P	P	P	P	P	P	A	P	P	P	
7	2052823	K. Bharath Kalyan	P	P	P	P	P	P	A	P	P	P	P	A	P	P	P	
8	2052824	Patan Shaheena	P	P	P	A	P	P	P	P	P	A	P	P	P	P	P	
9	2052825	E. Bindu	P	P	P	P	A	P	P	P	P	P	P	P	P	P	A	
10	2052826	S. Sri Chandana	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	
11	2052827	G.Sirisha	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	
12	2052828	T.Gopi Chand	P	P	P	P	P	P	P	P	A	P	P	P	A	P	P	
13	2052829	G.Navya	A	P	P	A	P	P	P	P	P	A	P	P	A	P	P	
14	2052830	Kanumuri Sri Ram	P	A	P	P	P	P	A	P	P	P	P	P	P	P	A	
15	2052831	N.Haritha Sri	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	
16	2052832	Shaik Ruksana	P	A	P	P	P	P	P	P	P	P	P	P	P	P	P	
17	2052833	Lanke Mohan Sai	P	A	P	P	A	P	P	P	P	P	P	P	P	P	P	
18	2052834	K.Anil Kumar	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	

A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh
Value Added Course / Certificate Course - Attendance Register

Class / Section: IIBCom(C.A) Year: II Department of: Computer Science Paper: Machine learning Lecturer: S.prabhavathi

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1	2052817	Kanumuri Vasanth Kumar	P	P	P	P	A	P	P	P	A	P	P	P	A	P	P	
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16	2052832	Shaik Ruksana	P	P	P	P	P	A	P	P	P	P	P	A	P	A	P	
17	2052833	Lanke Mohan Sai	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P	
18	2052834	K.Anil Kumar	P	P	P	A	P	A	P	P	P	P	P	P	P	P	P	

S.prabhavathi
Signature of Lecturer

Signature of HOD

Signature of Principal
PRINCIPAL
AG & SG Siddhartha Degree College of Arts&Science (Autonomous),Vuyyuru

ADUSUMILLI GOPALAKRISHNAIAH & SUGARCANE GROWERS

SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE

Vuyyuru-521 165, Krishna District, Andhra Pradesh

An Autonomous College in the Jurisdiction of Krishna University

Accredited by NAAC with "A" Grade

DEPARTMENT OF COMPUTER SCIENCE

VALUE ADDED COURSE:MACHINE LEARNING

VAC CODE:MLVAC01

CERTIFICATE

This is to Certify that Son /Daughter of shri/Smt

has Successfully completed value added course In MACHINE LEARNING

Conducted by the Department of COMPUTER SCIENCE from 14-06-2018 to 15-07-2018 We wish him /her bright future

Co-ordinator

Head of Department

Principal

PRINCIPAL

AG & SG Siddhartha Degree College of Arts&Science (Autonomous),Vuyyuru