Basic Concepts of Machine Learning

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 Abstract:--A child goes through many experiences since birth. When he falls while standing up, he tries to get up in a different way, once he learns to stand. He fell while walking the first time but learned to walk after a few attempts. He sees the fire and catches it. When adults see a tiger, they don't hold it in the tiger's mouth. We don't shake hands. Because we have seen that if you give a hand, that hand cannot be fully returned. This is based on the accumulation of prior experience, whether direct or indirect, of human behaviour or decision-making; This is what we call intelligence. And behind all this, the brain moves the hinges, with the help of its senses. Our current topic is Machine Learning. We will try to understand here the basic concepts and how machine learning happens.

[Keywords: Intelligence, memory , Robot, speed recognition, Image Recognition, learning **]**

Introduction:-

To behave like a human, the computer needs to have a brain like a human. The structural unit of the biological brain is the neuron. Neurons carry information through dendrites. The information is processed in the cell body. After processing, the information reaches another neuron through the axon. A synapse is a junction between two neurons. When a neuron connects to another neuron Creates a neural network. And that network we call nerve. Each nerve is engaged in one task.

Computer-scientists were inspired by these biological neurons to create Artificial Neural Networks (ANN) that can perform specific tasks like neurons. For example: Pattern Recognition, Face Recognition etc. But an artificial neural network is Basically a mathematical

LinkedIn, a social networking site for professionals, has recently released a list of the most in-demand skills for next year in several countries, including the United States. LinkedIn's annual Emerging Jobs report found artificial intelligence and data science positions in industry to top the most in-demand list in the U.S., and will continue to grow. This year, Facebook founder and CEO Mark Zuckerberg announced his plans to stay up-to-date with the technology world and gain expertise in that field. Machine learning was also on his list Tech analysts predict that by 2024, job opportunities in the teaching sector are likely to grow by 12 percent. This will open more new job doors for IT professionals.

Objectives :-

- Understanding what Machine Learning is
- Gaining a clear understanding of the requirements of machine learning To
- Be aware of the practical application of Machine Learning
- Understand the difference between traditional methods and machine learning methods of teaching

Methodology:

Method:- Qualitative research Methods

An attempt has been made to write the research paper on the basis of information obtained from various books, magazines and internet.

Artificial Intelligence (AI) stands as one of the most transformative technologies of the 21st century, revolutionizing various sectors and altering the fabric of human society. From its conceptual inception in the mid-20th century to its current widespread applications, AI has come a long way, evolving through periods of significant challenges and rapid development.

Historical perspective

The main roots of Artificial intelligence can be traced back to the 1950s when pioneering researchers like Alan Turing laid the theoretical groundwork. Turing's proposal of the Turing Test in 1950 was a seminal moment, challenging the scientific community to develop machines capable of exhibiting intelligent behaviour indistinguishable from humans. The Dartmouth Conference of 1956, organized by John McCarthy and others, formally introduced the term "artificial intelligence," marking the birth of the field.Early AI research in the 1960s and 1970s focused on symbolic methods and problem-solving, leading to the creation of programs such as the Logic Theorist and ELIZA. However, progress was hindered by the limitations of computing power and overly ambitious expectations, leading to the first "AI winter" of reduced funding and interest in the 1970s. The 1980s saw a resurgence in AI with the development of expert systems, which applied knowledge-based approaches to specific problems. This period, however, was followed by another downturn in the late 1980s and 1990s, known as the second AI winter, due to the limitations of these systems and economic factors.

The dawn of the 21st century brought about a renaissance in AI, driven by very advances in computing power, data availability, and algorithmic innovations. Landmark achievements, such as IBM's Deep Blue defeating world chess champion Garry Kasparov in 1997 and IBM Watson's victory in the quiz show Jeopardy! in 2011, showcased AI's potential in complex problem-solving and natural language processing.

A significant breakthrough came in 2012 with the success of deep learning techniques, particularly with the AlexNet neural network excelling in image recognition tasks. This success marked the beginning of a new era where AI started to outperform humans in various tasks. The capabilities of AI were further demonstrated in 2016 when DeepMind's AlphaGo defeated Go champion Lee Sedol, showcasing AI's prowess in mastering intricate and strategic games.

Today, AI permeates numerous aspects of daily life, from virtual assistants like Siri and Alexa to recommendation systems on platforms like Netflix and Amazon. In healthcare, AI aids in diagnostic processes and personalized medicine, while in finance, it enhances fraud detection and algorithmic trading. Autonomous vehicles, powered by AI, promise to revolutionize transportation, improving safety and more efficiency.

The future of AI holds even greater promise, with ongoing research in areas such as reinforcement learning, quantum computing, and ethical AI. However, these advancements come with significant challenges. Ethical considerations, including bias in AI algorithms, privacy concerns, and the impact on employment, are critical areas that require careful attention and regulation.

Artificial Intelligence or AI will gain importance in the coming years as well. Leadership positions in the technology sector, such as IO, CTO, Product Head etc., will be preferred for people with experience in AI technology. Those who demonstrate expertise in managing teams of AI experts, data science and creating innovative products will advance. One of the skills that will continue to be useful in the coming years is applied machine learning. Currently, the value of data science is increasing rapidly. They will be in high demand if they can demonstrate the ability to use data and put it to work.

What is Machine Learning?

A computer is given the ability to learn anything without having to program it in advance - this is machine learning. Computers can do anything very easily because of their ability to learn by themselves. In other words, if the computer's winning rate increases as the number of games it plays increases, then the computer is actually learning. It means he is learning by playing, and this learning ability on his own is called machine learning.

The basic principle of 'Machine Learning' is to correctly extract a particular data pattern or 'model' from a large amount of data or information. It is then used to classify new data, known as 'classification'. Speaking of, why is this classification necessary? The answer is - suppose you are asked to classify one, two and five paisa's, how would you do it? One way is, you divide the pennies according to their circumference and weight can do Because, the size and weight of each coin is slightly different. This classification may be very easy for humans, but not for a computer program. This classification requires a lot of data for a programmer to

understand, from which the program can understand the correct classification and identification of money. Application areas of machine learning are speech recognition, image recognition and inference.

Speech recognition: Listening to people through software applications Speech recognition can convert it to text. A machine learning application is a set of numbers, which represent the speech signal. Specific words or sounds can be separated by dividing this signal into different parts. These speech signals are generated by calculating different times and frequencies.

Image Recognition: Another important application of machine learning applications is working on image recognition processes. Sometimes objects are defined as digital images. Digital images are measured by counting the pixels of each image. Face detection and character detection work in two ways.

Inference: Using Machine Learning and Artificial Intelligence Inferences can be made about anything. For example, machine learning can predict whether a person will repay a loan or not before a bank gives a loan. Feasibility testing requires the use of specific data

The matter In this case data analysts have to play a role. Currently, the demand for machine learning engineers is increasing in large technology organizations as well as in general organizations. Various information of the organization Various people are showing enthusiasm to get the necessary benefits from it Institution Workers in this sector have job opportunities as machine learning engineers, data scientists, AI architects, business analysts and statisticians.

Why do we use computers? Sure to help us! To 'automate' the process. right? We write some programs, and the computer does the work for us based on those programs. We can call this programming a form of 'automation'. And who does the programming? Who again, man.

Difference between traditional programming and machine learning

Machine learning is a part of artificial intelligence. It's an application that does a few things:

1. Gives your system an ability to learn on its own

2. System learning comes from "experience" i.e. from old data

3. But this learning is not given to him separately by "programming". This is about 'machine learning'. Again what is this thing? Whatever man has discovered, he has done it by looking at nature's creation. Watching the flight of vultures fly, seeing the bats, the 'gold' of the submarine, what more! However, people are lazy. A bit like me. A master at making others work. It was just like that. About making the machine work. Humans give 'instructions', machines do the work. All right. As humans write

programs, stupid machines do the work. So, writing programs is also difficult. What can be done?

People looked at themselves. Well, how to learn by yourself? Of course from experience. For example, since I was a child, I have seen the small animal with blue eyes is actually a cat. The cat was first born as a child. Even though I was scared, my mother taught me what it was. By showing the picture of the book. Seeing hundreds of shapes/pictures of hundreds of cats, one thing came into my mind. Cat of any colour, lying down or standing up. That's the experience. for people So, how to give experience? Means the machine? Rightly said. with data. Not one or two, but thousands of data that happened. Write 'cat' in Bengali. In Google Images. Black, white, grey, tabby, tabby cats will be found. Write 'black cat' in Bengali, it will bring you black and blue-eyed cats. Hey, how did you learn? Taught people, the way they learn themselves. The machine is shown a 'caricature' image of thousands of cats and is told this is the cat. Do not learn mean? His father will learn. This is the 'training' data. for the instrument. Pictures of domestic and foreign cats are shown for more enjoyment. Millions upon millions. No more mistakes. Seeing the cat's eyes in the dark under the bed? Will say exactly right.

Remember Professor Andrew Ying? This Stanford professor created a huge course in 2012. It is still a popular course in the 'Machine Learning' world. Being free, thousands of people have enrolled. He gave an example of flying a helicopter there. I didn't believe it at first. He said, the 'autonomous' helicopter could not be flown properly at first. I mean, with man-made programs. In the video, it was seen that the thing was flying like crazy. Later I realized that to fly properly, he has to learn by himself. with experience Meaning, flying upside down like kneeling. Eating houses left and right. Helicopters are not people, that helicopter should fly by itself and give necessary 'error correction' properly. You have to learn yourself. What 'torque' will be the rotation, when to increase or decrease the speed, if you don't 'experience', how will you correct it? This is how the story of experiencing the instrument came.

Meanwhile, programming is also difficult, and programming people are not available as needed. So what to do? The programming will do the data instead of people. Machine learning is like teaching a computer how to program. The data will tell how the computer will program itself. If programming is not considered 'automation', then machine learning is the system of automating the process of that 'automation'.

A major breakthrough in machine learning would equal ten Microsoft. It's not me, it's Bill Gates himself. Machine learning is a great subject of computer science. Usually we give some instructions to the computer, the computer acts accordingly. But in case of machine learning we tell some processes, rest it learns itself and works accordingly. Let's say weather, for example, we feed a computer program all past weather data. By analysing that data, our program will predict the weather. We are not telling you what to say here. The program analyses the previous data and looks at the current weather to tell us what tomorrow's weather might be like. That's machine

learning Just giving data to a computer program cannot analyse it. We need to give some instructions on how to do data analysis. What algorithm to use, etc. If this is done, the rest of the work will be done by the machine or the program itself. Now even small apps need machine learning. Applications of machine learning in many areas of computer science and artificial intelligence including data mining, natural language processing, image recognition, expert systems Is Many examples can be given. Let me give you a close example. There is an Android app called Madviser. Its job is to suggest which mobile package is best for you. And for him It analyses all your data packages and voice calls. This app is not told what to do directly. Given some data, it analyses the data and suggests a package to the user. It is also an application of machine learning. The app is made by Bangladeshi developers.

Another simple example is OCR or Optical Character Recognition/Reader. Used to read text from images. Many of us may have used it. This is also an application of machine learning. After seeing the characters from the image, it detects which one is what. And this classification algorithm is used in machine learning. Machine learning or classification algorithms are also used to identify which emails are spam and which are not. Machine learning is done by using many such algorithms.

Machine learning algorithms are mainly divided into four categories goes

   A. Supervised Learning. B. Unsupervised learning. C. Semi-Supervised learning
      D. Reinforcement learning

Supervised Learning: Program on some pre-defined dataset is trained. The program makes decisions based on that train data. This is supervised learning. For example, whether a mail is spam or not, this decision is based on some previous data. This is an example of supervised learning.

Unsupervised learning: Some data to program in unsupervised learning is given The program makes decisions based on that data. For example, there is a basket of fruits. The program will divide different results into different categories, this is an example of unsupervised learning.

Semi-Supervised learning: Semi-supervised learning is a combination of supervised and unsupervised learning.

Reinforcement learning:- How do we learn as children? anything

If I like it after doing it, I do it more. If something hurts, I don't do it anymore. In reality, reinforcement learning is trained in the same way that humans or animals learn. Siri, Cortana are successful applications of machine learning. After uploading the image to Facebook, it automatically detects whose photo it is. It is also an application of machine learning. Bill Gates didn't lie. If machine learning can be applied more efficiently, then our entire technology world will change. Not that it isn't trying. This sector is constantly developing.

There are two types of people. Watcher & Player. What type would you be? If you are a player, you can study these things from now on. You can know slowly. There are many resources on the internet. These two courses on machine learning are great and popular.   1.ML Course at Audacity.   2. ML Course at Coursera

A little search on Google will turn up great resources. ML Expert is in high demand. And there is a shortage in our country. Where there is scarcity, there is opportunity. Use your will

The future of machine learning

In general programming we say what a program will do. We give data to Machine Learning programs, from that data the program creates its own program. That's the difference. We can solve great problems with machine learning through A detailed article about machine learning.

Machine learning may seem like a simple task, but it's not. Those who have knowledge of programming, have knowledge of mathematics in secondary school can learn. There are plenty of tutorials online to learn. There are many libraries to facilitate machine learning, such as sickie-learn for Python, Google's Tensor Flow, Apache Spark MLlib, Microsoft's Azure ML Studio, etc. The theory part of Machine Learning may seem a little difficult, but these libraries make practical work much easier after getting the basic idea. They implement complex algorithms. We just need to use Just need to know which algorithm or which library is best for your program.

Conclusion:

In machine learning, the program needs to be trained with the training data. There is a lot of data online. There are also many classifiers, which are trained with training data. For example, there is Inception, Google's best image classifier for working with images. It is trained on 1.2 million image data. It took two weeks to train Inception with so many images. We can easily use inception to classify any image. If you do not understand these terms, you can see this article: Some terms of machine learning Google itself has many tutorials on machine learning. Even the tools that Google uses for this, most of them are open source. Google has a few tutorials called Machine Learning Recipes. very great Besides, Google's free course on deep learning at Audacity is also great. Kaggle is a great platform for data science and machine learning like Top Coder, UVA. Here the contest is on data science. There is a lot of public data. Which can be used to learn Machine Learning and Data Science. Again, how to use this data If done, its source code can also be submitted. See how others have solved a problem. You can learn by watching. A great platform for learning. There are many more resources for learning all over the internet. There are many jobs for machine learning experts in companies like Google, Facebook and small and big companies. Just take a look at LinkedIn and you'll see. So you can learn if you like without worrying about what will happen

Reference:-

Books and journals sources

[1]. Richert, W., & Coelho, L. P. (2013). *Building Machine Learning Systems with Python*. Packt Publishing Ltd.

[2]. Keller, J. M., Gray, M. R., & Givens Jr., J. A. (1985). A Fuzzy K-Nearest Neighbor Algorithm. IEEE Transactions on Systems, Man, and Cybernetics, SMC-15*(4), 580-585.

[3]. Marsland, S. (2015). *Machine Learning: An Algorithmic Perspective®. CRC Press.

[4]. Bkassiny, M., Li, Y., &Jayaweera, S. K. (2012). A survey on machine learning techniques in cognitive radios. *IEEE Communications Surveys & Tutorials, 15*(3), 1136-1159.

[5]. Sutton, R. S. (1992). Introduction: The Challenge of Reinforcement Learning. *Machine Learning, 8", 225-227. Kluwer Academic Publishers.

[6]. Harrington, P. (2012). "Machine Learning in Action. Manning Publications Co.

Online source

1. https://rakibul-hassan.gitbook.io/mlbook-titanic/introduction/what-is-ml

2. https://en.m.wikipedia.org/wiki/Machine_learning

3.https://www.prothomalo.com/technology/%E0%A6%AE%E0%A7%87%E0%A6%B6%E0%A6%BF%E0%A6% A8-%E0%A6%B2%E0%A6%BE%E0%A6%B0%E0%A7%8D%E0%A6%A8%E0%A6%BF%E%A6%82- %E0%A6%95%E0%A7%87%E0%A6%A8-%E0%A6%B6%E0%A6%BF%E0%A6%96%E0%A6%AC%E0%A7%87%E0%A6%A8

4. https://www.geeksforgeeks.org/machine-learning/