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Artificial Neural Networks

Advantages and Disadvantages

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 January 2018

I. INTRODUCTION

Artificial neural networks are the modeling of the human brain with the simplest definition and building blocks are neurons. There are about 100 billion neurons in the human brain. Each neuron has a connection point between 1,000 and 100,000. In the human **brain**, information is stored in such a way as to be distributed, and we can extract more than one piece of this information when necessary from our memory in parallel. We are not mistaken when we say that a human brain is made up of thousands of very, very powerful parallel processors.

In multi-layer artificial neural networks, there are also neurons placed in a similar manner to the human brain. Each neuron is connected to other neurons with certain coefficients. During training, information is distributed to these connection points so that the network is learned.

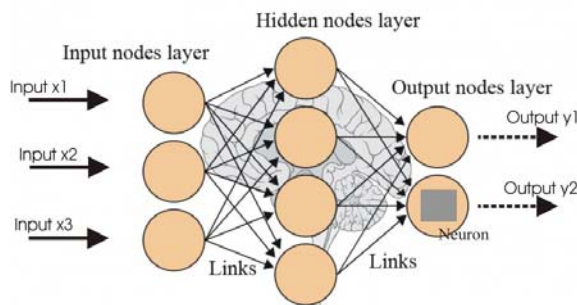


Figure 1: Layers of the Artificial Neural Network

As shown in Figure 1, a neural network consists of three layers: an input layer, an intermediate layer and an output layer. The blue boxes shown here represent the neurons and the arrows represent the connection points. The data set prepared for training at the input layer is shown to the network. The network assigns the weights of the events it learns to the connection points in the intermediate layer. Not every point has to be a value, and some points can be zero. A threshold value is added between the layers so that the zero values at the connection points do not become zero.

II. ADVANTAGES OF ANN

- **Storing information on the entire network:** Information such as in **traditional programming** is stored on the entire network, not on a database. The disappearance of a few pieces of information in one place does not prevent the network from functioning.
- **Ability to work with incomplete knowledge:** After ANN training, the data may produce output even with incomplete information. The loss of performance here depends on the importance of the missing information.
- **Having fault tolerance:** Corruption of one or more cells of ANN does not prevent it from generating output. This feature makes the networks fault tolerant.
- **Having a distributed memory:** In order for ANN to be able to learn, it is necessary to determine the examples and to teach the network according to the desired output by showing these examples to the network. The network's success is directly proportional to the selected instances, and if the event cannot be shown to the network in all its aspects, the network can produce false output
- **Gradual corruption:** A network slows over time and undergoes relative degradation. The network problem does not immediately corrode immediately.
- **Ability to make machine learning:** Artificial neural networks learn events and make decisions by commenting on similar events.
- **Parallel processing capability:** Artificial neural networks have numerical strength that can perform more than one job at the same time.

III. DISADVANTAGES OF ANN

- **Hardware dependence:** Artificial neural networks require processors with parallel processing power, in accordance with their structure. For this reason, the realization of the equipment is dependent.
- **Unexplained behavior of the network:** This is the most important problem of ANN. When ANN produces a probing solution, it does not give a clue as to why and how. This reduces trust in the network.
- **Determination of proper network structure:** There is no specific rule for determining the structure of artificial neural

networks. Appropriate network structure is achieved through experience and trial and error.

► **Difficulty of showing the problem to the network:** ANNs can work with numerical information. Problems have to be translated into numerical values before being introduced to ANN. The display mechanism to be determined here will directly influence the **performance of the network**. This depends on the user's ability.

► **The duration of the network is unknown:** The network is reduced to a certain value of the error on the sample means that the training has been completed. This value does not give us optimum results.

► **Science artificial neural networks** that have stepped into the world in the mid-20th century are rapidly developing. In our present day, we have examined the advantages of artificial neural networks and the problems encountered in the course of their use. It should not be forgotten that the disadvantages of ANN networks, which are a developing science branch, are eliminated one by one and their advantages are increasing day by day. This means that artificial neural networks will become an indispensable part of our lives increasingly important.