Artificial Intelligence Based E-Learning

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Abstract— **This paper is regarding exploring a possibility of providing free education to the unprivileged by means of E-Learning. Most of them are very eager to learn but are unable to do so because of the lack of resources, and awareness of how to get an already available free resource. The paper addresses an Artificial Intelligence-based data model: Artificial Neural Networks [ANN]. This model can be used to provide online materials for educational purposes based on the needs and interest of a user. An approach to this issue is discussed, and a proposition has been given to address the preferred issue.**

Index Terms— **E-Learning, Data models, Weights of neural network, Sigmoid neuron.**

I. INTRODUCTION

E-learning is the most commonly used source for education these days. Anything and everything is found online, even modern and international schools now-a-days use online resources and software that are designed specifically for gaining Knowledge. The online database is huge and expanding on a day-to-day basis. E-learning is growing rapidly. Considering an example: If a primary school student does not understand a concept, he/ she can understand it easily by browsing online or watching a YouTube video to grasp the concept. Similarly, they can also get information that is not limited to a text-book. There are several methods to learn which is later discussed in the paper.

Need for Education is one of the biggest challenges faced in the world. A lot many tend to discontinue their education as they simply cannot afford it. Based on my experience as a volunteer in a shelter home, I was teaching children various subjects from classes one to four. They are a lively bunch of students who have a dream of going to school one day and become educated like the others. Their quest for knowledge is never-ending, but a simple reason that they are unable to afford has become one of their biggest challenges to chase their dreams.

A. Artificial Intelligence

Artificial Intelligence was first invented in the year 1940.This field has shown a tremendous growth and development. However, many argue that this is a dangerous cutting-edge technology: as they believe that the AI will replace humans soon in terms of job security and they will outsmart humans.

What they fail to understand is that AI is built with human intelligence and can be controlled. It would not take away the jobs of a million but would help in discovering new jobs and also help in terms or productivity and efficiency in the work we do. It can also be used as a powerful source of knowledge.

B. Artificial Neural networks

An Artificial neural network is a replica of a human nervous system. It is a model that processes information. This model [1] consists of input layers, hidden layers and an output layer. Each of these layers are connected by a neuron and the neural network works with constantly upgrading its weights as illustrated in Figure1. Weights are sent back to the input layer by a process known as back propagation. This helps the network learn, which is known as experience replay. ANN is widely used in data classification, speaking of which is used in this paper, to solve the issue stated.
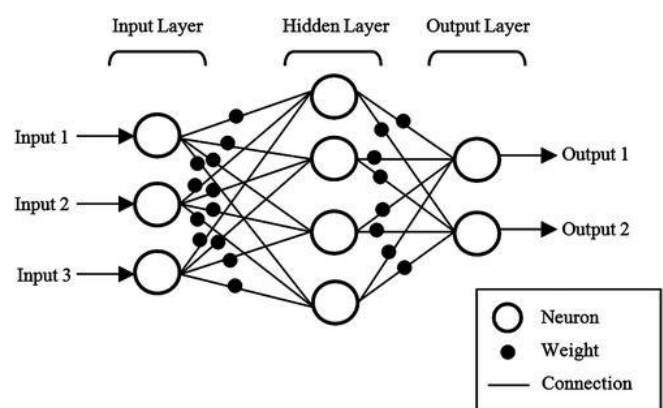

Figure 1. Artificial Neural network with weights.

C. Methods of learning

Everyone has a unique style of learning. The methods that are used are as follows:

1. **Visual (Seeing):** One prefers pictures and diagrams for learning.

2. **Auditory (Hearing):** Preference for audio recording or sounds.

3. **Reflective (Thinking):** Learns from words in both speech and writing

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4. **Kinesthetic(Feeling):** Generally, people utilize their body, hands and sense of touch.

II. PROJECT METHODOLOGY

A. Data Interpretation

Since the style of learning is different for everyone, it is significant for the AI to understand a person's learning style at an initial stage.

This can be achieved by a quiz that an Ai can make: based on the information the user provides while answering it. The AI learns and determines the learning technique, that is suitable and best for the user. And based on that, it proceeds to the next step that will be explained in the paper.

The concept of a quiz is like the quizzes found on social media, such as Facebook. The quizzes on Facebook has many categories such as: knowledge quiz, personality quiz. One such example of each category is: Test your pop culture knowledge. Are you an introvert or an extrovert?

A similar concept could be utilized by the AI to extract and understand, the learning habits which is most preferable for a user.

B. Weights of a neural network

The most commonly used models of the artificial neurons are the Sigmoid Neuron. This neuron is implemented as explained in this paper.

Considering a model that takes several binary inputs and produces one binary output. In this case the model takes three inputs, x1, x2 and x3. The neurons output, which is a binary value is determined by comparing the weighted sum to the threshold value.
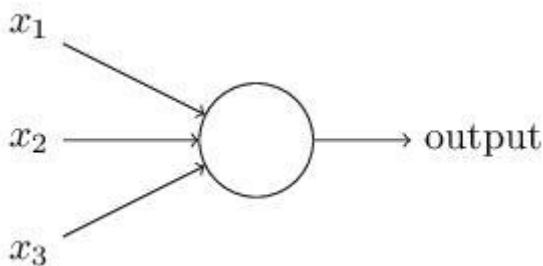

Figure 2. A Mathematical Model with one binary output

Weights are real numbers written as: w1, w2 …. They express the significance of each input to its output. The threshold is also a real number that is a parameter of the neuron.

Output= 0 if $\sum_j w_j x_j \leq$ threshold 1 if $\sum_j w_j x_j >$ threshold

This device [2] decides by weighing up evidence.

Considering an example for a visual method of learning that the AI Identifies from the quiz. We have to select which video is suitable for a person to learn from.

The AI plans by weighing up three factors:

1. Is the learning method of the user visual?
2. Does the keyword searched by the user match with the video suggested by the AI?
3. Are the reviews for this video good, as mentioned in the comment section of this video?

The AI can implement these three factors by a binary input variable as represented in Figure 2.

If x1 = 1, then the user's method of learning is visual and if x1 = 0 method of learning is not visual.

Similarly, if x2 = 1 the keyword matches the video selected, and if x2 = 0 it does not.

The same applies for x3 and the good reviews provided by the users.

There could be possibilities where the method is visual, and you are unable to find a video with the matched keyword. And if the method is not visual, there is no learning.

In such cases, perceptions are used to model, for decision making. A perception is an artificial neuron.

To do so, choose a weight w1 = 6w1 =6 for the method of learning. For the other conditions we choose w2 = 2w2 =2 and w3 = 2 w3 = 2.

Here the larger value of the weight is w1, which is the main factor compared to the other two factors. Let us choose a threshold of 5. With these choices, the perception implements a decision-making model. The output will be 1 if the method is visual, else a 0. The other two conditions do not depend on the output.

Hence it is the weights and the threshold that is a major component that are used to obtain appropriate decision-making models. By varying the two a completely new model could be obtained.

Taking the previous illustration, if our choice for the threshold was 3 , then the latter two factors will be considered and not the first factor. The Ai will look for the keyword and good reviews received, but not the method of learning. Dropping the threshold would ignore the factor: method of learning.

C. Sigmoid neurons

The Sigmoid function is similar to that of perceptions except, an input to the neural network is a raw input data. The input is much more complex compared to binary, as it can take an input of digits and a handwritten text.

To make an AI neural network learn, a small change in the weights or bias in the network, causes a small change in the output.

Let us consider Figure 2. Sigmoid neurons have the same inputs x1, x2, x3. Except that instead of 0 and 1, it could also take values between 0 and 1. E.g.: 0.366. Similar to a perception, the sigmoid neuron also has weights w1, w2.. and a bias b. The output in this case will not be binary, instead it is:

Where σ is the sigmoid function which is defined as:

$$\sigma(z) \equiv 1 /(1+e^{\wedge}-z).$$

The output of a sigmoid neuron with inputs x1, x2.. bias b and weights w1, w2 is given by:

$$1 / 1+\exp\left(-\sum_j w_j x_j - b\right).$$

Suppose if z≡w·x+b is a large positive number, then e^ =z is nearly equal to 0 and so σ(z)≈1 (which means that the sigmoid neuron is equal to 1).

If z=w·x+b is very negative, the conduct of a sigmoid neuron closely approximates to a perceptron. Only when w·x+b is of modest size that there's much deviation from the perceptron model.

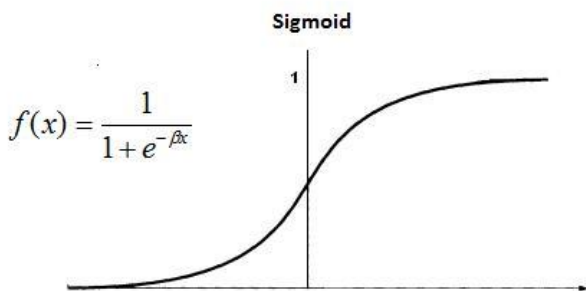The shape of the sigmoid function must be considered as illustrated in the figure 3 below.

Figure 3. A graph plotted for an output of a sigmoid function.

The output of a neuron is not a binary value, but a value in between a binary number. It can be interpreted from a sigmoid graph as illustrated in figure 3.
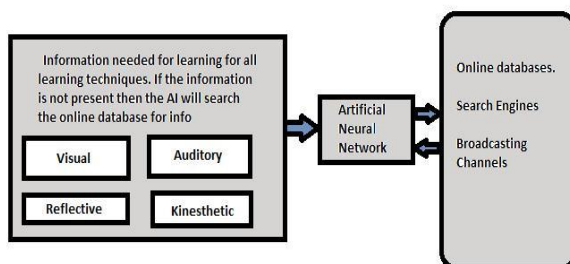

Figure 4. Illustrates the project methodology

III. CONCLUSION

By Implementing this project, it will be useful for obtaining learning materials from an online database. It will facilitate E-learning for the underprivileged, ranging from all ages. This can only be done if a learning technique of an individual is identified, from the results of a quiz and fed to the artificial neural network (ANN). The ANN in turn complies a list of online materials and also searches the internet, with keywords specified by the user using a sigmoid neuron.

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