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RESEARCH ARTICLE

FUTURE SCOPE OF MODERN MACHINE LEARNING AND DATA ANALYSIS USING ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM

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ABSTRACT

Artificial intelligence is a branch of computer science which deals with the concept of intelligence. Intelligence is a kind of implementation of logic in an effective manner to solve the complex task within fewer steps and less burden. The AI is mainly appears in the form of Expert System, Artificial Neural Network, fuzzy logic which are mainly used to solve the complex problems in a effective manner. The AI technique is mainly used to make the system intelligent as like as human so that it can have a decision capability like a human thinking. The machine should able to compute the complex problems in a specified manner within the stipulated time and fixed number of steps.

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INTRODUCTION

The basic principal behind the implementation of Artificial Intelligence in the modern era is the "conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." (McCarthy, Minsky, Rochester, & Shannon, 1955, p. 1) and moved swiftly from this vision to grand promises for general human-level AI within a few decades. This vision of general AI has now become merely a long-term guiding idea for most current AI research, which focuses on specific scientific and engineering problems and maintains a distance to the cognitive sciences. A small minority believes the moment has come to pursue general AI directly as a technical aim with the traditional methods – these typically use the label 'artificial general intelligence' (AGI) (see Adams *et al*., 2012). These AGI is mostly applied in the field of computational cognitive problems where the complexities are less. Here we are going to discuss the major scope of AI in the modern engineering.

DEEP LEARNING:

It is a type of intelligence which is mainly applied in the field of machine, so that it can be made so intelligent so that it can able to compute the task in a effective manner with less time.

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A deep learning mechanism basically allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction [2]. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. The machine learning has a great contribution to the modern society, in which we are living. We are fully dependent on machine for our day to day life objectives.

Conventional Learning Approach

It is a traditional learning approach of machine in which it uses the normal approach of data analysis. In this case the techniques were limited in their ability to process natural data in their raw form. For decades, constructing a pattern-recognition or machine-learning system required careful engineering and considerable domain expertise to design a feature extractor that transformed the raw data [2, 3] (such as the pixel values of an image) into a suitable internal representation or feature vector from which the learning subsystem, often a classifier, could detect or classify patterns in the input.

Representation Learning

In this approach the learning is implemented in terms of some predefined methods for a machine. In this approach the machine analyze the raw data by itself and if possible then it can able to classify the data by itself [4].

Unlike conventional approach, it doesn't require any further simplification. The deep learning approach is mainly a type of representation learning approach, which contains multiple levels of representation, obtained by composing simple but non-linear modules that each transform the representation at one level (starting with the raw input) into a representation at a higher, slightly more abstract level (Hammond *et al*., 1999) [5]. With the composition of enough such transformations, very complex functions can be learned. For classification tasks, higher layers of representation amplify aspects of the input that are important for discrimination and suppress irrelevant variations.

Data Analysis and Simplification

It is the most important part of the learning process in which the raw data has to be taken into consideration first. Whenever a raw data is obtained from any resource then the machine first try to analyze the data. For example if we are going to purchase a product form the market, we are first try to find the variety among the product, then we are looking for the quality in terms of its price, size etc. so like a human analysis the machine also try to analyze the data. This concept is basically implemented in terms of expert system. A expert system is mainly used to justify the decision statement and helps the machine to take a right decision in a problem evaluation [3, 4]. The data analysis concept is originated from the concept of human brain which is technically a term of Artificial Neural Network (an application of AI). In this ANN, the neuron can be identified as biological fact. The first step toward artificial neural networks came in 1943 when Warren McCulloch, a neurophysiologist, and a young mathematician, Walter Pitts, wrote a paper on how neurons might work. (Kahneman, and Frederick, 2002) TheyModeled a simple neural network with electrical Circuits which is capable to solve some complex instruction. Regarding Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A neural network in modern Engineering plays a vital role in every aspect, which may includes the areas, such as:

- **Adaptive Learning**: An Adaptive learning is a process of an ability to learn how to do tasks based on the data given for training or initial experience (Kahneman, and Frederick, 2002). It is the concise view of raw complex instruction.
- **Self-Organization**: An ANN can create its own organization or representation of the information it receives during learning time. It is so smart enough that it can read the data by itself and took place the action accordingly[6].
- **Real Time Operation**: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
- **Fault Tolerance via Redundant Information Coding:** It is the most important phase of any system, that how it can handle the occurrence of faults which may arise during the processing. Partial destruction of a network leads to the corresponding degradation of performance (Kahneman, and Frederick, 2002). However, some network capabilities may be retained even with major network damage.

In the data analysis the major constrain is its computability. So now we are going to discuss the computability in the expert system.

Expert Decision Computation

To compute the complex task, we need to take the help of expert system. As we know that, a expert system can be defined in terms of AI as, "An expert system is a computer system that emulates the decision-making ability of a human expert".

The diagram is as showed below.

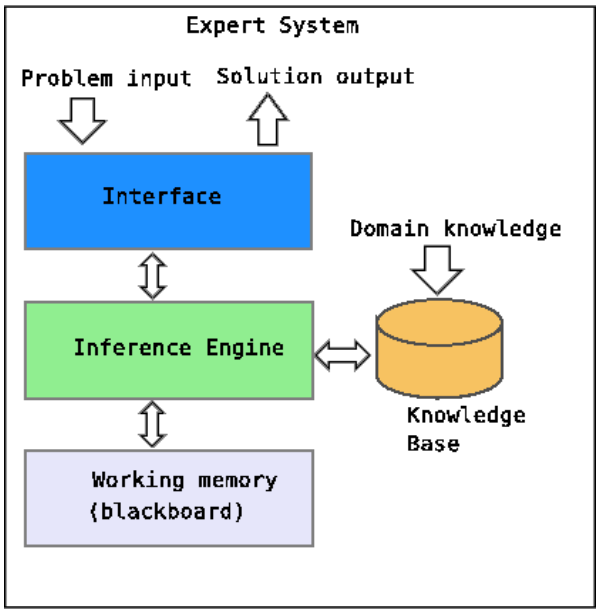

Figure 1. (Expert Decision computation)

In the above diagram, it can easily analyze that, before the data is to be computed, it is first edited in terms of their internal behavior [6]. If the data is not according to the behavior, then it should be categorized first. Then the data is sending to run time engine which consist of certain interface which help the data to get processed. If in due time any error is gets raised then, it will notify to the user.

Component of Expert Decision Computation

As we know that, in the expert system, there are several phases are present, hence these phases are also known as component of expert system. But in general, there are three major components are,

- Knowledge Base
- Interface Engine
- User Interface

The knowledge Base is domain specific. It contains high-quality knowledge. Knowledge is required to exhibit intelligence. The success of any ES majorly depends upon the collection of highly accurate and precise knowledge. Similarly if we are trying to get the Interface Engine, then it is a set of rules and procedures by using which we parse the sentence. And the user interface is purely user defined [6], Keeney, 1992). It is the layer through which, we can interact with the application. The schematic diagram is as showed below.

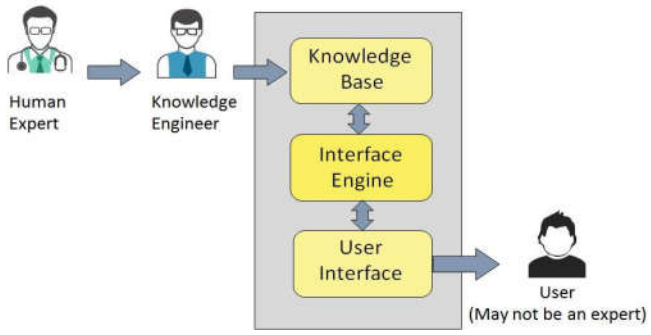

Figure 2. (Component of expert computation)

In this system the raw information is processed through the inference engine and send to the user as a modified updated information.

Logic manipulation and interpretation

Logic interpretation is theanother important part of data analysis. In raw data the logic is not present in an proper sense. Hence to manage the data logic we undergo through the mathematical operation. The mathematical logic in machine can be implemented in terms of fuzzy logic, which is an important application of AI (Keeney, 1992). Here the intelligence can be implemented in mathematical logic evaluation. Fuzzy Logic (FL) is a method of reasoning that resembles human reasoning (Kowalski, 1975). The approach of FL imitates the way of decision making in humans that involves all intermediate possibilities between digital values YES and NO. The conventional logic block that a computer can understand takes precise input and produces a definite output as TRUE or FALSE, which is equivalent to human's YES or NO. The inventor of fuzzy logic, Lotfi Zadeh (Keeney, 1992; Kowalski, 1975), observed that unlike computers, the human decision making includes a range of possibilities between YES and NO [7, 8]. The logic can be implemented in the machine in such a way, such as

- It can be implemented in systems with various sizes and capabilities ranging from small micro-controllers to large, networked, workstation-based control systems (Kowalski, 1979; Kowalski, 2011).
- It can be implemented in hardware, software, or a combination of both.

Hence by doing this we get the following benefits such as

- It can control machines and consumer products.
- It may not give accurate reasoning, but acceptable reasoning.
- Fuzzy logic helps to deal with the uncertainty in engineering.

Conclusion

Uncertainty about the state of the world is only one of the complications contributing to the problem of deciding what to do? To reduce this complexity, classical decision theory makes simplifying assumptions. The most restrictive of these is the assumption that all of the alternatives to be decided between are given in advance. For example, if you are looking for a new job, it would assume that all of the job options are given, and it would focus on the problem of deciding which of the given options is most likely to result in the best outcome. But as (Keeney, 1992; Hammond *et al*., 1999; Carlson *et al*., 2008) and other decision analysts point out, this assumption is not only unrealistic as a descriptive model of human decision making, but it is unhelpful as a normative (or prescriptive) model: To make a good decision between alternatives, it is necessary first to establish the goals (or problem) that motivate the alternatives. As a future prospect, the AI is more useful for Human as well as machine, because due to its more scalability nature it can applied in many forms of the machine logic. No doubt, the AI have many application by utilizing which we can enhance our day to day activity. Now a day we are fully dependent on machine for our betterment of work and its output. It has a wide future scope and thus it is assumed as a key to achieve a enhance technology which is always used in the wellbeing for the human society. It is now not only limited to a particular field but also it has a wide range of application in other field. It plays a vital role in modern engineering also.

ABOUT THE AUTHOR

Prof. Amar Nath Singh, is a Reader in the department of Computer Science and Engineering, GEC, Bhubaneswar, Odisha. He received his master degree in the year of 2007 form BPUT, Rourkela, Odisha, India. He is perusing his PhD in the field of Mines area. His research are includes Underground Mines, Artificial Intelligence, Wireless Sensor Network and Expert system, Fuzzy Logic Network, HCL, Algorithm, Web logic, etc.

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