

A Conceptual Framework on Artificial Intelligence and Machine Learning and Its Implications on Various Fields

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Abstract

Continuous adaptation and frugal innovation are extremely important components of the manufacturing industry. These factors are important as it leads to sustainable manufacturing using different modern technologies. To promote sustainable development Industry has realised that smart production is equally important but it requires transnational perspective and various technological adaptation to a large extent. Industries are involved in intensive research efforts in the area of artificial intelligence and different artificial intelligence enabled techniques such as machine learning etc. to establish its presence in different parts of the world with major focus towards sustainable manufacturing at core. The research paper is basically focusing on the application of artificial intelligence and machine learning in the industry. The research paper is trying to review various research papers from reputed journals to understand the depth of study already done in the field of artificial intelligence and machine learning. With the advent of industry 4.0, artificial Intelligence and machine learning are considered as the driving variables of smart manufacturing revolution in the industry. Smart manufacturing is tried by different organisation from India but they did not able to implement it at fullest possible way and one of the reason being the lack of application in the field of artificial intelligence or machine learning. Maximum number of cases as far as the implementation of artificial intelligence is concerned in industry can be found in US and European market.

Key words - Artificial intelligence, Industry 4.0, Machine learning

Objectives

Objectives of the research paper are mentioned below: -

- To understand the concept of artificial intelligence and its various applications with reference to industry 4.0
- To study the implementation challenge of artificial intelligence and machine learning in different contexts.
- To understand the implications of artificial intelligence across industries.

Introduction

When we try to find out the application of smart production systems in any industry contexts it requires different types of innovative solutions to enormous problems to ultimately increase the quality and sustainability of manufacturing activities and at the same time reducing costs to a large extent. In the context of artificial intelligence driven technologies it can be said that technologies like internet of things, advanced embedded systems, cognitive systems, big data, cloud computing, augmented reality etc. are capable enough to create a new industry parameter. Broadly artificial intelligence is classified into different categories and those categories are programming, data mining, expert systems, genetic algorithms, machine learning, neural networks, theorem proving, theory of computation etc. In the 21st century artificial intelligence is considered as one of the most important areas of research work in almost all fields namely engineering, medicine, business, finance, accounting, economics, stock market etc. The dimension of artificial intelligence has grown humongous since the intelligence of machine with machine learning capabilities has created a significant impact on different business areas across industries (Maes, 1990). The application of artificial intelligence influences the largest trends in various business areas to create sustainability at global platform. It could be very useful to solve critical issues of problem for sustainable manufacturing and various related areas like logistics, waste management etc. In this context in case of smart production, it is observed that in industry there is a specific trend which is going on to incorporate artificial intelligence in the area of green manufacturing processes as different countries have already employed strict environmental policies and they are promoting green manufacturing. By incorporating artificial intelligence effectively industry

had already realised that they can achieve a revolutionary growth with reference to creating sustainability for long run. Artificial intelligence will be the main area for discussion of fourth industrial revolution. The growth of machine learning as one of the branches of artificial intelligence is also started doing well in industry. The growth of machine learning is also quite fast and its application has spread to different industrial fields like learning machines, those are recently used in areas like medical science, pharmacology, agriculture, business etc.

Literature review

The researcher did not attempt to find characterization of the artificial intelligence or machine learning but instead of that the researcher try to find out the application of artificial intelligence and its usage in case of non comprehensive collection of projects and project related paradigms. Artificial intelligence broadly not related to any kind of statistical tools like linear regression and its application but some of the empirical observations had shown clearly the complexity of integrated circuits with reference to minimum component and operation cost (Sperber & Wilson, 1986). At the same time the idea of machines could not just related to a process but also to find out how to solve equations that has seen as the first step in creating a digital system which code emulate the processes of brain and the behaviour of any living things. Before the commencement of digital technology there are many researchers asking themselves a question which is recently connected with the concept of artificial intelligence and to how the brain works and the principle component related to the living brains (Williams, 1995). There was the evidence of analogue brain by using which actual programming used to be performed using a computer long back and the early researchers believe that with the help of analogue circuits they able to mimic the electrical behaviour of the brain identically and with the help of that fundamentally they able to replicate actions and intelligence of living things. Machines actually relied on level rearranged circuits using resistors capacitors and basics of components doors automatically behave in a certain way on the basis of the sensor Input and charge levels. One of the biggest issues was trying to address by the researcher is that how can somebody establish the fact that a machine is intelligent. With the larger issue of defining the field is subject to question but one of the most famous attempts to find answer to the intelligence question was there in Turing test. With the help of the artificial intelligence history and its scope of approaches and fails it can be observed that everything emerged from abstract theory and blue sky research

with the help of day to day applications and with the help of machine intelligence factor is trying to imbibe in the process.

Briefly it can be said that artificial intelligence is basically concerned with developing computer system knowledge and effectively and at the same time efficiently use the knowledge to help solve various business related issues or problems and can accomplish various tasks. The brief statement is enough to make everybody understand that it is commonly accepted as the education of human through the presence of computer and without that problem solving could be a major issue. Human knowledge that has been converted into a format which is absolutely suitable for the application of artificial intelligence system and at the same time the knowledge generated by an artificial intelligence system perhaps by collecting data and information and after that analysing data or information and knowledge at its disposal which will help organisation to take many important business related decisions (Poole, 1997).

There are recent research works are going on in the area of explainable artificial intelligence as researchers and practitioners are trying to provide more transparency to the algorithms those are formulated. Most of the research works are focusing on explaining the decision making for action plan to a human observer and it should not create any controversy to say that looking at how human explain to each other and at the same time it should able to serve as a useful starting point for explanation in the field of artificial intelligence and machine learning. It is quite fair to say that most of the work in the area of explainable artificial intelligence uses only the researchers at process and perspective of what will create a good explanation to explain the concept of artificial intelligence (Kowalski et.al., 1979). There are significant amount of research bodies are available in the field of philosophy, psychology and cognitive science areas on the basis of which any researcher would able to understand the process of defining generating, selecting, evaluating and taking final decision by people. All these points argue that people employ certain level of cognitive biases and expectations at social level during the explanation process of any phenomenon which happens as per the perspective of the human being and due to that there could be a possibility of biasness in the entire process. The research work argues that the area of explainable artificial intelligence can build on the basis of existing body of knowledge based on cognitive theory, artificial intelligence, machine learning processes, psychology, social psychology etc.

The field of artificial intelligence and the research work related to that has built upon various tools and techniques of multiple disciplines which include formal logic, probability theory, decision theory, management science, linguistics, cognitive theory and philosophy. However the implication of all these disciplines in artificial intelligence has implemented in different ways to develop a sustainable model of technological advancements. From last few years the field of artificial intelligence has developed with lot of enhancements and extensions in various fields. Among various fields most relevant one is the computational logic which is embedded in an agent cycle that combines and improves upon different types of traditional logic and classical decision theory implemented to nurture the field of artificial intelligence and machine learning in the best possible way (Kowalski, 1975). It does help in improving the human intelligence in different ways. Computational logic is nothing but a kind of logic which is available in many forms and researcher is trying to extract those forms. Abductive logical programming is one of the forms of computational logic which is used as an agent model which helps in various descriptive and normative thinking and with the help of that decision maker can take vital business decisions. As a descriptive model it includes various production systems as one of the basic case and as a normative model it fundamentally includes classical logic theory which is also compatible with the classical decision theory which is quite widely used in decision science and data science. These descriptive and normative properties of objective logical programming helps to make it a dual process theory which helps to build two different types of thinking process like intuitive and deliberative thinking. Like most of the theories dual process theory also help to build different forms in the field of decision science. Intuitive thinking helps to propose answers quickly to judge any problems those are erased during any business process and deliberative thinking helps to monitor the phenomenon and to go through the quality of any proposal which could be endorsing correcting or overriding (Keeney, 1992).

Abductive logic programming agent generally functions on one plan or on various other alternative plans at one point of time depending on the search strategy has been implemented. First search works on one plan at one point of time but other search related strategies are desirable quite often. The abductive logic programming agent module can be implemented to develop or modify various artificial agents but it can be very helpful to implement various descriptive model with reference to human thinking and decision making process. The argument for the better implementation of decision theory on abductive logic programming agent model depending on the claim that its clausal logic could be implemented to modify the

language of thoughts at different points of time. In the philosophy of language there are different schools of thoughts with reference to the relationship between the language and thought and those various thoughts only three main schools of thought are regarded as one of the best possible arguments. Those are: -

1. The language of thought is a private and language like representation which is absolutely independent of public and natural languages.
2. The language of thought is a form of public language and it is a form of natural language what we generally speak which influences the process of thinking which comes from our mind.
3. The thought process of human being does not have any language like structure as such but with the help of artificial processes we can try to find some structure in it.

The abducted logical programming agent module generally belongs to the first school of thought and according to that it tries to hold some language like representation which is absolutely independent of people or any other natural languages and at the same time it opposes the second school of thought and it is observed that there are a lot of differences as per as agent model is concerned (Kahneman & Frederick, 2002). But interestingly the model is compatible with the third school of thought and it says that with the help of artificial processes we will be able to give some structure to the thought process. We can see significant amount of differences as far as second School of thoughts due to the reason that abductive logical programming model of thinking does not really require the existence of any type of natural language and its artificial intelligence standards and natural language is too difficult and not appropriately incoherent to serve as one of the best possible useful model of human thinking by using which process could be formed, modified or verified for the long term. In the process of artificial intelligence the thought process is that some form of logic has come from the language of thoughts which is strongly associated with logic-based model but this has been broadly overshadowed during recent years by different types of interpretivist researchers and people those are trying to implement bayesian approach in the process of artificial intelligence. Uncertainty about the state of the world is one of the basic complications which are contributing towards the problem of deciding that what to do during the process of the implementation of artificial intelligence at large scale. To reduce such complex situation the thing which is suggested by researcher is classical decision theory which helps to make different types of simplifying assumptions. One of the most restrictive

of this is the assumption that all the alternatives to be decided between are generally given in advance and on the basis of such options the implementation of artificial intelligence is monitored.

Implications

Evaluation techniques which are involved the empirical study of the behaviour of an algorithm and the approach is quite prevalent enough with reference to machine learning. Science is empirical in nature and it clearly suggests that theories in the area of science are absolutely based on rigid and robust empirical phenomenon which would be supported by various laws and ideas. There is a significant amount of truth has been shown in the area of machine learning researchers and those are interestingly focusing to find various analogous phenomenon in the behaviour of learning system and that is encouraging and widening the scope of machine learning in multiple fields of science and technology (Hammond et. al., 1999). In the area of science many such phenomenon are mentioned in terms of relationship between various Independent and dependent variables or construct depending on the nature of study whether it is qualitative or quantitative and its implications. In machine learning generally researchers are trying to find two natural independent terms and those are basically knowledge to be learnt and the regularity in the technology based environment. For the betterment of incremental learning method researcher may also vary the order in which data would be presented and it would be classified further and the overall stability or situation of the technology-based environment over a period of time. Most of the natural dependent variables are generally related to some of the performance based criteria which will ultimately help to classify and differentiate various tasks or the quality of various solution paths which is related to problem solving task. However, it could be said that these are not only focusing on only variables but one of the most important tasks which is awaiting machine learning researchers to identify the relevant independent variables or construct and to find different types of related metrics which could be useful for the better implementation of machine learning to gain maximum in the field of technology (Carlson et.al., 2008).

So it is observed that today's artificial intelligence has the potential and capabilities to imitate human Intelligence and performing different types of task that requires proper thinking and learning process and at the same time to solve problems and eventually making various important decisions related to different types of business functions or any other functions.

Artificial intelligence software or programs generally are inserted into various robots, computer or any other similar type of systems which eventually helps in thinking ability and monitor various thought process related to functions. Therefore it can be said that artificial intelligence machines or mechanism should be in position to perform various required task by limiting different types of process oriented errors. In addition to that machine learning should be in such a position to perform various tasks without the involvement of human control for assistance for long run. Artificial intelligence is ability towards effectively performing every narrower and different type of cognitive tasks those are considered only increases the dependence of the people towards various technologies. The tools of artificial intelligence are having the ability to process enormous amounts of data which is already there in computer and which can give control to analyse all the related information which is required for the business decisions. As recently the depth of knowledge building has rapidly developed and it takes only a part of the human brain. It is also observed that the potential of human brain is actually higher than what we imagine, use or prove.

Conclusion

In today's world artificial intelligence has already entered into our daily life by using different types of GPS navigation and check scanning machines in different places. Use of artificial intelligence in businesses contributes up to the potential of various areas of daily life such as customer relationship, customer service, finance related things, sales and marketing, administration and related things technical processes related to various functions in various sectors. Undoubtedly over the next few years the digital efforts cannot be isolated projects or initiatives in different companies but those companies would be involved in adopting artificial intelligence related technologies at almost every level and processes which will help the organisation to increase their competitiveness and to gain competitive edge over their competitor. Artificial intelligence already begins to integrate different business related activities and it is trying to find the connection with the output of the company. Currently massive research work is going on artificial intelligence to improve the world functioning significantly in different context.

References

1. David Poole. 1997, The independent choice logic for modeling multiple agents under uncertainty. *Artificial Intelligence*, 94:7-56.

2. Daniel Sperber, and Deidre Wilson. 1986, *Relevance*. Blackwell, Oxford.
3. Daniel Kahneman and Shane Frederick., 2002, Representativeness revisited: attribute substitution in intuitive judgment. In *Heuristics and Biases – The Psychology of Intuitive Judgement*. Cambridge University Press.
4. John Hammond, Ralph Keeney and Howard Raiffa, 1999, *Smart Choices - A practical guide to making better decisions*. Harvard Business School Press.
5. Joseph Williams. 1995, *Style: Toward Clarity and Grace*. University of Chicago Press.
6. Kurt A. Carlson, Chris Janiszewski, Ralph L. Keeney, David H. Krantz, Howard C. Kunreuther, Mary Frances Luce, J. Edward Russo, Stijn M. J. van Osselaer and Detlof von Winterfeldt. 2008, A theoretical framework for goal-based choice and for prescriptive analysis. *Marketing Letters*, 19(3-4):241-254.
7. Pattie Maes. 1990, Situated agents can have goals. *Robot. Autonomous Syst.* 6(1-2):49-70.
8. Ralph Keeney, 1992, *Value-focused thinking: a path to creative decision-making*. Harvard University Press.
9. Robert Kowalski. 1975, A proof procedure using connection graphs, *JACM*, 22(4):572-595.
10. Robert Kowalski. 1979 *Logic for Problem Solving*. North Holland Elsevier (1979).
11. Robert Kowalski. 2011, *Computational Logic and Human Thinking – How to be Artificially Intelligent*. Cambridge University Press