



Research Paper

# Understanding of Artificial intelligence and machine learning

Manoj Verma

Assistant Professor, IET, Bundelkhand University Jhansi

E-mail id:- [manojverma4817.cs@gmail.com](mailto:manojverma4817.cs@gmail.com)

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## Abstract

In the evolution of artificial Intelligence (AI) and machine learning (ML), reasoning, knowledge representation, planning, learning, natural language processing, perception, and the ability to move and manipulate objects have been widely used.

## Keywords

Artificial intelligence, Machine learning, Expert System.

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## Objective of Study

Artificial Intelligence has become a topic of debate in today's technological landscape. There are some people who love AI whereas others hate it. Some believe that it is the main thing that will surely advance humankind even further than we already have achieved. On the other hand, some people acknowledge that AI will eliminate mankind.

## I. Introduction

In today's world, technology is growing very fast, and we are getting in touch with different new technologies day by day.

Here, one of the booming technologies of computer science is Artificial Intelligence which is ready to create a new revolution in the world by making intelligent machines. The Artificial Intelligence is now all around us. It is currently working with a variety of subfields, ranging from general to specific, such as self-driving cars, playing chess, proving theorems, playing music, Painting, etc.

AI is one of the fascinating and universal fields of Computer science which has a great scope in future. AI holds a tendency to cause a machine to work as a human.

## Why Artificial Intelligence?

Before Learning about Artificial Intelligence, we should know that what is the importance of AI and why should we learn it. Following are some main reasons to learn about AI:

- With the help of AI, you can create such software or devices which can solve real-world problems very easily and with accuracy such as health issues, marketing, traffic issues, etc.
- With the help of AI, you can create your personal virtual Assistant, such as Cortana, Google Assistant, Siri, etc.
- With the help of AI, you can build such Robots which can work in an environment where survival of humans can be at risk.
- AI opens a path for other new technologies, new devices, and new Opportunities.

## Goals of Artificial Intelligence

Following are the main goals of Artificial Intelligence:

1. Replicate human intelligence
2. Solve Knowledge-intensive tasks
3. An intelligent connection of perception and action
4. Building a machine which can perform tasks that requires human intelligence such as:
  - Proving a theorem
  - Playing chess
  - Plan some surgical operation
  - Driving a car in traffic

5. Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

### **History of AI**

- Throughout history, people have been intrigued by the idea of making non-living things smart. In ancient times, Greek stories mentioned gods creating clever machines, and in Egypt, engineers made statues move. Thinkers like Aristotle and Ramon Llull laid the groundwork for AI by describing how human thinking works using symbols.
- In the late 1800s and early 1900s, modern computing started to take shape. Charles Babbage and Ada Lovelace designed machines that could be programmed in the 1830s. In the 1940s, John Von Neumann came up with the idea of storing computer programs. At the same time, Warren McCulloch and Walter Pitts started building the basics of neural networks.
- The 1950s brought us modern computers, letting scientists dig into machine intelligence. Alan Turing's Turing test became a big deal in computer smarts. The term "artificial intelligence" was first used in a 1956 Dartmouth College meeting, where they introduced the first AI program, the Logic Theorist.
- The following years had good times and bad times for AI, called "AI Winters." In the 1970s and 1980s, we hit limits with computer power and complexity. But in the late 1990s, things got exciting again. Computers were faster, and there was more data. IBM's Deep Blue beating chess champion Garry Kasparov in 1997 was a big moment.
- The 2000s started a new era with machine learning, language processing, and computer vision. This led to cool new products and services. The 2010s saw AI take off with things like voice assistants and self-driving cars. Generative AI, which makes creative stuff, also started getting big.
- In the 2020s, generative AI like ChatGPT-3 and Google's Bard grabbed everyone's attention. These models can create all sorts of new things when you give them a prompt, like essays or art. But remember, this tech is still new, and there are things to fix, like making sure it doesn't make things up.

Artificial intelligence is the capability of a computer system to mimic human cognitive functions such as learning and problem-solving. Through AI, a computer system uses math and logic to simulate the reasoning that people use to learn from new information and make decisions.

Artificial Intelligence, or AI, is the result of our efforts to automate tasks normally performed by humans, such as image pattern recognition, document classification, or a computerized chess rival.

### **Machine Learning**

The Machine Learning Tutorial covers both the fundamentals and more complex ideas of machine learning. Students and professionals in the workforce can benefit from our machine learning tutorial.

A rapidly developing field of technology, machine learning allows computers to automatically learn from previous data. For building mathematical models and making predictions based on historical data or information, machine learning employs a variety of algorithms. It is currently being used for a variety of tasks, including speech recognition, email filtering, auto-tagging on Facebook, a recommender system, and image recognition.

You will learn about the many different methods of machine learning, including reinforcement learning, supervised learning, and unsupervised learning, in this machine learning tutorial. Regression and classification models, clustering techniques, hidden Markov models, and various sequential models will all be covered.

### **What is Machine Learning**

In the real world, we are surrounded by humans who can learn everything from their experiences with their learning capability, and we have computers or machines which work on our instructions. But can a machine also learn from experiences or past data like a human does? So here comes the role of Machine Learning.

### **Introduction to Machine Learning**

A subset of artificial intelligence known as machine learning focuses primarily on the creation of algorithms that enable a computer to independently learn from data and previous experiences. Arthur Samuel first used the term "machine learning" in 1959. It could be summarized as follows:

Without being explicitly programmed, machine learning enables a machine to automatically learn from data, improve performance from experiences, and predict things.

Machine learning algorithms create a mathematical model that, without being explicitly programmed, aids in making predictions or decisions with the assistance of sample historical data, or training data. For the purpose of developing predictive models, machine learning brings together statistics and computer science. Algorithms that learn from historical data are either constructed or utilized in machine learning. The performance will rise in proportion to the quantity of information we provide.

A machine can learn if it can gain more data to improve its performance.

How does Machine Learning work

A machine learning system builds prediction models, learns from previous data, and predicts the output of new data whenever it receives it. The amount of data helps to build a better model that accurately predicts the output, which in turn affects the accuracy of the predicted output.

Let's say we have a complex problem in which we need to make predictions. Instead of writing code, we just need to feed the data to generic algorithms, which build the logic based on the data and predict the output. Our perspective on the issue has changed as a result of machine learning. The Machine Learning algorithm's operation is depicted in the following block diagram:

### **Features of Machine Learning:**

Machine learning uses data to detect various patterns in a given dataset.

- It can learn from past data and improve automatically.
- It is a data-driven technology.
- Machine learning is much similar to data mining as it also deals with the huge amount of the data.
- Need for Machine Learning

The demand for machine learning is steadily rising. Because it is able to perform tasks that are too complex for a person to directly implement, machine learning is required. Humans are constrained by our inability to manually access vast amounts of data; as a result, we require computer systems, which is where machine learning comes in to simplify our lives.

By providing them with a large amount of data and allowing them to automatically explore the data, build models, and predict the required output, we can train machine learning algorithms. The cost function can be used to determine the amount of data and the machine learning algorithm's performance. We can save both time and money by using machine learning.

The significance of AI can be handily perceived by its utilization's cases, Presently, AI is utilized in self-driving vehicles, digital misrepresentation identification, face acknowledgment, and companion idea by Facebook, and so on. Different top organizations, for example, Netflix and Amazon have constructed AI models that are utilizing an immense measure of information to examine the client interest and suggest item likewise.

Following are some key points which show the importance of Machine Learning:

- Rapid increment in the production of data
- Solving complex problems, which are difficult for a human
- Decision making in various sector including finance
- Finding hidden patterns and extracting useful information from data.
- Classification of Machine Learning
- At a broad level, machine learning can be classified into three types:
- Supervised learning
- Unsupervised learning
- Reinforcement learning

Machine learning is an application of AI. It's the process of using mathematical models of data to help a computer learn without direct instruction. This enables a computer system to continue learning and improving on its own, based on experience.

### **Expert System**

An expert system is a computer program that is designed to solve complex problems and to provide decision-making ability like a human expert. It performs this by extracting knowledge from its knowledge base using the reasoning and inference rules according to the user queries.

The expert system is a part of AI, and the first ES was developed in the year 1970, which was the first successful approach of artificial intelligence. It solves the most complex issue as an expert by extracting the knowledge stored in its knowledge base. The system helps in decision making for complex problems using both facts and heuristics like a human expert. It is called so because it contains the expert knowledge of a specific domain and can solve any complex problem of that particular domain. These systems are designed for a specific domain, such as medicine, science, etc.

The performance of an expert system is based on the expert's knowledge stored in its knowledge base. The more knowledge stored in the KB, the more that system improves its performance. One of the common examples of an ES is a suggestion of spelling errors while typing in the Google search box.

**Below are some popular examples of the Expert System:**

DENDRAL: It was an artificial intelligence project that was made as a chemical analysis expert system. It was used in organic chemistry to detect unknown organic molecules with the help of their mass spectra and knowledge base of chemistry.

MYCIN: It was one of the earliest backward chaining expert systems that was designed to find the bacteria causing infections like bacteraemia and meningitis. It was also used for the recommendation of antibiotics and the diagnosis of blood clotting diseases.

PXDES: It is an expert system that is used to determine the type and level of lung cancer. To determine the disease, it takes a picture from the upper body, which looks like the shadow. This shadow identifies the type and degree of harm.

CaDeT: The CaDet expert system is a diagnostic support system that can detect cancer at early stages.

### **Characteristics of Expert System**

**High Performance:** The expert system provides high performance for solving any type of complex problem of a specific domain with high efficiency and accuracy.

**Understandable:** It responds in a way that can be easily understandable by the user. It can take input in human language and provides the output in the same way.

**Reliable:** It is much reliable for generating an efficient and accurate output.

**Highly responsive:** ES provides the result for any complex query within a very short period of time.

### **Components of Expert System**

- An expert system mainly consists of three components:
- User Interface
- Inference Engine
- Knowledge Base

## **II. Conclusion**

Artificial intelligence has the potential to transform all organizations. The process by which this transformation happens can vary, but the steps will tend to follow the roadmap we have listed in this book. Following all the steps outlined in the previous chapters will enable your organization to implement and excel in the use of AI technology.

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