Application of Artificial Neural Networks in Information Systems

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Abstract

Information systems are formal, sociotechnical, organizational systems designed to collect, process, store, and distribute information. Four important components comprise the Information Systems, they are a task, people, structure, and technology. Information can be used for purposes such as learning, prediction, classification, and extension. With technologies such as artificial intelligence, the information can be used to analyze complex data. Artificial neural networks are an interconnected group of nodes, which is compared similarly to the biological neurons or the neural networks. The networks have a large potential to remedy troubles that cannot be solved by way of logical, analytical strategies with the preferred software. In this paper, applications of these networks in the field of information system is explained. The main objective of this paper is to identify and understand the functionality of artificial neural networks for the decision-making process in Information Systems. Results exhibit that the usage of soft computing techniques such as in synthetic ANNs can enhance the effectiveness of information systems.

Keywords: *ANNs, Information System, Supervised training , Unsupervised training.*

1. Introduction

The information needs to be of high quality to be useful and accurate. Any high-quality information would possess major characteristics such as accuracy, completeness, consistency, uniqueness, and timeliness. When the information is accurate, it indeed helps in the development of new business ideas in an organization. A small portion of information, which is referred to as partial information is still incomplete. Hence, the information needs to obey the completeness characteristic. When the information is unique and distinct, it adds a very great value to an organization. The information needs to be consistent and concise to support the decision-making process of an organization. The real-time data is the major element of timeliness, the companies use both old and new data to achieve their goals in a competitive environment.

Artificial Neural Networks (ANN) are the pieces of a computing system designed to simulate the way the human brain analyzes and processes information. They are the foundations of Artificial Intelligence (AI) and solve problems that would prove impossible or difficult by human or statistical standards. ANN has self-learning capabilities that enable them to produce better results as more data become available.

Artificial neural networks are built like the human brain, with neuron nodes interconnected like a web. The human brain has hundreds of billions of cells called neurons. Each neuron is made up of a cell body that is responsible for processing information by carrying information towards (inputs) and away (outputs) from the brain. ANN has hundreds or thousands of artificial neurons called processing units, which are interconnected by nodes. These processing units are made up of input and output units. The input units receive various forms and structures of information based on an internal weighting system, and the neural network attempts to learn about the information presented to produce one output report. Just like humans need rules and guidelines to come up with a result or output, ANNs also use a set of learning rules called backpropagation, an abbreviation for backward propagation of error, to perfect their output results [3].

An ANN initially goes through a training phase where it learns to recognize patterns in data, whether visually, aurally, or textually. During this supervised phase, the network compares its actual output produced with what it was meant to produce, i.e., the desired output. The difference between both outcomes is adjusted using backpropagation. This means that the network works backward going from the output unit to the input units to adjust the weight of its connections between the units until the difference between the actual and desired outcome produces the lowest possible error [3, 4].

Artificial Neural Networks (ANN) are paving the way for life-changing applications to be developed for use in all sectors of the economy. Artificial Intelligence (AI) platforms that are built on ANN are disrupting the traditional way of doing things. From translating web pages into other languages to having a virtual assistant order groceries online to conversing with chatbots to solve problems, AI platforms are simplifying transactions and making services accessible to all at negligible costs [2, 3].

2. The Structure of Artificial Neural Network

A typical neural network includes layers and weighted nodes[8, 13]. There exists an important feature known as network behavior, which primarily depends on the communication between the members or nodes [14]. There are different types of neurons in each layer. They are as follows:

1. Input layer: The main functionality of the input layer is to fetch the raw data that is to be fed to the network.
2. Hidden layers: The hidden layer is activated based on the weights between the input and the hidden units. The performance of the layers is determined by the inputs and the relationship between the layer's weight and the hidden layer.
3. The output layer: It mainly relates to the output generated by the network. In this layer, the performance is determined based on the bodyweight of the hidden connection which is between the hidden layer and the output layer.

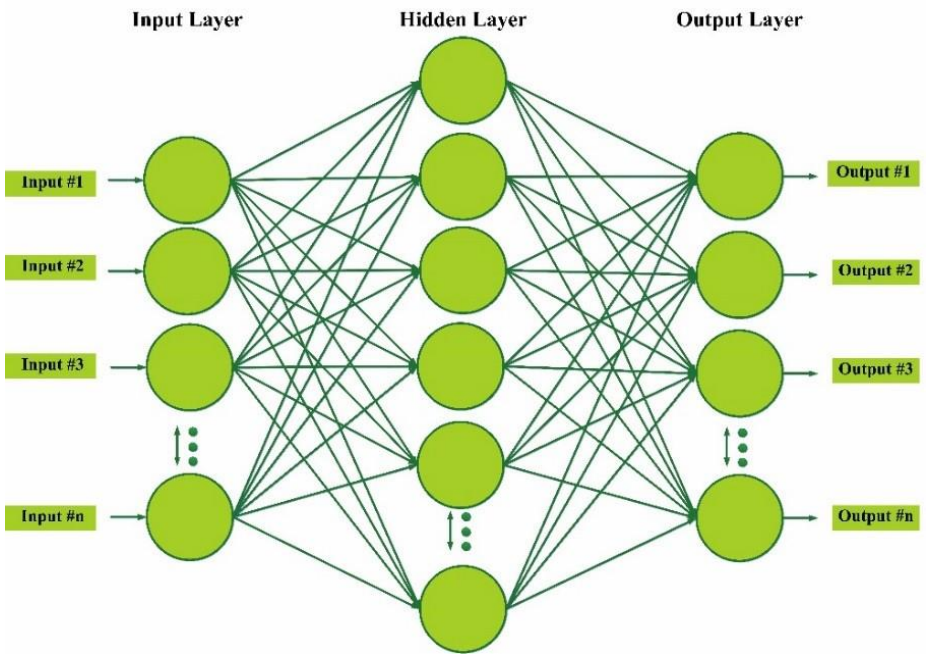

Figure 1: The Structure of Artificial Neural Network.

Figure 1 shows the structure of an ANN.

The advantages of neural networks are as follows:

1. The ability to learn how to do tasks based on the information given to them. This is known as Adaptive Learning
2. An artificial neural network automatically organizes the presentation of information received during learning. Neurons switch with the compatible learning theory and input response. This is known as Self-Organising
3. Artificial Neural Network's capabilities can be specifically designed and built for optimal results in parallel computing with the hardware. This was known as Real-Time Operators.

There is network interaction between the neural network layers via multiple connections or link weight s. They are as follows:

1. Forward: From this type, the highest links are the signals which travel in one direction and have no feedback.
2. Backward: Data is node-to-node input from higher layers to lower layers.
3. Side: The output nodes are used as input nodes per layer.

There are general variations between a neural network and a computer. Neural networks have a differe nt way of solving the problem. Traditional methods use computer algorithms to solve the problem is to solve the problem of the following set of unambiguous instructions [1].
If the computer has not previously solved problems or there is no unique algorithm, the program will n ot be able to solve the problem. Further, based on the training they are divided into four categories:

1. **Constant weight**: There is no training and there is an application to optimize data, to reduce size, resolution, and compression.
2. **Unsupervised training**: Weighing on the correct inputs and outputs only. However, comparing the output and determining the amount of error to be corrected weights is not appropriate. Weights synchronize only based on patterns of input of data. The aim is to extract features of input patterns based on the clustering or classification strategy and the diagnosis of similarities that are already identified without an output corresponding to the input patterns. Typically this type of training is based on performing the best match.

The unsupervised network switches weights depending on the input-output as a suitable response to this input is in the next contract [1]. The network is thus learning how to respond to data. So finding neurons is one of the most important cases of unsupervised networks. Figure 2 shows the unsupervised training in an ANN.

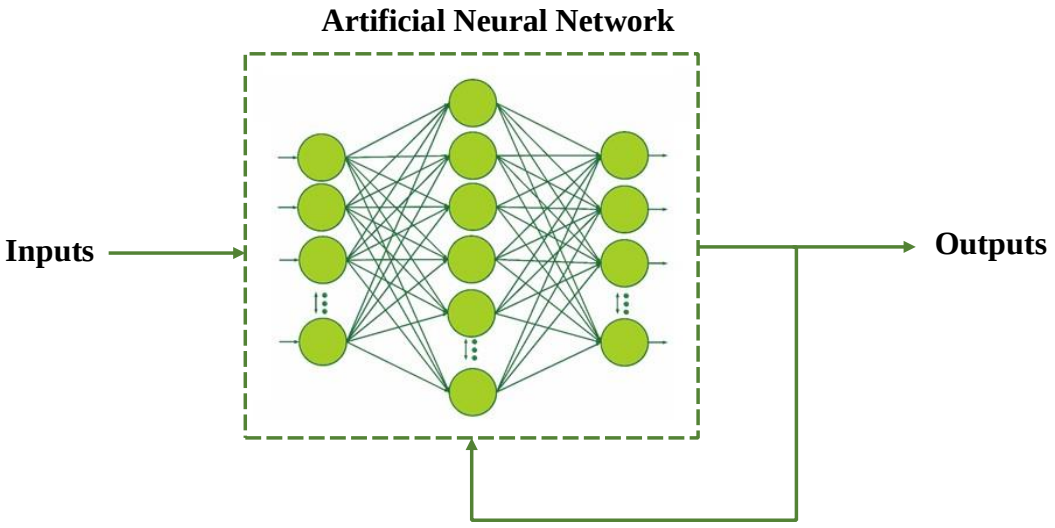

Figure 2: The Unsupervised training in Artificial Neural Network.

3. **Supervised training**:

For each group of outputs corresponding to the input, patterns are shown and the weights are adjusted if there is an appropriate error in the difference produced in optimum output level training patterns. In these approaches, tests are correlated with weights or gap distributed input and output weights are adjusted for the release of the film. The goal is to design a network that is first trained through available training data, then to recognize class networks by providing an input vector. This network is commonly used for functions of pattern recognition. Figure 3 shows the supervised training in an ANN [1].

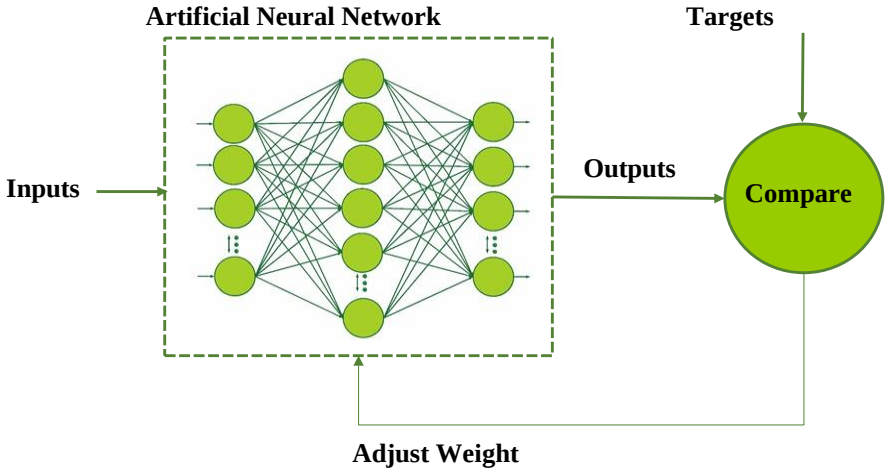

Figure 3: The supervised training in Artificial Neural Network.

3. Information Systems used in Accounting

An information system is a database designed to store, process and analyze the results of regular reports. Applications designed to process high volumes of data support the accounting process. Big businesses can make millions of transactions in a month, while medium-sized businesses with the traditional system can process up to 100,000 to over a month. Market solutions for individual customers using this knowledge for decision making, scheduling, and converting data into business intelligence using IT software [10]. Through organizing and monitoring advertising campaigns, accountants can now

gain business intelligence from their companies. The real value of information is the customer-oriented type from the stored information and application intelligence to the development of the strategy. Accountants and financial managers consider four business areas to assist in customer-oriented management decisions [10]. First of all, it is necessary to identify the details, such as financial information, because accountants are familiar with the financial data obtained. Second, information can be obtained from large multi-database in many cases because the necessary data has already been given. Thirdly, using sophisticated analytical techniques, the data can be analyzed. Finally, for planning and decision-making activities, the information is used. The four business areas will become the primary business intelligence information. For the advantage of expenses or as analysts, financial experts can use the software as a management consultant. In this new role, accountants achieve data stored in the database. Figure 4 shows the structure of an accounting information system [1].

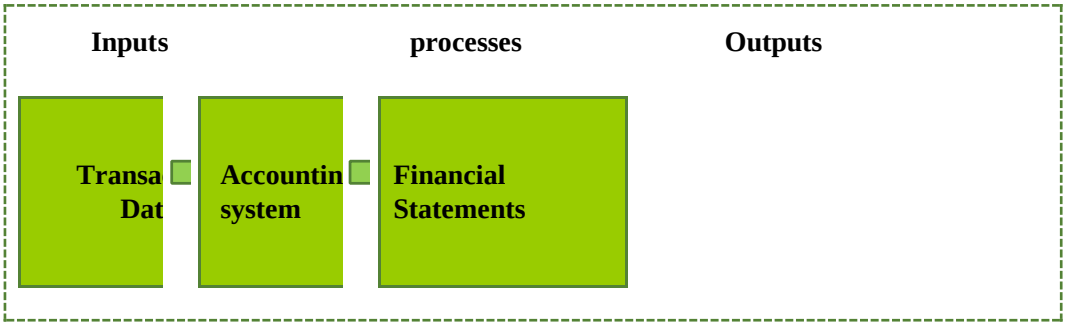

Figure 4: The Structure of an accounting information system

There is no significant growth according to the contributions of modern information technology, accounting information system, decision support. Organizations that want to use such systems will take advantage of others ' experience in the field to buy an expert system. A new approach in the accounting profession is the application of information systems, decision support, and business intelligence to create competitive advantage-based accounting [1]. There are fewer processes that are revealed by logical reasoning, evaluation and structural analysis based on scientific principles when making decisions for accountants. Some are also supposed to use their imagination magic, however, that with such systems can render decision-making processes and handle accountants, but such ability is merely an illusion. But at the same time, this type of attitude is ideal for accounting, and accountants are very often dealing with complex issues. In these cases, the only solution would be the use of techniques such as ANNS for artificial intelligence and decision support [10]. However, business intelligence companies and researchers seem to slowly grow in the use of accounting decision support systems. Another definition of this can be seen as an expert process being the accounting decision support system. The main reasons are device limitations and loss of interest in it, lack of knowledge and hard to implement for the other problem [1].

4. Application of Artificial Neural Networks

Neural networks are growing in structural analysis and hardware implementation and growth, quantity and quality terms in design and neural processing techniques. ANNs are a valuable tool for managing a wide range of fields as a vital component of most data mining systems, changing the way organizations look at the data relationship and the strategy of the company. In many cases, the ANNs techniques were used, some of which included a wide range of medical, accounting, accounting, process control, human resources, financial services, and GIS [1].

Accounting and accounting is one of the best areas of use of this system [11]. Today, a wide variety of ANNs are used in the scientific discovery branch for various applications that are used by various

groups of decision-makers, such as managers and organizations, accountants, financial analysts, tax experts, and the public[17]. This attractive approach is used by experts in various fields of accounting and financial knowledge to find "second guess" about the reliability of their findings and judgments[2, 10]. Figure 5 demonstrates the financial management information system focused on ANNs. In the area of management accounting, some of the uses of such information systems include:

4.1. Stock Returns

Predicting prices or returning stocks is not easy because there are many market factors involved in determining that all of these factors cannot be used in the technical analysis[19, 20].To predict the future price movement, only historical data on prices and volume of trading are used. Predicting the stock market is very difficult because there is no due process and in the stock market, there is no straightforward estimate or forecast of stock prices [1]. The stock market, where investors benefit a lot because it provides a financial opportunity to investors. Until the difference in their business interests by spending their money on the stock of the company. It's a state of uncertainty. This means that stock price behavior characteristics are given as well as non-deterministic forecasts. The capacity of ANNs is very effective in identifying unknown and secret trends in the information that can be used to forecast the stock market. ANN approach is suitable for this type of chaotic system because we don't have to understand the solution. This is the method's major advantage. On the other hand, in traditional techniques, we need to understand algorithms inputs and outputs with full details.

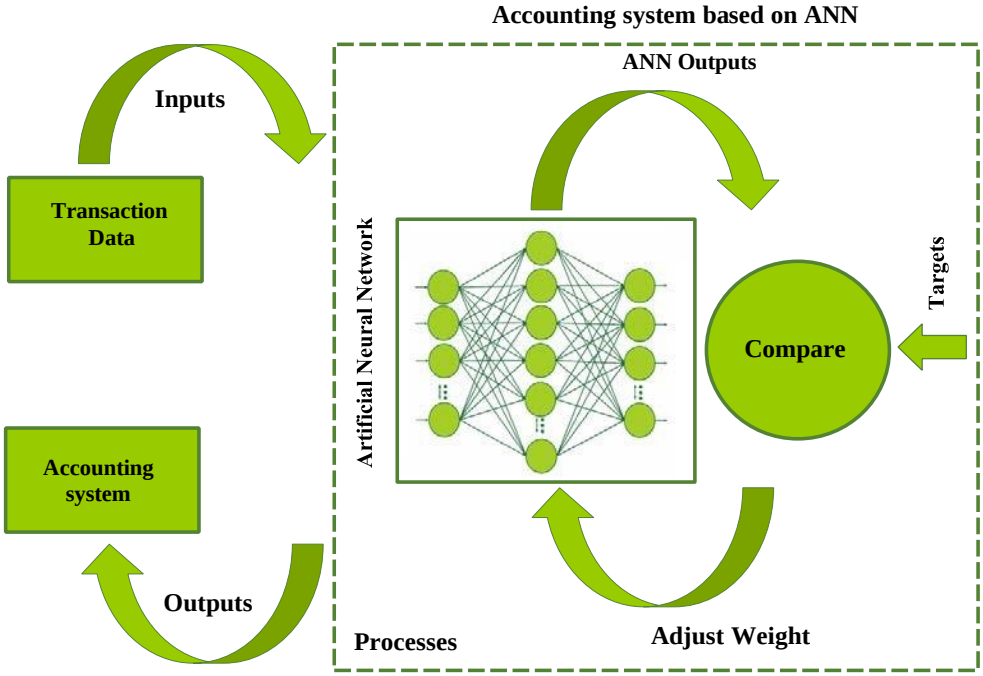

Figure 5: Information system based on ANNs for management accounting.

4.2. A modern approach to the Accounting Information System

An accounting information system is a function and element of the company that provides financial data and information to all users in the decision making the process by financial event processing [1].

The accounting information system can be a conceptual convergence of the accounting and data management systems ' wider themes. Pivotal to data is what is popular in both the accounting and

management information systems. Accounting for more data about patterns, thus protecting knowledge-producing processes [7].

4.3. ANNs to analyze auditing

One of the main reasons why neural networks are used is that auditors withdraw or leave organizations themselves [22]. Therefore, experimental knowledge audit firms that have gained professional experience over the years are lost. This issue is a major loss to a certified public accountant firm because an institution's most important asset is experienced, audit staff. Because information and experiences are stored in an ANN, they will not disappear and due to new experiences, data quality will gradually increase. These networks can be used as a tool to avoid the loss of many professional and experienced experts from institutions. Reducing audit costs and subsequently reducing audit fees are other advantages of using these systems. Many ANNs ' audit requirements include risk assessment, audit plan, technical assistance, fraud detection [7].

CONCLUSION

The applications of artificial neural networks to address management accounting problems information systems are discussed in this paper. One of the biggest issues in management accounting is analyzing complex information that is not responsible for solving conventional analytical methods. The results show that it can be a responsible method to use an artificial neural network method as a soft computing approach. The networks cover all relationships between variables that are discovered and or are not discovered. ANNs can, therefore, be used to help manage to account with powerful smart tools. Mentioned ANNs applications in the article show complicated humanities and accounting problems such as decision-making can be decided by supporting the software. Besides, the growing use in recent years of artificial intelligence and other soft computing approaches shows the effectiveness of these techniques.

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