Topic:Perceptron in deep learning with student placement program data.

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Abstract:

Campus placement is an activity of participating, identifying and hiring young talent for internships and entry level positions.Main objective of the student placement -To provide the right job for the right person in the right place at the right time. To ensure our students will start their career and move forward in the right direction for better quality living. To provide ultimate satisfaction to our valuable students by offering the companies of their choice according to their eligibility Artificial intelligence (AI) and Deep Learning (DL) are strategies for making human beings's lives simpler in the Education sector through predicting and identifying ailments more quickly.. Educational institutes look for more efficient technology that assist better management and support decision making procedures or assist them to set new strategies. Deep learning is a subfield of AI and ML that is inscribed by the structure of the Human brain.DL algorithm attempts to draw similar conclusions of humans. It would be continually analyzing the data with a given logical structure called Neural network.These papers have considered the dataset of 1000 students with variables CGPA and IQ including academic achievement,skill set and prior job experience.These data are used for training the model for rule identification and for testing the model for classification.

Introduction :

Deep Learning is the part of a broader family of machine learning methods based on artificial neural networks with representative learning.this algorithm uses multiple layer to progressively extract higher level feature from raw input for ex:In image processing lower layer may identify the edges while higher layer may identify concept related to human activities such as human can easily identify the image,letters but machine will take time to process.There are different types of Neural Network such as (CNN) Convolution Neural Network,(RNN) Recurtional Neural Network-it basically deals with speech and text related data ,(GAN) it mostly used in text and images data.

Deep learning as one subset of machine learning has become the most popular research hotspot currently. It employs an artificial neural network(ANN) that is an information processing machine modeled on the structure and action of a biological neural network in the brain. Deep neural networks learn experience from data to approximate any nonlinear relations between the input information and the final output. A well-trained deep neural network has the ability to capture abstract features over the entire data set.

The purpose of this thesis is to predict which students are going to place this year by applying deep neural networks. Applying an interpretation,geometric intuition, and algorithm to find optimal parameters, the network is trained to reach stability and be optimal solution so that an appropriate model can be predict whether the students is going to be placed or not on the basis of given data values such as CGPA and IQ .This problem of predicting future possibilities can be regarded as a classification problem. The optimal network to perform classification on credit card data sets is explored and implemented in two open source machine learning libraries, namely TensorFlow released by Google and pytorch.

2.1 The Artificial neuron

As the name suggests "Neural Networks", are inspired by the human brain system. ANNs were originally designed with biological neurons as a reference point; sometimes they are called a brain model for computers,Artificial neural networks can also be thought of as learning algorithms that model the input-output relationship it is neural network transforms input data by applying a nonlinear function to a weighted sum of the inputs,The neuron is fed by input signal x1, x2, …, xm through a set of modifiable weights that can either strength or dampen the specific input. A signal xj at the input of the link j connecting to the neuron k is multiplied by the weight wkj . The input weight products are summed as a net input of the activation function that produces output which are restricted into some finite value. In addition, a bias denoted by bk is also added to the neuron as a component of the net input of the activation function

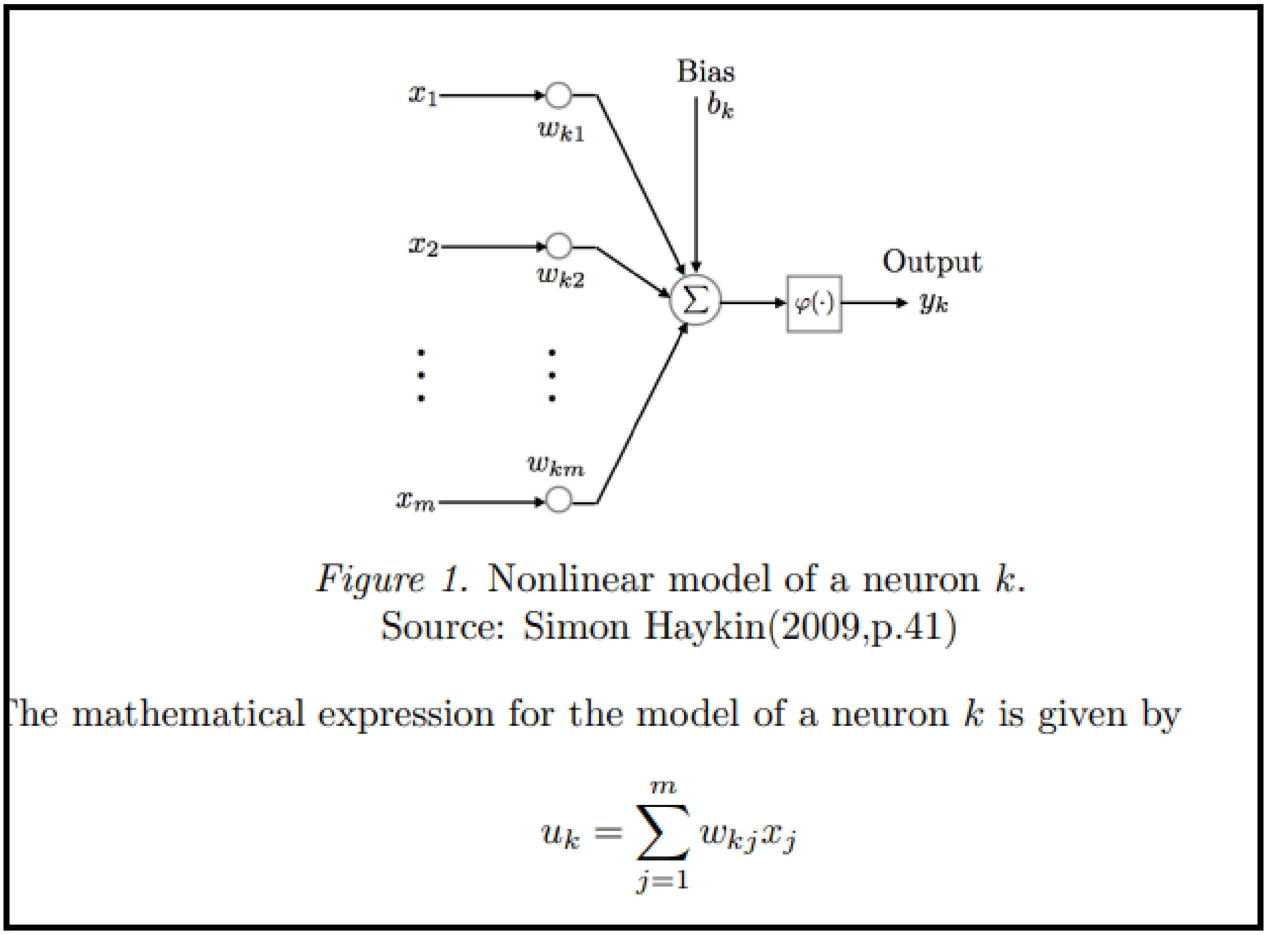


Figure 1. Nonlinear model of a neuron k.
Source: Simon Haykin(2009,p.41)

The mathematical expression for the model of a neuron k is given by

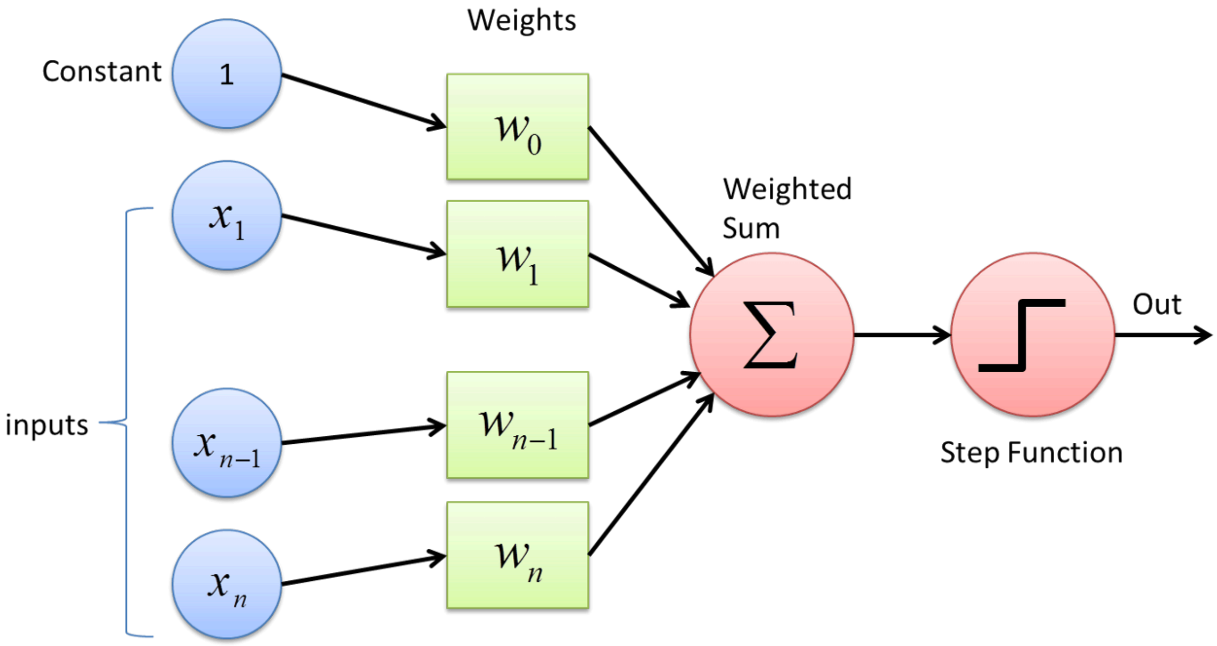
$$u_k = \sum_{j=1}^{m} w_{kj} x_j$$

2.2 Perceptron:

- The perceptron algorithm was invented as far back as 1958 by Frank Rosenblatt. While it was supposed to be a machine instead of a program, it was implemented in custom-built hardware, such as the “Mark 1 perceptron,” which was designed for image recognition.
- The U.S. Office of Naval Research funded the making of the perceptron. The first perceptron was built at the Cornell Aeronautical Laboratory.
- A perceptron is a single-layer neural network for supervised learning. A neural network is a computer that mimics the way a human brain works.Supervised learning, meanwhile, is a machine learning (ML) technique that requires a human to train a computer by giving it data to get the desired results .

- A perceptron has four main parts that we will describe in greater detail in the following section. These are input values, weights and bias, the net sum, and an activation function.

- **Input values**: These refer to the data that humans feed to the computer to get the desired output.
- **Weights and bias**: These refer to how much each input should affect the output. They are multiplied by the input values before the net sum is computed.
- **Net sum**: After multiplying the input values with their corresponding weights and bias, the products are added together to get this number and this also makes itself the dot product of the provided input.
- **Activation function:** This applies a step rule to assume the numerical output should come in range of +1 or -1 or check if the output is greater than zero or not.



Why do we need an activation function?

Because a perceptron uses binary, you need to separate values into two parts only. The activation function does just that. It maps the inputs into the required values like (0, 1) or (-1, 1).

2.3 Training & Prediction of perceptrons.

This part based on the mentioned problem we will see how the perceptron trains the algorithm to predict the solution in these part will tell you the training and prediction methods of the perceptrons here prediction also has two parts namely as follows such as Interpretation and Geometric intuitions will see the same with help of the example.

problem:We have the dataset of college student of around 1000 cases who are pass out this year and waiting for placement this data contains the IQ and Student_CGPA Column main function of this algorithm is to check which student will going to placed this year or not.

For training purpose here have uses the perceptron model as we know the perceptron formula w1x1+w2x2+w3x3+b=z in this we need to find out the values of weights i.e W1 and W2 & w3 and so on along with that we have bias as well lets suppose the values for W1=1 w2=2 and w3=3 will have to plot the ame into the above equation i.e

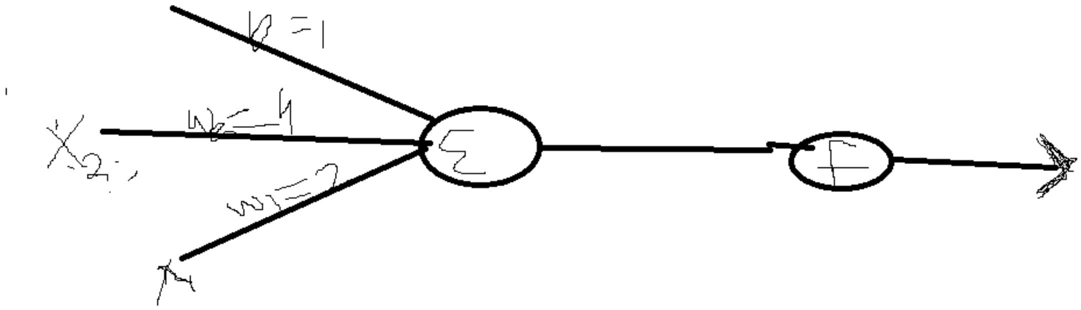
w1x1+w2x2+w3x3+b=z here b=1 and result z=1 it can be 1 or 0 1 represent the number of students placed and 0 represent not placed students.

Note: if we have multiple inputs then we should start calculating from weight value w0,w1,w2,w3.....

$$\begin{cases} 1 & s_1 > 0 \\ 0 & s_1 < 0 \end{cases}$$

The above figure indicates if the s1>0 then there would be chances to get placed and s1<0 represents there are no chances to get placed.

Interpretation:Consider the same data which we have seen above here weight are nothing but the input values which represent the important feature of the input values as we have IQ and CGPA as input values,below is the attached image who have the w1=2 & w2=4 and b=1 Sigma or submission which combines the whole data and send it to the activation function
Here have Input value or important features as IQ= w1=2 and CGPA=w2=4 it has larger weight vale i.e CGPA field than IQ so it conclude that the student who have Good CGPA can have more chance to get placed than the student who have more IQ .



Geometric Intuition:

The geometric intuition of a perceptron is a fundamental concept in the field of artificial neural networks, particularly in the context of binary classification tasks. A perceptron is a simple computational unit that takes a set of input values, applies weights to these inputs, sums them up, and then passes the result through an activation function to produce an output.

Here's a summary of the geometric intuition behind the perceptron:

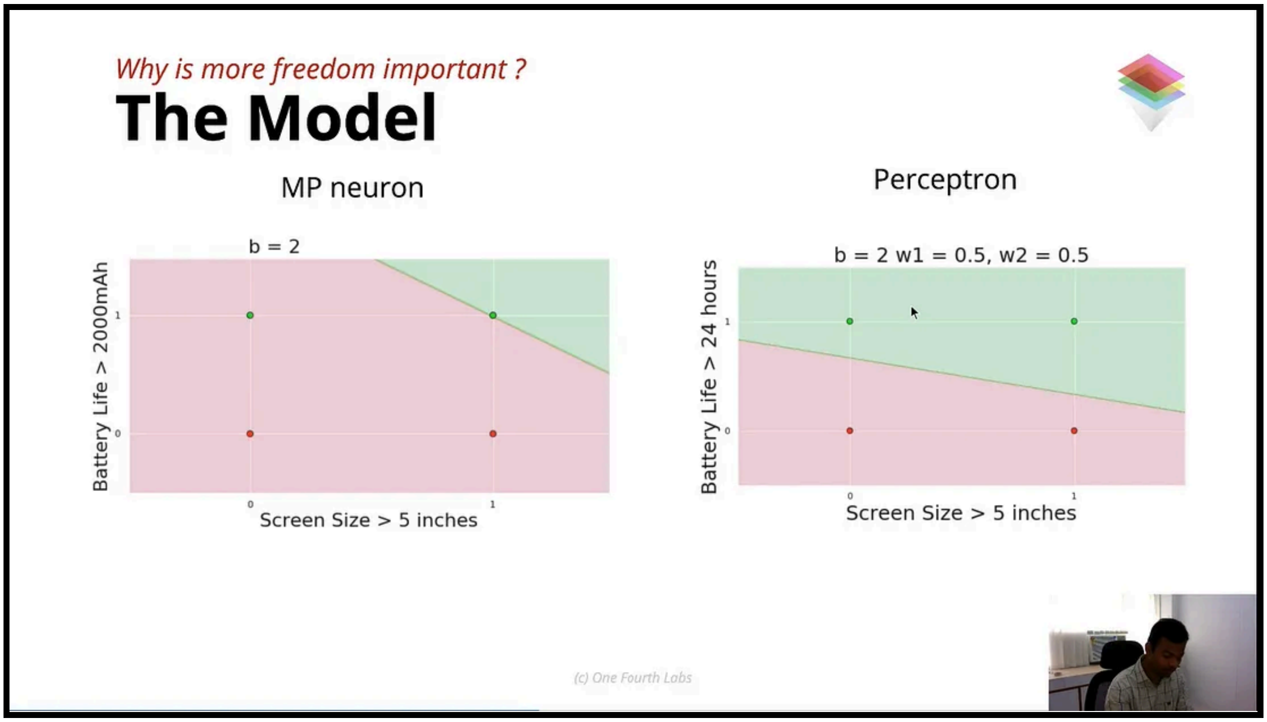
Inputs and Weights: In a perceptron, you have a set of input values (features) and corresponding weights. Each input is multiplied by its corresponding weight, and these weighted inputs are summed up.
Bias Term: There is also a bias term, which can be thought of as a measure of how easy or difficult it is for the perceptron to activate. It is similar to the y-intercept in the equation of a straight line.

Activation Function: The sum of the weighted inputs, along with the bias term, is then passed through an activation function. Traditionally, the step function was used as the activation function in the original perceptron model. This function outputs either 0 or 1, depending on whether the sum is above or below a certain threshold.

Decision Boundary: The perceptron's decision boundary is the line (in 2D) or hyperplane (in higher dimensions) that separates the two classes (positive and negative) in the input space. It is determined by the weights and bias of the perceptron.

Classification: Once the input is passed through the perceptron and the activation function, it assigns the input to one of the two classes based on which side of the decision boundary it falls. If it falls on one side, it's classified as one class; if it falls on the other side, it's classified as the other class.

Training: The perceptron learning algorithm adjusts the weights and bias during training to find the optimal decision boundary that minimizes classification errors. This adjustment is made iteratively as the perceptron learns from the training data.



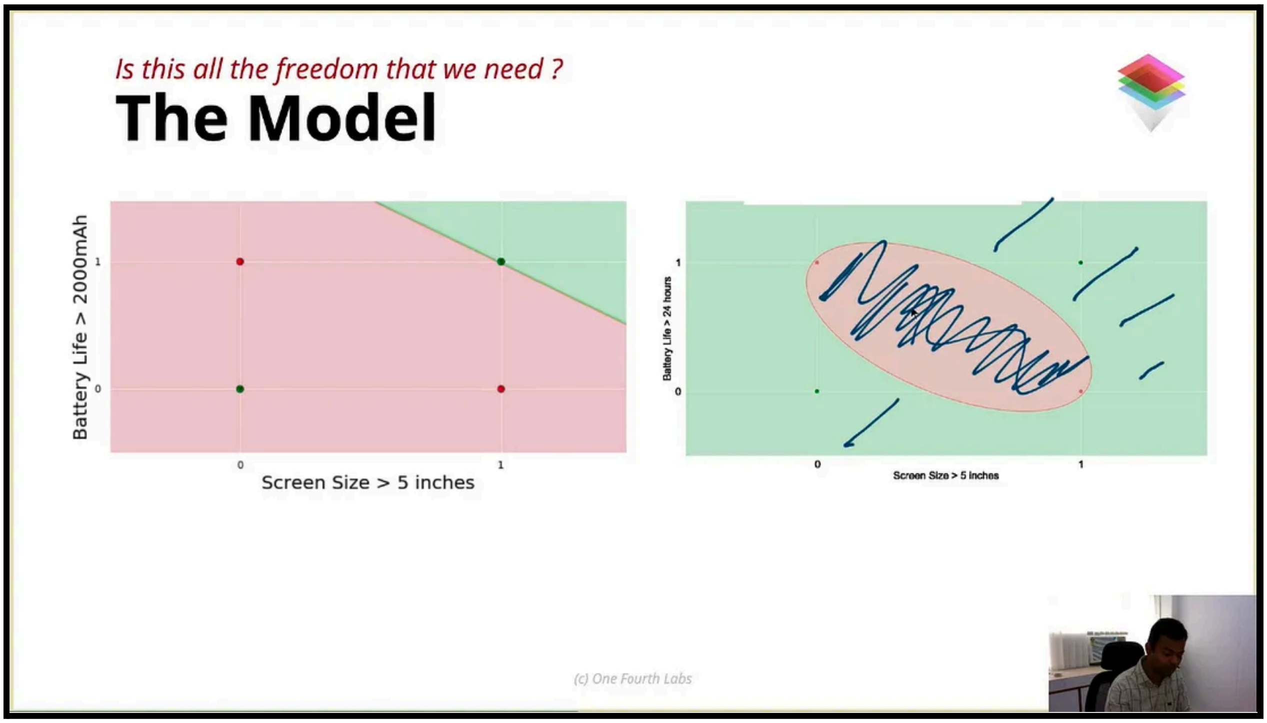
Why is more freedom important ?

The Model

MP neuron

Perceptron

(c) One Fourth Labs



Is this all the freedom that we need ?

The Model

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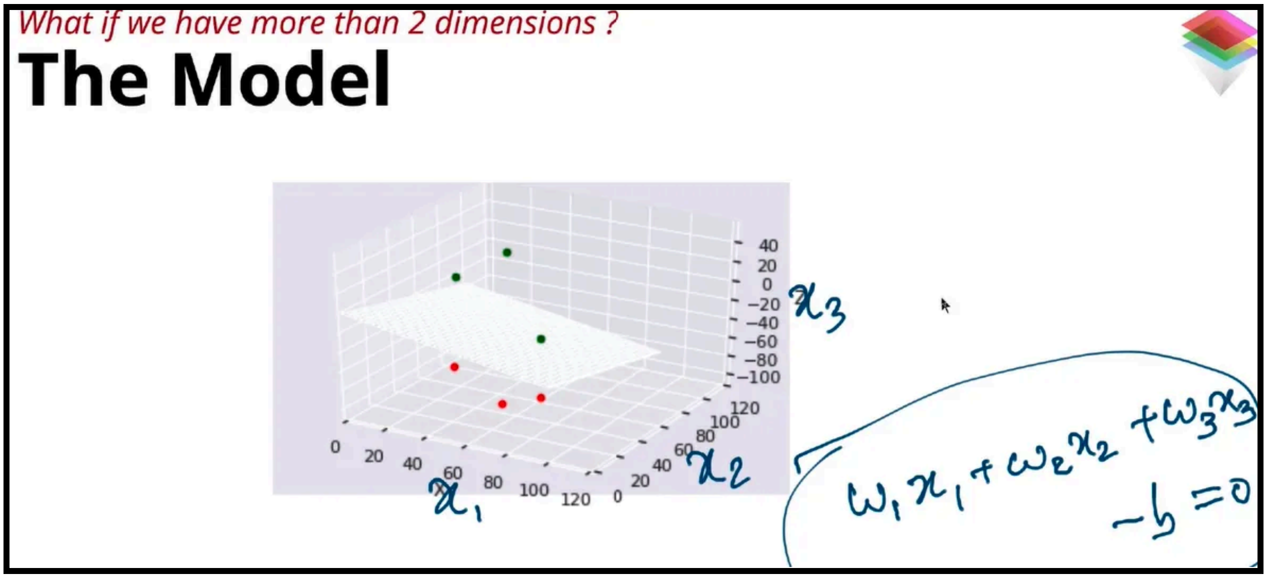


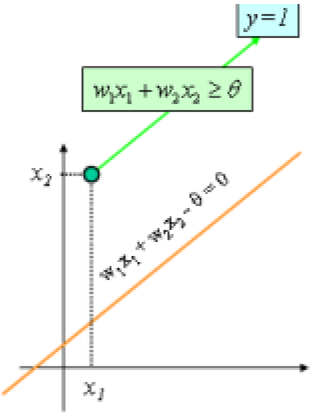
What if we have more than 2 dimensions ?

The Model

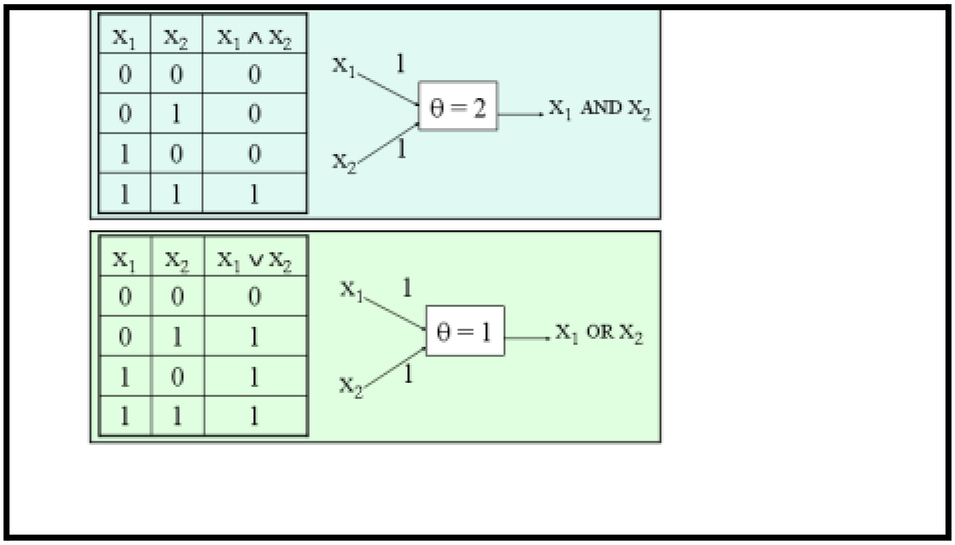
$w_1 x_1 + w_2 x_2 + w_3 x_3 - b = 0$

Geometrical Interpretation:

The computation of the output of the perceptron has simple geometrical interpretation.
Consider the n-dimensional input space (each point here is a potential input vector X ∈ R
n
).
The weight vector W ∈ R
n
is the normal vector of the
decision hyperplane.
The perceptron is activated (outputs 1) only if the input vector X is on the same side (of the decision hyperplane) as the weight vector W .
Moreover, the maximum net value (W T X) is achieved for X being close to W , is 0 if they are orthogonal and minimum (negative) if they are opposite.
The required perceptron's behavior can be obtained by adjusting appropriate weights and threshold.



The weight vector W determines the direction of the decision hyperplane. The threshold Θ determines how much decision hyperplane is moved from the origin (0 point)
A single perceptron with appropriately set weights and threshold can easily simulate basic logical gates:



x_1	x_2	$x_1 \wedge x_2$
0	0	0
0	1	0
1	0	0
1	1	1

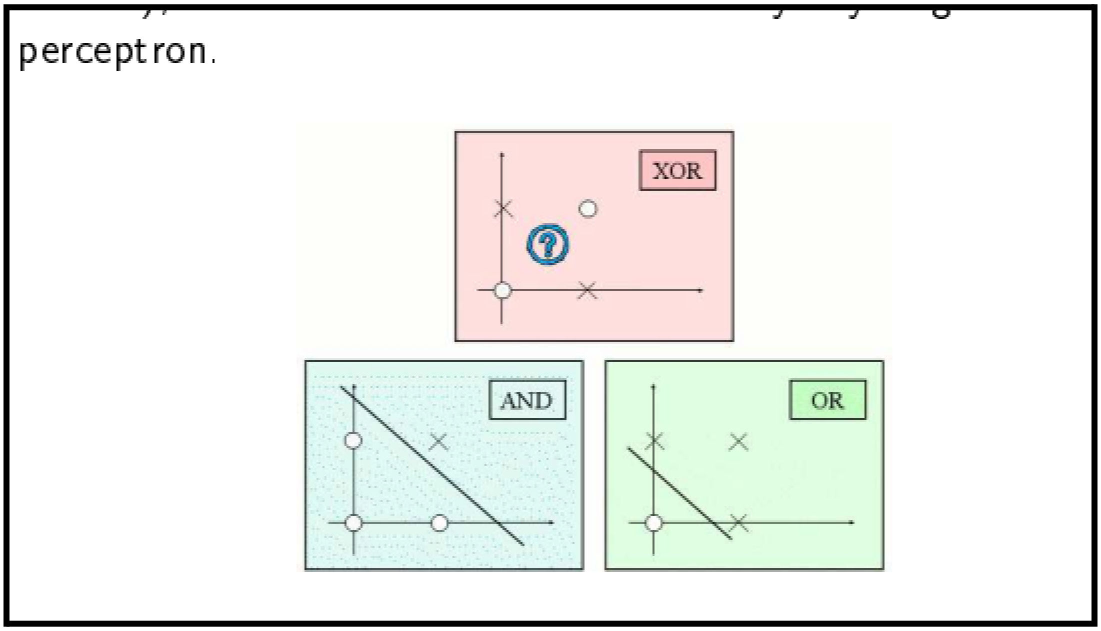
x_1	x_2	$x_1 \vee x_2$
0	0	0
0	1	1
1	0	1
1	1	1

Limitations of single perceptron:

A single perceptron can distinguish (by the value of its output) only the sets of inputs which are linearly separable in the input space (i.e. there exists a n-1-dimensional hyperplane separating the positive and negative cases).

One of the simplest examples of linearly non-separable sets is logical function XOR (excluding alternative).

One can see on the pictures below that functions AND and OR correspond to the linearly separable sets, so we can model each of them using a single perceptron (as shown in the previous section), while XOR cannot be modeled by any single perceptron.



perceptron.

3.Review of Literature:

In this article I have collected the data from multiple sources such as the Internet ,websites,reference books,Youtube videos..

Deep Learning for Coders with fastai and PyTorch by Jeremy Howard and Sylvain Gugger

Naresh Patel K M, Goutham N M, Inzamam K A, Suraksha V Kandi, Vineet Sharan V

4.Research Methodology:

Here using question and Answer type of methodology to represent this thesis have visited 3,4 college had discussion with many students and got to know the solution so of the question are given below:

Q1.What would be specific criteria for the placement interviews to get placed?

Q2.Can anyone share their experience and tips on how to secure a placement in a reputable deep learning program at a top tech company?
Q3."What are some common challenges faced by participants placement programs, and how can they be overcome?

5.Findings and Conclusions ....

Using a perceptron in deep learning with student placement program data can yield valuable insights and predictions regarding a student's placement outcome based on certain input features. Here's a conclusion drawn from such an application:

Conclusion:
The utilization of a perceptron in the context of a student placement program dataset demonstrates the potential of deep learning models in predicting placement outcomes with reasonable accuracy. By training a perceptron on relevant features such as academic performance, internship experiences, and other factors, we can make informed predictions about whether a student will get placed or not.

Key findings and takeaways include:

Predictive Power: The perceptron, a simple neural network unit, showcases the capacity of deep learning to capture complex relationships within the data. It can effectively discern patterns and associations that might not be apparent through traditional statistical methods.

Feature Importance: Through the perceptron's weight coefficients, we can identify which features have the most significant impact on placement outcomes. This information can guide students and educational institutions in focusing on critical factors for improving placement rates.

Data Quality: The success of the perceptron, like any machine learning model, is highly dependent on the quality and representativeness of the input data. Ensuring that the dataset is clean, well-structured, and up-to-date is paramount.

Ethical Considerations: It's essential to be aware of potential biases in the data and model predictions. Ethical considerations should guide the use of these models to avoid discrimination and promote fairness in placement decisions.

In conclusion, employing a perceptron in deep learning for student placement program data analysis offers a promising avenue for enhancing placement prediction accuracy.