

Application of Artificial Neural Networks (ANN) - In Designing SODEPUS (Study of Dynamic Earth Processes using Software)

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Abstract

A particular kind of psychology works in every child. With the passage of time it develops. At that time education is required & school life starts. Now the question arise can every child give equal amount of concentration? The answer is - No. If we nurture their psychology at this moment we can discover something new in them. How is it possible? No, we don't need to worry about anything. Our focus of attention is on the factors of development of knowledge for a child. As such, we can differentiate the factors as Learner, Content, and Environment.

At this particular place we will use "Artificial Neural Network". Because "Artificial Neural Network" (ANN) is the area of computer science that helps to create artificial neurons that mimics the structure of the human brain". An artificial neural network operates by creating connections between many different processing elements, each analogous to a single neuron in a biological brain. These neurons may be physically constructed or simulated by a digital computer. Each neuron takes many input signals, then, based on an internal weighting system, produces a single output signal that's typically sent as input to another neuron. Now-a-days, we have noticed innumerable application of this invaluable tool in diversified fields.

Our main task is to understand the psychological thinking and according to that provide SODEPUS to child. The full form of SODEPUS is "Study Of Dynamic Earth Processes Using Software". Here 'Dynamic Earth Processes' does not mean subjects related to Geology or Geography or something of that sort. SODEPUS will be of different kind. It depends on the age and psychology of the child. It is

not that everyone will be ‘Engineer’ or ‘Doctor’. We can select some section of talent through this process. Today, technology is viewed as a facilitator which can help hone a child’s skills. Be it helping a child discover his inner artist or facilitating a child through their studies, technology is changing the way children can learn today, and making it fun. Stated in a simple way – can we utilize the concept of Neural Network (NN) in order to understand the aspects of Human Development Index (HDI) and Educational Development Index (EDI) and thereby providing a framework for Integrated Social Development (ISD)? Through this paper, an attempt has been made to establish a relation between the diversified fields so that we can get satisfactory output/result when it comes to building a better tomorrow.

Keywords: Artificial Neural Network, Learner, Content, Environment, SODEPUS, Technology, Human Development Index, Educational Development Index, Integrated Social Development.

1. Introduction

Every branch of human knowledge has its reason, its merit and its own sphere of work and each is helpful in the dialectical progression of knowledge. Development of individuality of human beings has been accepted as one of the earliest times. Sir Percy Nunn has expressed it in a clear and emphatic manner. He says that “Nothing good enters into the human world except in and through the free activities of individual men and women, and the educational practice must be shaped to accord with that truth.”

The first stage of human life is infancy. The period of infancy covers the first five years of life of the children. Infancy refers technically only to the first year of life, but the psychological studies bring it up to the age when the child is developed enough to attend school. As we all know, education is an index of human development. It has also been considered as an instrument of social change. It is the most dynamic force in the life of an individual in influencing his physical, mental, emotional, and social development.

2. Why SODEPUS?

In my project, the name SODEPUS has been given. Here, ‘Dynamic Earth Processes’ does not necessarily mean all the processes of Geology or Geography or something of the sort. Rather, I mean to say that every process of transformation that is taking place in an individual is DYNAMIC in nature. Also it is true that MIND is the controlling force of the human spirit. As we all know, socialization is the process by which a person develops from a mere biological organism, as at birth, to an adequate adult human person. Are we in a position to monitor the noticeable phases of a child’s life? Now-a-days ‘Artificial Neural Networks’ (ANN) has gained momentum while dealing

with such problems. Because, very often there arises a situation where the question of prediction, estimation, and forecasting becomes vital. Stated in a simple way, Artificial Neural Network (ANN) can be defined as a set of processing units that exhibits some features of the biological neural network when assembled in a closely interconnected network. A definition given by Igor Aleksander and Helen Morton is given as follows. “Neural computing is the study of networks of adaptable nodes which, through a process of learning from task examples, store experiential knowledge and make it available for use” [Aleksander and Morton 1990].

In this context, reading a child psychology can enable us to provide some suitable measures that can be helpful to form a good and successful individual. In other words, depending on the mental growth and on the pattern of thinking, we can provide assistance to those young buds.

Having said all this, we very often notice that HUMANITY is somewhere absent. A child with full of emotional attachment becomes selfish, self-oriented, materialistic as he starts to attain MATURITY. The vital question is – Can we call that child a true HUMAN? Can we really point out the significant turning point that compels us to adapt a new approach for our survival? We need to think. So, let’s put our attention back to our business. What I am trying to mean is that using the models of ‘Neural Network’, we can make an attempt in unfolding the intricacies of human brain, intelligent level, pattern of thinking, changes in likes and dislikes so on and so forth.

Our basic approach is to delineate the conceptual framework from the behavioral aspects that enables us to categorize the significant parameters that are required to assess the invaluable attributes and as such we can design the module for teaching and learning for a child.

3. How Artificial Neural Network (ANN) can be useful?

Now-a-days everything seems to be customized. Because, tailor-made products are mostly in demand and are available very easily. Automated output is our choice. The pattern of thinking and the horizons of thinking have gone tremendous change. In a nutshell, sophistication has swept our life-style. All this has become possible due to the emergence of customized application software in various fields.

The essence of Neural Network is that, it consists of processing neurons, also called as nodes or perceptron and information flow channels between neurons. Each node in a neural network can have more than one input and each of it has a weight associated to it. The node performs a simple computation on its input values, which are single integers or real numbers, to produce a single numerical value as its output. This output can act as an input to any other node in the next layer or it can be a part of the output from the network as a whole.

The integration of AI (Artificial Intelligence) and DBMS (DataBase Management System) technologies promises to play a significant role in shaping the future of computing. As noted by Brodie (1988), this integration is crucial not only for next-generation computing but also for the continued development of database management

system technology and the effective application of much of AI technology. The need exists for:

- (1) Access to large amounts of existing shared data for knowledge processing,
- (2) The efficient management of data as well as knowledge, and
- (3) The intelligent processing of data.

Although, there are two types of neural networks namely, 'Rummelhart' and 'Hopfield', we shall focus our attention on 'Hopfield' type, because it deals with multi-dimensional dataflow. Also, this type of network does not show neuron layers. All neurons are linked themselves. These networks are typically used for studies about the optimization of connections. This kind of neural network can be trained with or without supervision; the purpose of its training is the minimization of its energy, leading to independent behavior.

How to proceed? At the outset, it is worth mentioning that the first to apply scientific methods to the study of individual psychology was Galton himself. As such, the following are the important factors that can be attributed for an individual achievement.

- Cognitive capacities (or "abilities")
- Emotional or affective characteristics (such as "interest" or "zeal")
- Moral or conative characteristics (notably "a will to work")

The following are some of the notable criteria that we need to take care of while dealing with the problems of this sort:

- a) Aptitudes
- b) Interests
- c) Personal problems
- d) Health
- e) Family and Home background
- f) Socio-Economic Status
- g) Reaction to school subjects

4. Methodology

Since time immemorial, men have been driven to push the limit of their dreams. In order to provide a roadmap to an improbable journey of life, we need to take care of certain factors that differentiate one's attitude towards life. This study focuses on child who has come from various sections of society having different backgrounds. It is also true that child health and child care are two vital requirements for the development of a healthy nation. This is no longer the exclusive domain of doctors and paramedical personnel, but is increasingly becoming the concern and responsibility of social planners and social institutions like family and school. In order to draw a clear distinction between structural non-linearity and non-structural linearity, we need to disintegrate the conceptual framework into clustered models.

We know that for any problem, the solution and relevant information is fed in the computer in a form acceptable to the computer. In other words, we need to model the steps of solution in the form of a program which manipulate the given data/information in terms of mathematical entities like numbers, sets, relations, functions, graphs, records etc. Also, the steps of solution are generally precise, involving no ambiguity. The following figure (Figure. 1) is a schematic representation of the stages of learning. Thereafter, we shall further develop sub criteria's that can evaluate the strengths and weaknesses of a child. Also, the potential factors are to be taken into consideration while we derive empirical relationships. Such as Aptitude, Interest, Health, Family Background, Financial Status, Social Context, Surrounding infrastructure etc. etc. Here, we shall go for designing a MODEL on MULTILAYER PERCEPTRON in order to delineate the causes/effects relationship. So, in our case we shall focus on 'Function Approximation' as we try to approximate the projected path of our pattern. The feature of multilayer perceptron is as follows:

- a) Combine several perceptrons to create a non-linear decision boundary
- b) Each perceptron gives a non-linear mapping to new dimension.

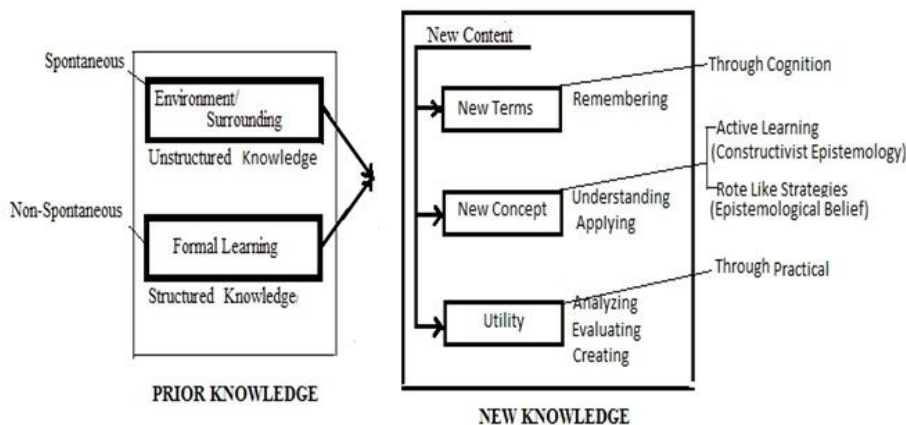


Figure 1: Schematic representation of stages of learning.

Initially, the types of knowledge have been classified as structured and unstructured. Thereafter, classes for three subdivisions i.e., 'New Terms', 'New Concept', and 'Utility' have to be defined along with their attributes. Ultimately, a situation may arise when we may be confronted with a number of issues that contradict with each other. Our aim is to evolve a comprehensive model for analysis and prediction based on the available datasets.

4.1 Models

Neural network models in artificial intelligence are usually referred to as artificial neural networks (ANNs); these are essentially simple mathematical models defining a function or a distribution over or both and , but sometimes models are also intimately associated with a particular learning algorithm or learning rule. A common use of the

phrase ANN model really means the definition of a class of such functions (where members of the class are obtained by varying parameters, connection weights, or specifics of the architecture such as the number of neurons or their connectivity). The figure (Figure 2) is an illustration of the schematic representation of input-output model.

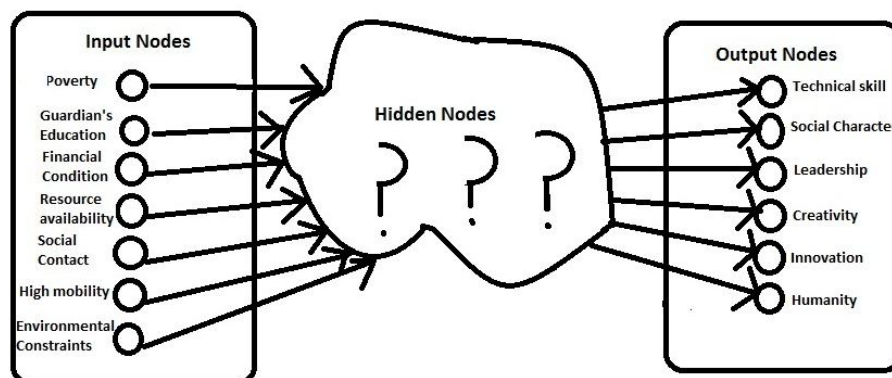


Figure 2: Input-Output model.

Conventionally, a number of models can explain the relationship between the components. What we are looking for is a holistic approach. Though, a number of units are there that can serve as an eye-opener for having an in depth analysis. Here, we have to look for specific algorithms that can deal with the complexities. In this case the vital task is to delineate the class boundaries. Naturally we will accept a number of datasets for each class. In order to provide adequate services to the society, it is an endeavor to integrate the most scientifically advanced domain along with the most common problems of day-to-day world.

4.2 Evaluation

Evaluation is the process by which we judge the worthwhileness of something in order to make decisions. In spite of having the technical assistance, resources, and methodologies, there seems to be a gap when it comes to formulating the strategies and reaping the actual benefit. It's very difficult to monitor the mindset of a child. Mere indoctrinating young buds adopting conventional methods may not lead to drawing convincing results. What we analyze based on some inputs is not the prime criteria. Rather, a sound monitoring mechanism should be designed and developed in order to put an imprint on our society with the help of advanced tools that are readily available.

5. Conclusion

Education, as we all know, is the most important pillar of our society. Today, technology is viewed as a facilitator which can help hone a child's skills. Be it helping a child discover his inner artist or facilitating a child through their studies, technology is changing the way children can learn today, and making it fun. In recent times, we have seen that 'Artificial Neural Networks' (ANN) has been able to prove its worth in forecasting and estimation especially in the field of stock market, weather forecasting, medical diagnosis, so on and so forth. More often we have come across terminologies like Machine Learning, Data Mining etc. etc. that applies in diversified fields. So, can we not take a step further ahead in order to harness its potential in a newer dimension? A lot of rethinking has to be done and our priorities need to change before we can hope to see a positive outcome.

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