

Connectionist Model in Artificial Intelligence

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Abstract

Computers have been used in every sphere of life and their role is increasing day by day, as newer and newer technologies are being developed. Artificial intelligence is at the heart of many exciting innovations. Representation forms the vital part of any AI application. If the representation is correct the half of the work is done. The connectionist approach is one of the ways to represent and identify any object in AI field. This approach has been successfully used and implemented in many of the real-life areas. The connectionist approach is based on the linking and state of any object at any time. An object has to mean with respect to its state and its links at a particular instant. It has many advantages for representation in AI field.

Keyword: Artificial Intelligent, connectionist approach, symbolic learning, neural network.

INTRODUCTION

The branch of Artificial Intelligence involves the need for computer science which can interact with the machines to solve the problems face by the humans in their daily basic needs. This concept took the applications based on the interaction of humans in intelligence and applies basic derivations on systems so as to resolve it. It has connectivity with other sources such as mathematics, Biology etc. Basically, computers are generated to perform simple tasks very easily and comfortably. There are many complex problems that are difficult to tackle which cannot be resolved by the humans or the computers. AI is another method to improve behavior in tackling those difficult tasks. Basically, humans are interested I solving the problems. AI helps humans to understand the problems by recreating it so that it enables us to extend our capabilities. There are many technologies and applications that are derived by the AI like Military for controls and target identity, Entertainment, video games etc. The main purpose of research in AI is to create certain kind of technologies that allow our personal systems & machines to function in another easier way.

In this, we have basically involved the principle of AI in the connectionist model. The connectionist systems are the largest network with the simple processor and they are massively interconnected. Various models represent the knowledge in AI. These systems work in parallel and in this system, each processor has a numerical activation value which connects to the other processor of different strength. In this paper, we basically discuss different connectionist models which are used to represent the knowledge in AI. These models mainly consist of various symbolic approaches in which symbols are defined for different works.

The first paradigms discussed in this research paper is traditional symbolic paradigms which were invented by NEWELL AND SIMON IN 1976 which creates some kind of inceptions from symbol manipulation and second was symbolic AI which basically involves the set of properties which are called as symbols that can occur as component of another type of entities called expressions. They are basically considered as the large network of simple processors, these processors contain a numerical activation value which can communicate with other systems to which it is connected. Connections between both the processors determine how input is transferred to the output. In systems, the data is stored in numerical strengths rather than symbolic structures between the processors.

The main question arise with the special intelligence is that the power of computational is sufficient for the implementation of truly intelligent systems? Or connectionist systems and the brain are connected in which manner?. And the answers are discussed basically in the matter stated below. One more thing mentioned is the IR systems which provide population of users with the huge amount of collection of information which is stored in many functions like a collection of similar data, applications etc.. Its main function is to obtain from the number of users. There are many types of systems which are significant with updated documents which are now used by the machines in reading mode.

Information retrieval is basically used to retrieve data from various type of databases through systems. The question arises that how this type of IR (Information Retrieval) works to

retrieve information and how they are extracted, that is basically mentioned in this paper.

This part must involve the work of neural sciences and machine languages mainly numerical digits which are considered by the system. It mainly involves certain graphical things like images, sound, animations etc. The purpose of involvement of the computer systems to find the similar type of data is given by VANNEVAR BUSH IN 1945. It would appear that Bush was inspired by some kind of statistical machine filled by EMANUEL GOLDBERG in 1920's and 30's. Their system is mainly be categorized by the use of some models, which have been studied earlier.

The question arises that why we need connectionist models? It would be understood with the help of paradigms. Paradigms are basically the structure or the pattern that are helpful in the explanation of Connectionist Models. These connectionist symbols approach are made clear by using two competing paradigms which are described in the paper. They depend upon uniform processing of elements due to its nature which is used mainly in robust processing.

LITERATURE REVIEW

Connectionist models are certain methods in different fields of artificial intelligence, imaginary science, the study of nervous system etc.[19]

These models are shown by some paradigms. Paradigms are the structure or a pattern about something. Connectionist and their symbols can be explained using two competing paradigms.

In the stream of AI symbolic models are manufactured by symbolic paradigms, these models were based on the representation that contains symbols organized in another way. The need for connectionist paradigms emerged from disappointment with symbol manipulation methods and their not functioning well in robust and flexible processing.

The connectionist paradigms are based on a uniform processing of elements which are interconnected by external links and such model's parallel nature makes them good at flexible and robust processing.

Symbolic artificial intelligence, set of entities, called symbols, are consisted in a physical symbol system. symbols are physical patterns that can appear as components of another type of entity called an expression. Thus the symbol structures are related to each other in some physical way.

It was further claimed that symbols can be designated randomly: "a symbol may be used to designate any expression whatsoever"; "it is not prescribed a priority what expressions it can designate. "There exists a process for creating any expression and for modifying any expression in arbitrary ways." Based on that, it was concluded: "a physical symbol system has the necessary and sufficient means for general intelligent action", that is the physical symbol system hypothesis.

INFORMATION RETRIEVAL

Information retrieval is basically retrieving of related information from databases, through these systems large collection of stored information can be accessed and delivered to the user.

Earlier data used to be comprised of text documents but now new data types are increasingly involving like pictures, audio, video etc.

The computers were used to get related pieces of information. There was a machine called Univac –where the pattern was coded in letters and figures by a magnetic spot on a steel tape. In 1922, the aim of us department of defense was to look out the community of information retrieval through supplying of required infrastructure that was needed for evaluation of text retrieval. These systems were needed more and more with the growing availability of documents in machine-readable form and the parallel emergence of digital libraries.

Subject experts and trained indexers manually used to do document indexing, document classification and analysis of content but human involvement in the progress and maintenance were expensive, time taking and error-prone. The processing power and machine readability of modern computers have enabled texts to be fully indexed.

Vector model is useful in categorizing documents effectively and distinguishing relevant documents during query processing. With this model, text documents or any other data type are represented as vectors of identifiers, for example, index terms. Vector model has various advantages:-

It is a simple model that is based on linear algebra. It terms weights. It allows computing of similarity between queries and documents.

In AI, neural network models are used to retrieve relevant documents taking advantage of the connectionist model, in this architecture, user's query and collection documents are given a representation similar to that of the vector model building a network.

These networks are comparatively easy to use and can calculate any function regardless of its linearity, it has its own cons too, requires a load of training and cases, increasing accuracy by a fewer percent can bump up the scale by few magnitudes.

Information retrieving process is a little complex with a lot a data being provided hence information filtering system works to remove inordinate or unwanted information using automatic or digital methods to present to a user. To manage information overload is the aim. For example, editors provide relevant information for their clients, books, magazines etc. a number of techniques are there to get information filtered, few of them give error rates lower than 15% in many experiments, for example, decision trees, support vector machines, neural networks etc. Current problem is to find a way for these systems to understand the individual needs of information of its users

APPLICATIONS

The main purpose of this model is to represent the pattern in symbolic form. In some connectionist model representation are distributed into a few number of processing elements but sometimes some connectionist model is converted into the large network which is not easy to find. To resolve some errors applications are prepared so we can easily identify the connectionist model.

A. Symbolic AI

The Symbolic artificial intelligence can be defined by some methods in connectionist model research which depends on extreme level symbolic. By the symbolic AI we can find an idea GOF AI ("Good Old Fashioned Artificial Intelligence) i.e. idea for devoted to the research of the fundamental nature of knowledge, reality and existence. In robotics, they are known as ("Good Old Fashioned Robotics"). Another application of symbolic artificial intelligence is robotics to represents the robots in symbols. They can be helpful in the study of the nervous system.

Many different technologies of symbolic artificial intelligence-

1. Applications
2. Projects
3. Programming Language

Artificial intelligence also defined as the weak AI to perform the specific task in medical diagnosis, robot control, electronic trading. It also consumes advance features in industries, education, transportation etc.

1) Education

The symbolic AI helps in the education system by teaching the students about how to control the robotics. They made their self-robots to teach the subjects like biology and computer science. The artificial intelligence also helps us in electrical systems like aircraft. By the use of AI, the students are allowed to take the classes online which can be helpful in the learning process.

2) Finance

The finance instruction can be helpful in neuroscience to find out the claims or detect the charges. Banks used AI system to organize operation, maintain book-keeping, investment and arranged properties. Apps like Calisto and money stream are used artificial intelligence in financial services.

3) Hospitals and Medicine

In this neuroscience can help in making a decision of hospitals system which is used to give the idea for developing the concept of EMR software. It is also used in drug creation. Also, help in design treatment plans.

4) Online and phone client services-

AI is helpful in online web services. It can also use to reduce the maintenance cost of training. Currently, different services are used in artificial intelligence to manage the future client services. This stage can find angry clients through their services and respond.

Projects-

a. Games

i) Alpha Go a computer that plays the Chinese game go created by Google.

ii) Chinook a computer program that plays English Draughts

iii) Stockfish AI, an open source chess engine.

B. Representation and search

Representation and search play a vital role in the symbolic AI. In this application, we have given the concept of space first by two methods i.e. the DFS and BFS. To reach from the present state to the destination we need a space. In DFS the present form examine an alternative path and on the spot, only one operator can be applied which convert into another form and then from that form similar method is continued until it reaches its final form and on destination state, no other operator can be applied. In BFS there is an alternative path shown by the system only one time by applying each of the applicable operators. The concept of spacing has been proposed to solve the human machine and vision, problem-solving, natural language. Another is representation it describes the concept of knowledge about the searching of an algorithm for an interface which means the direct search.

C. Symbolic Learning

In AI the learning is a big problem in cognitive science. It is very difficult representation in symbolic artificial intelligence, speaking is difficult comparatively learning for symbolic AI. The major work for symbolic learning is batch learning. Batch learning is a method in which information is available in a proper manner to update the data for future use.

The main goal of this application is to provide the knowledge about learning and reasoning. This application represents the knowledge in the symbolic graph. There are various research areas in which symbolic learning is used

- 1) Ecology & environment
- 2) Graphics and multimedia
- 3) Security and privacy
- 4) Medical and health
- 5) Social sciences
- 6) Human language technologies
- 7) Programming language and software engineering

Products-

There are many items and electronic components discover by research area which is available as download applications,

database, APIs and many services. There are many products which are made like

1) *Skype Translator*

It helps to connect with your family, friends who live at a long distance. It translates your audio messages and video messages in different languages.

2) *SQL server*

This is advanced technology that helps to keep your data safer.

3) *Microsoft Pix*

A smart camera app that automatically helps to make better photos without extra effort. It has some special characteristics behind the lens.

There are some programs and events which were held:-

Table I. Programs related to symbolic learnings

PROGRAM NAME	PROGRAM TYPE	REGION
Desertion Grant Program	Scholarship and fellowship	North America
How to write a big research paper	Academic Resources	Worldwide
How to give a great research talk	Academic resources	Worldwide
Outstanding Collaborator Award	Competition and awards	Worldwide
AI engage	Academic resources	Worldwide
Open source challenge	Competition and awards	Worldwide
Academic knowledge service	Academic resources	Worldwide

Table II. Events related to symbolic learning

EVENT	EVENT NAME	EVENT TYPE	DATE
Theory seminar	Hosted by Microsoft	MSR Redmond, building 99	Jan 27,2017
MSD 1'17 Microsoft	Conference	Boston, MA, USA,	March 27,2017
Microsoft Research Asia Academic Day 2017	Hosted by Microsoft	Vilan, Taiwan	March 27,2017

D. Hybrid Models

Hybrid models are more preferable models for connectionist models to make it more robust, more powerful and more adaptable systems. They are slowly but they can grow at a high rate. In the making of hybrid models, there are some

architecture, learning issues. The first hybrid model involves collections of process and representation. Multiple different mechanisms can connect in a different way. Second connectionist models which are related to learning abilities and hybridization make it hard to learning. In hybrid systems, the learning is immense to show symbolic learning and also have some advantage in case of learning.

1) *Architecture*

We can divide the hybrid models into two categories:-

Single module architecture

In single module architecture we can represent the information in symbolic form so there is no more of hybrid models or a local model in which each and every node of the model explain the concept of each node and also can be represented with the huge amount of generals, the nodes are which are connected to each other introduce each concept of each node.

Multimode module architecture

In multimode architecture further, we partition it into two homogeneous and heterogeneous models. The homogenous mode is same as the single module model but there is a difference that they have the same copies of a similar type of data, which is used to discover the data for processing the similar group of input.

For example-suppose, we have many clients with the same data and same procedure but with a different state of mind to deal with different conditions.

In heterogeneous models, we can separate the process in different ways like representation. In multimode many possible combinations of different types of connectionist model are present.

For example-A model can be a group of local models and distributed models for reasoning and decision making or it can be a combination of symbolic models and connectionist models which is mainly for practical application.

E. Neural Networks

The study of the neural system has often used the technique in the connectionist model in AI. In comparison with other different learning technique, this one is a better technique which is relatively insensible to noise. It is algorithmically cheap, it is easy to use. There is two disadvantage of this network firstly its effects depend on the first selection of module of the system. Secondly, the inferred hypothesis are not easily present the one method is to use to understand the networks. The way to use a neuroscience is a logical programming which a is powerful way of expression and easily understands by the human. By the combination of neuroscience and logical programming is an easy way of the specification of neural networks architecture. The main purpose of artificial neuroscience is their capacity to learn a solution to a general problem which is related to noise if some input or training are corrupted artificial neuroscience produce good results.

There are two different artificial neural networks system:-

A. Feedforward Artificial neural networks

The artificial neural network contains the information which goes in one direction it means if we send a unit to the other unit then they don't have any information so there are no loops which go back to the network known as feedback loops. They are very useful for structure-property/design/different strategy and they have one input and output.

1) Feedback Artificial neural networks

In feedback artificial neuroscience the feedback loops are allowed so that the outputs are not fixed if we send a unit to the other unit and we have not any information. So feedback loops are there to send it back for gaining the information. They have used in content addressable memory.

B. Machine Learning in Artificial neural networks

As we know artificial neurosciences have a capacity of research the new things and they are needed to be trained. So there are different learning methods.

1) Supervised learning

In supervised learning, ANN has not involved itself but the scholar is involved.

For example, in a class, the teacher gives the example of the data which they already know. It is used in pattern recognizing.

2) Unsupervised learning

It is useful when we have no information on the datasets whose answers are already mentioned.

For example- finding a non-visible data.

3) Reinforcement learning

It is the concept of the review of data. The artificial neural network makes a result by understanding its surrounding. If we found bad result then we did the adjustment of their weights to make it better for future.

Many uses of neural networks

They can do many operations which is good for humans but not for the machine.

- 1) Aerospace- Aircraft fault decision, for autopilot aircrafts.
- 2) Electricals- IC chip layout, voice synthesis, chip failure, Code sequence prediction.
- 3) Marketing- document readers, loan adviser, corporate financial analysis.
- 4) Speech- speech recognition, speech classification.
- 5) Telecommunication- real-time spoken language translation
- 6) Software- pattern recognition in facial recognition

CONCLUSION

From this research paper, we concluded that connectionist models are very beneficial in artificial intelligence like in neural network in which large system is basically divided into the parallel distribution system. Connectionist models also help us in symbolic learning in which robots are controlled in symbolic form so in future it will be helpful to understand how to control the robot. Connectionist model in artificial intelligence provides the security so nobody knows about the connection between the systems.

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