

Artificial Neural Networks: An Overview

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Abstract

The artificial neural network (ANN), or simply neural network, is a machine learning method evolved from the idea of simulating the human brain. Artificial Neural Networks are currently under widescale research due to its excellent fault tolerance, fast and highly scalable with parallel processing. It has varied applications which have been briefed in this paper along the brief working of the Artificial Neural Network.

Keywords: Artificial Neural Network, Applications of ANN, Advantages of ANN.

Introduction

Robotics is an inter-disciplinary branch of engineering and science which deals with the design, construction, operation and use of Robots for the development of Human Technology and Lifestyle. Current research is trying to link the Human body and Robots in an intricate link. This link is Artificial Neural Network which is based on the Neural Network of Humans. ANN, for short, would lead to self-learning of the concepts of Human world thus enabling the robot to learn various things automatically. This paper is an overview regarding the Artificial Neural Network and its applications.

Applications of an Artificial Neural Network

1. Speech Recognition

Speech Recognition is an inter-disciplinary sub-field of computer linguistics which that deals with the development of methodologies and technologies to enable the recognition of speech and conversion of that speech into text by a computer.

2. Computer Vision

Computer Vision is an interdisciplinary field which tries to make the computers gain high-level

understanding of digital media. The process of acquiring, processing and analysing the digital media is made easier when utilising ANN which is based on a Human Neural Network.

3. Pattern recognition

A pattern maybe anything ranging from a finger-print to an art installation. Pattern recognition encompasses a huge array of data process issues. The ANN has been utilised in such a way that Pattern Recognition has been using the same principle as a human brain thus increasing the efficiency and decreasing the complexity of the algorithms.

4. Face Alignment

Face recognition is a visual pattern recognition problem. In detail, a face recognition system with the input of an arbitrary image will search in database to output people's identification in the input image.

5. Lung Cancer Detection

Researchers from Al-Azhar University, Gaza, have already developed a lung cancer detection method using Artificial Neural Network wherein symptoms of the cancer were used as input variable along with other information and this set of data was established, trained and validated using a data set. The success rate of this method of detection is 96.67%.

6. Intelligent Data Analysis

ANN have been successfully used to solve highly complex problems within the physical sciences and as of late by scholars in organizational research as digital tools enabling faster processes of data collection and processing. As

practical and flexible modelling tools, ANN have an ability to generalize pattern information to new data, tolerate noisy inputs, and produce reliable and reasonable estimates.

7. Predictions

Rice University engineers have created a deep learning computer system that taught itself to accurately predict extreme weather events, like heat waves, up to five days in advance using minimal information about current weather conditions with up to 85% accuracy. This can lead to proper precautions against untoward weather-related disasters or unbearable weather conditions.

8. Skin Cancer detection

Skin cancer, the most common human malignancy, is primarily diagnosed visually, beginning with an initial clinical screening and followed potentially by dermoscopic analysis, a biopsy and histopathological examination. According to a research study by Stanford University, they utilised a type Artificial Neural Network to effectively identify the skin cancer with a level of competence comparable to dermatologists.

9. Data Mining

Artificial Neural Networks are non-linear statistical data modelling tools. They can be used to model complex relationships between inputs and outputs or to find patterns in data. Using neural networks as a tool, data warehousing firms are harvesting information from datasets in the process known as data mining.

10. Creation of Life

If we are able to explore the depths of the Human mind and are able to map out the Neural Network along with each link's exact use (As the Brain still remains one of the most unexplored organs of a human body) we might be able to artificially create a neural network of a living organism and once given proper shape we might have a chance at creating life.

Advantages of ANN

1. **High Accuracy:**
Neural networks are able to approximate complex non-linear mappings
2. **Noise Tolerance:**
Neural networks are very flexible with respect to incomplete, missing and noisy data.
3. **Independence from prior assumptions:**
Neural networks do not make a priori assumptions about the distribution of the data, or the form of interactions between factors.
4. **Ease of maintenance:**
Neural networks can be updated with fresh data, making them useful for dynamic environments.
5. **Parallel Nature:**
When an element of the neural network fails, it can continue without any problem by their parallel nature.

Conclusion

A tool is meant to be used and humans try to create a multi-purpose tool to satisfy all needs at a simple level. Artificial Neural Network is one such tool that if successfully discovered and implemented would lead to a technological revolution of this era. A myth of how we just utilise 10% of the human brain can then be answered on the basis of the usage of the Artificial Neural Network as it is a representation of the Human brain. The most powerful tool mankind has ever got is the brain and using that we have reached to this position in a span of a million years, and what if we create a brain without the limitations of the Human brain? It would be the era of explosive growth in terms of technology if the tool is put to proper usage.

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