International Journal of Scientific Research in Computer Science, Engineering and Information Technology
ISSN : 2456-3307 (www.ijsrcseit.com)
doi : https://doi.org/10.32628/CSEIT206455

A Study on Artificial Intelligence Technologies and its Applications

Haripriya S*[1], Dr. L. C. Manikandan[2]

*[1]P G Scholar, Department of CSE, Musaliar College of Engineering & Technology, Pathanamthitta, Kerala, India

[2]Professor and HoD, Department of CSE, Musaliar College of Engineering & Technology, Pathanamthitta, Kerala, India

Article Info
Volume 6, Issue 4
Page Number: 1-10
Publication Issue :
July-August-2020

Article History
Accepted : 20 July 2020
Published : 27 July 2020

ABSTRACT

Artificial Intelligence (AI) helps computers to learn from experience, adjust to new stimuli, and perform tasks of a human nature. It works by combining large amounts of data with fast, iterative processing and smart algorithms, allowing the program to learn from patterns or features in the data automatically. We address AI and various subfields of AI in article. In this paper, we are studying the types, applications, tools. In addition, few examples of existing Internet of Things services with AI working behind them are discussed in this context.

Keywords : Artificial Intelligence, Machine learning, IoT, Robotics, Smart devices, Industrial IoT

I. INTRODUCTION

Artificial Intelligence (AI) is the recreation by machines, particularly computer systems, of processes of human intelligence. These mechanisms include learning (acquiring knowledge and rules to use information), reasoning (using rules to arrive at provisional or definite conclusions) and self-correction; AI can be classed either as weak or as strong.

Weak AI, also called narrow AI, is an AI system desig ned and trained for a specific task. Virtual personal as sistants, like Apple's Siri, are a weak form of AI. Stron g AI, also known as general artificial intelligence, is a n AI system with generalized cognitive abilities in hu mans. A powerful AI program, when faced with an unknown problem, is able to find a solution without human intervention [1].

AI's hardware, software, and personnel costs can be expensive, many vendors include AI components in their standard offerings, as well as access to Artificial Intelligence as a Service (AIaaS) platforms. AI as a Service allows individuals and businesses to experiment with AI for different business purposes and to explore multiple platforms before committing. Although AI systems give companies a range of new technologies, the use of artificial intelligence poses ethical issues. This is because deep learning algorithms are only as intelligent as the data given in training. Since a person chooses what data will be

used to train an AI program, there is inherent potential for human bias and it must be closely monitored. To make the world and its physical objects truly autonomous, we need a machine learning (ML) [2] that emulates human learning, as well as a framework module for data analysis (DA) [3]. ML would develop techniques to promote learning in different network components / devices to make them automated and self-sufficient, while DA would evaluate / analyze all data generated over time to determine past trends and be more efficient / efficient in the future.

II. ARTIFICIAL INTELLIGENCE

AI is the science of machine intelligence, so that they are able to carry out tasks that the human mind historically needed. AI-based systems are rapidly evolving with respect to implementation, adaptation, processing speed and capabilities. Machines are becoming more and more able to take on fewer repetitive tasks. AI is simply about' choosing' a correct decision at the right time. To put it plainly, there is a lack of AI imagination in the decision humans should take. It may be argued that human ingenuity will always change the role of productive work, but AI-based systems have reduced the repetition of human efforts quite elegantly, and could yield results in relatively little time [8].

Most of AI's ongoing work can be called' Narrow AI.' This means that technology is only supporting those functions. We're looking for something far more than that though. Therefore, many areas have conjugated to drive the advancement of AI [1]. Furthermore, AI relies heavily on data science techniques. For the creation of software, the ideas come primarily from computer science that is mainly concerned with algorithmic efficiency and scalability of data. The ideas come from a lot more varied sources to examine. Methodologies are borrowed from both the natural sciences (such as physics, mathematics, graph theory) and social sciences (such as economics, sociology, political science). Also very common in data science are different techniques that are naturally interdisciplinary, such as ML [3], data mining, DBMS [9].

ML is one of the principal tools for achieving AI. The human brain can solve certain types of problems in learning. For example, there are plenty of optical neurons in the visual system which make object recognition easy for humans. Learning is not only restricted to humans, it is diversified to animals, plants etc. Our very survival depends on the ability to learn and adjust to the environment. Machines can be equivalently made to learn and adjust themselves to mimic the natural learning process, to be called' ML' for better performance. Training (including ML) is mostly performed in three ways: supervised, reinforced and unregulated. Researchers have often talked about the way in which we eventually create human-like AI as a certainty. With increasing pace we are definitely heading towards that target. A significant part of the success we've seen in recent years is all due to the fundamental changes in how we interpret AI working, which were primarily brought about by ML. Therefore, granting ML the credit of instilling smartness into computers wouldn't be wrong.

A. Goals of AI

- **To generate Expert Systems** – The systems which reveal intelligent behaviour, learn, demonstrate, explain, and advice its users.
- **To realize Human Intelligence in Machines** – Creating systems that recognize, think, learn, and behave like humans.

III. TYPES OF ARTIFICIAL INTELLIGENCE

Arend Hintze, an assistant professor at Michigan State University of Integrative Biology and Computer Science and Engineering, categorizes AI into four groups, ranging from the type of AI systems that currently exist to sensory systems that do not yet exist. His categories are as follows: [5].

A. Reactive machines: Deep Blue, the IBM chess program which beat Garry Kasparov in the 1990s, is one example. Deep Blue can recognize and anticipate pieces on the chess board but it has no memory and can't use past experiences to inform future ones. This analyzes potential move its own and opponent and chooses the most strategic move. Deep Blue and Google's AlphaGO have been developed for limited purposes and cannot be extended easily to a different situation.

B. Limited memory: Such AI systems can use past experiences to inform future decisions. Some of the decision-making mechanisms of self-driving cars are planned in this way. Observations guide activities taking place in a not-so-distant future, such as a car changing lanes. These observations are not stored enduringly.

C. Theory of mind: This psychology word refers to the understanding that others have their own beliefs, requirements and intent ions that force the decisions they make. This type of AI does not yet exist [10]

D. Self-awareness: In this category, AI systems have an intelligence of self, have consciousness. Machines with self-awareness recognize their present state and can utilize the information to conclude what others are feeling. This category of AI does not yet exist.

IV. TECHNOLOGIES OF AI

AI is included into a variety of diverse types of technology. Technologies of AI are shown in Figure 1 [13].

A. Machine learning: The science of obtaining a machine without programming to function Deep learning is a type of machine learning that can be called, in very simple terms, as predictive analytics automation. There are three types of machine learning algorithms:

- **Supervised learning:** Data sets are classified in order to detect patterns and use them to mark new data sets.
- **Unsupervised learning:** Data sets are not labeled and are sorted by similarities or differences.
- **Reinforcement learning:** Data sets are not labeled, but feedback is given to the AI system after performing an action or several actions.

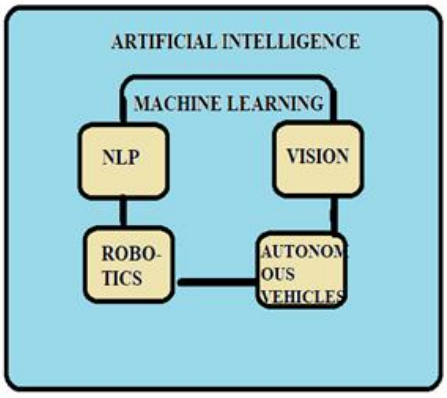

Figure 1. Technologies of AI

B. Machine vision: The knowledge of allowing computers to see. This technology uses a camera, analog to-digital conversion, and digital signal processing to capture and analyze visual information. It is often contrasted with human eyesight because, for example, machine vision is not constrained by nature and can be programmed to see through walls. It is used in a variety of applications, from signature

recognition to the study of medical images. Computer vision, which focuses on computer-based image processing, is frequently associated with machine view.

C. Natural Language Processing (NLP): A computer program processes human and not computer language. One of the oldest and best-known examples of NLP is spam detection, which looks at an email's subject line and text and determines whether it is garbage. Current approaches to NLP are based on machine learning. NLP tasks include text translation, an analysis of feelings and recognition of speech.

D. Robotics: An engineering field focused on the design and fabrication of robots. Robots are often used to perform tasks which are difficult for humans to consistently perform or perform. These are used to move large objects in space in assembly lines for vehicle manufacturing, or by NASA. Researchers also make use of machine learning to build robots that can interact in social environments.

E. Self-driving cars: These use a grouping of computer vision, image recognition and deep learning to construct automated skill at piloting a vehicle while staying in a given lane and avoiding unpredicted obstructions, such as pedestrians.
1)

V. AI APPLICATIONS

An application of AI is shown in Figure 2.

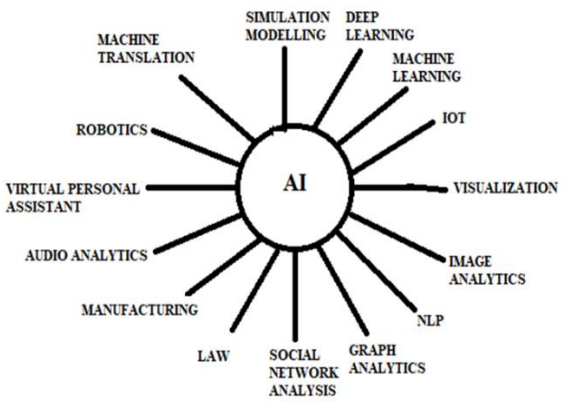

Figure 2 : Applications of AI

A. AI in Healthcare: The best bets are to improve patient satisfaction and cut costs. Enterprises apply machine learning to make diagnosis easier and quicker than humans. IBM Watson is one of the best known health-care systems. This knows the natural language and is able to answer questions asked about it. The program uses patient data and other available data sources to form a theory, which it then presents with a scoring scheme for trust.

Certain AI implementations include chatbots, a computer program that is used online to answer questions and support clients, to help plan follow-up appointments or to help patients through the accounting process and virtual health assistants that provide basic medical feedback [15].

B. AI in Business: Robotic automation of processes is applied to highly repetitive tasks normally carried out by humans. Machine learning algorithms are built into analytics and CRM applications to discover knowledge on how to represent consumers more efficiently. Chatbots were built into the websites to provide customers with instant service. Automation of job positions has also turn out to be a discussion point among academics and IT analysts.

C. **AI in Education**: AI will automate testing, allowing more time for the educators. AI will appraise and adjust students to their needs, helping them to work at their own pace. AI tutors can provide the students with additional support to ensure that they remain on track. AI could change where and how students learn, and maybe even replace some teachers.

D. AI in Law: In law, the process of discovery, sifting through records, is often daunting for humans. Automating this method is using the energy more efficiently. Startups are also developing virtual assistants to ask and answer questions that can sift

programmed-to-answer questions by analyzing the taxonomy and ontology related with a database.

E. AI in Manufacturing: This is an area that was at the forefront of embedding robots into the workflow. Industrial robots used to perform single tasks and were isolated from human workers, but as technology progressed this changed.

VI. AI ENABLED IOT

IoT is a broad term that includes too many Internet-interconnected devices, actuators, data storage and data processing capabilities. Therefore, any IoT-enabled device can sense its environment, transmit, store and process the collected data and act accordingly. The final step to act accordingly depends entirely on the processing stage. An IoT service's true smartness is strong-minded by the level of processing and/or acting it can do. A non-smart IoT system will have imperfect capacity and can't evolve with the data. A smarter IoT framework, however, will have AI and could serve the actual goal of automation and adaptation. In this context, few examples of existing IoT services are discussed here with the working of AI behind them [1].

A. Voice Assistants: These are cloud-based voice services that do something as table-top personal assistants to users. They carry out various tasks in their immediate vicinity via third party applications and other smart devices. These are able of answering questions, calling cabs, production of restaurant reservations, playing music, flipping on / off smart lights, and a lot of more user-based voice commands. Few of the well-known voice assistants are:

- **Alexa** is Amazon's voice assistant, used in devices such as Amazon Echo, Amazon Tap etc. There is a specific set of competencies known as the Alexa Skills Kit (ASK) that can be changed and revised to personalize or develop those competences.
- Apple Inc.'s Apple Homepod uses **Siri** which serves a similar purpose.

Such voice assistants are able to perform multiple tasks primarily because of the implementation of various AI subfields. Automatic far-field voice recognition, wake-up word identification, speech-to-text translation, natural language processing and interpretation, contextual reasoning, dialog management, question answering, conversational AI etc. are constantly conducted to allow the voice assistants perform tasks in real time.[14].

B. Robots: Recent advances in this field of robotics have led to the formation of robots that have increased human likeness and are capable of interacting with humans while understanding, reciprocating and expressing some human emotions. Robots are IoTs in themselves as they contain multiple sensors and actuators along with AI which helps them learn and adapt over time.

- **SoftBank Robotics Pepper** is a human-shaped robot considered a humanoid companion capable of interacting with people. It can understand the emotion of a human being through his / her facial expression, movement of the body, tone of voice, words used etc. It is capable of identifying four human emotions, namely happiness, sorrow, risk and reciprocation. It is able to move around and interact with people and other devices in its vicinity. Pepper is commercially used in a variety of stores to act together with customers.
- **Hnson's Sophia Robotics** is a social humanoid robot that is incredibly human-like and can express emotions through over 50 facial expressions. Sophia is the first robot in the world to get full nationality from a country. She also gave interviews and sang in a concert.

- **Moley Robotics Robotic Kitchen** is an superior fully functional robot that is incorporated into a kitchen. It has robotic arms, microwave, hob, and a human interaction touch screen device, and is intelligent to prepare expert food from its recipe collection.

In these robots, the application of natural language processing, computer vision, shape recognition, object recognition, detection and tracking, block-chain technology to interpret inputs and responses, facial recognition, voice recognition, speech-to-text technology, obstacle recognition, haptics etc. has been broadly used to allow them to function effectively.

C. Smart Devices: There are Smart objects (SO) / devices present in an IoT apart from the voice assistants and robots, which make the job simpler for humans. AI-enabled SOs use object recognition applications, facial identification, voice recognition, identification of speech and expression, deep neural networks, learning transfer, computer vision etc.

By June Smart Oven aims to cook food every time completely It has an HD camera and food thermometer that helps monitor the food being cooked inside the oven automatically and, if necessary, can switch cooking modes. This oven can be run by Alexa and by analyzing the user's likings will suggest and customize automated cook-program.

Deako's Smart Lights can be remotely controlled through smartphones, and Alexa or Google Assistant. They are linked via the Internet and may take delivery of from time to time software upgrades.

Affectiva's automotive AI is an in-cabin sensing AI that can be used in autonomous taxis and highly automated vehicles. It detects the emotional and cognitive state of the occupants in the vehicle from their faces and voices through in-cabin cameras and microphones.

D. Industrial IoT: Besides being used inside smart homes, IoT has an enormous area of application in the a variety of industries. These solutions carry out a company as a whole's statistical and financial analysis and supply predictions using some AI and ML algorithms [11].

Primer is an Alluvium product which offers industrial solutions. Primer produces an overview of the stability score in real time, based on the collected data, the device sensors and properties. This aims at identifying potential problems well in advance and lets operators know the irregularities and make necessary adjustments to the entire facility from something as simple as a sensor.

Plutoshift is yet another IoT-based industrial solution. It allows industrial firms to incessantly trail their asset performance, compute financial impact and supply support for informed decision-making.

VII. CHALLENGES FOR AI

Nearly all of the current AI research areas would discover applications in future real-time AI systems. However, we can identify several AI areas that may have a significant impact on the development of real-time AI systems as they are related to these systems fundamental operational constraints [4].

- Reduced Search Variance.
- Approximate and incremental problem-solving.
- Custom Troubleshooting.
- Calculation.
- Reactions to the representation, planning and learning.
- Modeling based on the utilities.
- Representation and rationale temporary.

- System Representation and Projection.
- Planning and implementation at a time.
- Reasoning and Engagement multi-agent.

VIII. ARTIFICIAL INTELLIGENCE TOOLS AND FRAMEWORKS

Developing neural networks is a long process that requires a lot of thinking behind the design and a whole bunch of complexities that actually make up the system. These nuances can easily finish up being confusing and not all can be easily tracked. Therefore, require for such tackle arises where humans handle the major architectural decisions leaving to such tools other tasks of optimisation. Imagine architecture with only 4 possible Boolean hyper parameters, it would take 4 to test every possible combination Races. The retraining 24 times of the same system is definitely not the best use of time and energy. In fact, most of the newer algorithms include a whole host of hyper parameters. It is here that new tools come into the picture. These tools not only assist to build up but also to optimize these networks [10]. From the dawn of humanity, we as a species have forever tried to make things that will help us in everyday tasks. From stone tools to modern machinery, to tools for creating programs to help us in our daily lives. Some of the main tools and frameworks are:

A. Scikit Learn: Scikit-learn is one of the most common ML libraries. It underpins many calculations for administered and unsupervised learning. Precedents include straight and measured relapses, trees of preference, bunching, etc. It builds on two important Python, NumPy and SciPy libraries. This includes a lot of standard AI and data mining assignment calculations including bunching, relapse and ordering. Indeed, even undertakings such as changing information, determining features and techniques for ensembles can be executed in a few lines.

B. Tensorflow: On the off chance that you're in the field of Artificial Intelligence, you've most likely figured out, attempted or conducted some kind of deep learning calculation.

C. Theano: Theano is beautifully folded over Keras, an odd state library of neural systems that runs almost parallel to the library Theano. It was designed to make the updating of profound learning models as quick and easy as possible for innovative work. It continues to run on Python 2.7 or 3.5 and can be implemented on GPUs and CPUs reliably. Constructed with scalability in mind (fairly easy-to-use multi-GPU and multi machine training support). Many cool features, such as writing custom layers easily in high-level languages.

D. Computational Network Toolkit(CNTK): CNTK allows users to easily understand and unite common types of models such as feed-forward Deep Neural Network(DNN),Convolutional Neural Network (CNN), and Recurrent Neural networks (RNNs/LSTMs).This implements stochastic gradient learning across multiple graphics processing unit (GPUs) and servers with automatic differentiation and parallelization. CNTK is available under an open-source license, for anyone to try.

E. Google ML Kit: Google ML Kit, Google's beta learning machine Software Development Kit (SDK) for mobile developers, is calculated to enable developers to construct custom features on Android and IOS phones. The kit allows developers to integrate machine learning technologies with app-based APIs running on the device or in the cloud. These contain features such as recognition of face and text, barcode scanning, image labelling, and more.

IX. CONCLUSION

In the future, people will wear smart devices, eat smart pills that measure the medicine's impact on the body, live in smart homes, and so on. Everything will be smart and connected to the Internet. To build something of a major value, all branches of science must cooperate. Machines, for example, can now take on less-routine tasks, and this transition is taking place during an era in which many workers are already struggling. Our lives will continue to be more technologically driven and we will rely on AI-enabled systems for everything.

X. REFERENCES

[1]. AshishGhos, Debasrita Chakraborty, Anwesha Law, "Artificial intelligence in Internet of things", Machine Intelligence Unit, Indian Statistical Institute, 203 B.T. Road, Kolkata 700108, West Bengal, India.

[2]. Miller, T. (2017). Explanation in Artificial Intelligence: Insights from the Social Sciences. [online] Arxiv.org. Available at: https://arxiv.org/abs/1706.07269 [Accessed 4 Apr. 2018].

[3]. Witten.I.H., Frank.E, "Data mining: practical machine learning tools and techniques", Morgan Kaufmann, Burlington, Massachusetts, 2016.

[4]. Gorman.M.M, "Database management systems: understanding and applying database technology", Elsevier Science, USA, 2014.

[5]. N. J. Nilsson, "Principles of ArtificialIntelligence", San Mateo, CA, USA: Morgan Kaufmann, 2014..

[6]. Michalski, R.S., Carbonell, J.G., Mitchell, T.M, "Machine learning: an artificial intelligence approach", Springer Science & Business Media, Berlin, Germany, 2013.

[7]. Poole, D.L. and Mackworth, A.K, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

[8]. Russell, S. J.; and Norvig, P. 2009, "Artificial intelligence: A modern approach (3rd ed). Upper Saddle River, NJ: Prentice Hall.

[9]. B. D. Cameron, ``Trends in the usage of ISI bibliometric data: Uses, abuses, and implications", Portal, Libraries Acad., vol. 5, no. 1, pp. 105_125, 2005.

[10]. Fox, M.; and Long, D. 2003. PDDL2.1: An extension to PDDL for expressing temporal planning domains. Journal of Artificial Intelligence Research 20: 61-124.

[11]. David. J. .Musaliner , James A. Hendler and Ashok K. Agrawala, "The Challenges of Real time AI", Institute for advanced computer studies, The University of Maryland College Park, June 1994.

[12]. Nilsson.N.J, "Evolutionary artificial intelligence. Improving Instruction of Introductory Artificial Intelligence", Papers from the 1994 Fall Symposium, 19–21. New Orleans: AAAI Press.

[13]. Korf.R.E, "An undergraduate introductory AI course. Improving Instruction of Introductory Artificial Intelligence", Papers from the 1994 Fall Symposium, 5–7. New Orleans: AAAI Press.

[14]. Dr.Marr, "Artificial Intelligence – A personal view" (Massachusetts Institute of Technology, 1976.

[15]. Jiaying Liu1, Xiangjie Kong, Feng Xia, XiaomeiBai, Lei Wang, Qing Qing, and Ivan Lee, "Artificial Intelligence in the 21st Century" University of South Australia, Adelaide, SA 5095, Australia.

AUTHOR PROFILE

HARIPRIYA S is currently pursuing M.Tech in Computer Science and Engineering at Musaliar College of Engineering and Technology, Pathanamthitta, Kerala, INDIA. She has received B Tech degree in Computer Science and Engineering from College of Engineering Adoor, Pathanamthitta, Kerala, INDIA. Her research area of interest includes the field of Artificial Intelligence, machine learning and Internet of Things.

Dr. L. C. Manikandan is working as Professor at Musaliar College of Engineering and Technology, Pathanamthitta, Kerala, INDIA. He has received Ph.D. degree in Computer and Information Technology from Manonmaniam Sundaranar University, M.Tech Degree in Computer and Information Technology from Manonmaniam Sundaranar University, M.Sc., Degree in Computer Science from Bharathidasan University and B.Sc. Degree in Computer Science from Manonmaniam Sundaranar University. His main research interest includes Video Surveillance, Image Compression & Video Coding in image processing.

Cite this article as :

Haripriya S, Dr. L. C. Manikandan, "A Study on Artificial Intelligence Technologies and its Applications", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 6 Issue 4, pp. 336-344, July-August 2020. Available at doi : https://doi.org/10.32628/CSEIT206455
Journal URL : http://ijsrcseit.com/CSEIT206455