Chapter 14
Artificial Intelligence in Medical Science

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ABSTRACT

The use of intelligent artificial devices has solved many real-world problems and also improved the living style of human beings. The capability of providing unbiased and accurate result has also increased the demand for these devices. For getting faster and well-organized outcomes, scientists and researchers are giving more and more interest in developing such devices. Use of expert systems, concepts from nature-inspired algorithms, neural networks, genetic algorithms, fuzzy logic, internet of things are used extensively to solve various problems in science and engineering. In medical science these techniques are used for data analysis, disease diagnosis, data retrieval, object detection, pattern analysis, data management, monitoring patient health status by physicians, interactions between patients and physicians, keeping record of the medications of the patients, and so on. This chapter performs a detailed analysis on the use of intelligent devices in medical science and about the root concepts on which these devices are designed.

INTRODUCTION

Any device or machine having its own computation ability is considered as intelligent. With the advancement of technology, many intelligent devices are developed with less expense having high computational and analytical ability. These characteristics of intelligent devices have increased the demand of these devices in engineering, medical science, space research, geological survey, automobiles, traffic control and many more. The intelligent devices have the capability to learn like a human being and solve many real-world problems in an intelligent manner. In many cases, they are replacing human beings and giving more accurate and faster results than humans. Such type of systems have the ability of learning from past experience, communicating with other devices to gather and share information. The storage capacity

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and processing speed of these devices are much higher than the human brain which has increased the popularity of these devices. These devices are used to solve many sensitive and sophisticated problems in medical field. The systems also have the capability to solve many problems using past information and data stored in the form of a knowledge base.

Intelligent systems consist of devices which are intelligent in nature and have the capability to work on software designed using the concepts from Artificial Intelligence as well as having network connectivity. Figure 1 shows the characteristics of an intelligent system.

Intelligent devices use their analytical ability on the defined set of information in the form of rules to obtain a conclusion. Humans learn from experience, machines derive new rules from existing rules using inference mechanism. Machine also have the analytical and reasoning ability like human beings. The computing capability of machine is more as compared to humans. Machine also has the ability to process different languages so that they can interact with people and can store and analyse the information stored in different languages.

Components of Artificial Intelligence

Artificial intelligence involves different sub-areas like neural network, fuzzy logic, genetic algorithm, evolutionary algorithms, natural language processing, expert systems which play a vital role in the construction of an intelligent machine. Neural networks are popularly used in object recognition, face recognition, handwritten character recognition, information retrieval, classification of information etc. Now-a-days development in neural network called deep learning techniques are used in the learning of intelligent devices. Fuzzy logic concept is used in recognizing patterns, vehicle control equipment, different electronic equipment like washing machines, air conditioners, vacuum cleaners etc. Expert systems help in medical diagnosis and monitoring, financial advice and suggestions etc. Natural Language Processing techniques are used for speech and voice recognition, analysis and interpretation. Internet of Things is a new technique which uses networking and sensor technologies to provide better healthcare facilities to the patients.

Figure 1. Characteristics of intelligent systems