1. INTRODUCTION OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence tutorial provides an introduction to ai which will help you to understand the concepts behind artificial intelligence. In this tutorial, we have also discussed various popular topics such as history of ai, applications of ai, deep learning, machine learning, natural language processing, reinforcement learning, q-learning, intelligent

agents, various search algorithms, etc. The figure 1.1 shows the overview of Artificial Intelligence.

Figure 1.1: Overview of Artificial Intelligence

Our AI tutorial is prepared from an elementary level so you can easily understand the complete tutorial from basic concepts to the high-level concepts.

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

2. GOALS OF ARTIFICIAL INTELLIGENCE

The following are the main goals of artificial intelligence:

Replicate human intelligence

- Solve knowledge-intensive tasks
- An intelligent connection of perception and action

- Building a machine which can perform tasks that requires human intelligence such as:

1. Proving a theorem
2. Playing chess
3. Plan some surgical operation
4. Driving a car in traffic

Artificial intelligence is not just a part of computer science even it's so vast and requires lots of other factors which can contribute to it. To create the ai first we should know that how intelligence is composed. Goals of AI are shown in figure 2.1.

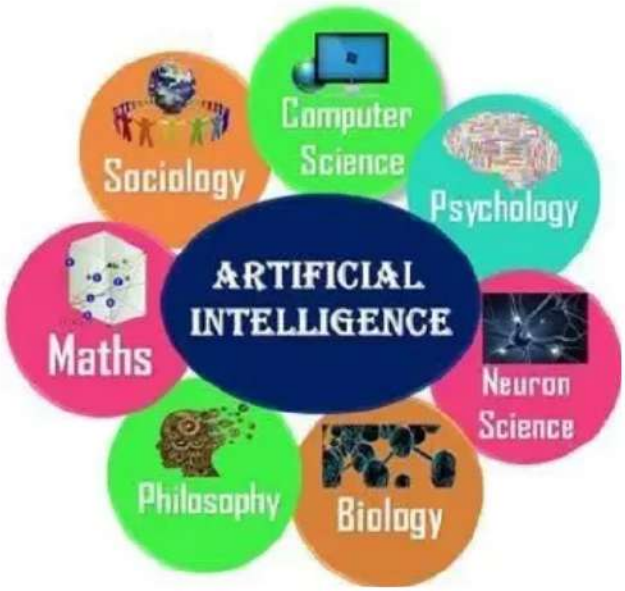

Figure 2.1: Goals of Artificial Intelligence

The intelligence is an intangible part of our brain which is a combination of reasoning, learning, problem-solving perception, language understanding, etc.

3. FUNDAMENTALS OF PYTHON

Fundamentals of python consists of a discussion of basic building blocks of the python programming language. And we will be discussing each topic separately. Figure 3.1 shows the fundamentals of Python.

Figure 3.1: Fundamentals of Python

Statements:

Python statements are nothing but logical instructions that interpreters can read and execute. It can be both single and multiline. There are two categories of statements in python:

- Expression statements
- Assignment statements

An expression is a combination of operators and operands that is interpreted to produce some other value. In any programming language, an expression is evaluated as per the precedence of its operators.

An Assignment statement is a statement that is used to set a value to the variable name in a program. Assignment statement allows a variable to hold different types of values during its program lifespan.

Assignment statement allows a variable to hold different types of values during its program life span. The types of statements are shown in figure 3.2.

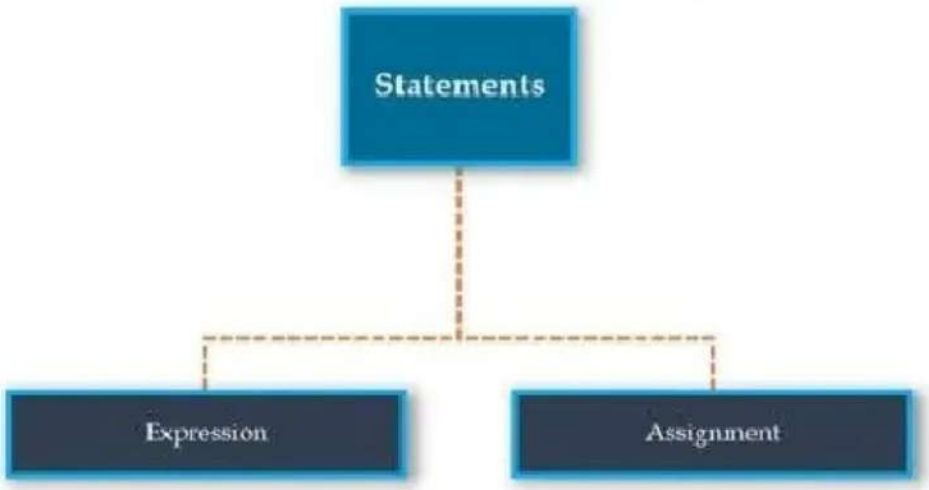

Figure 3.2: Statements

Another way of understanding an assignment statement is, it stores a value in the memory location which is denoted by a variable name.

Indentation:

Unlike most programming languages python uses indentation to mark a block of code. According to python style guidelines or pep8, you should keep an indent size of four. Indentation is shown in the figure 3.3.

Figure 3.3: Indentation

Comments:

Comments are nothing but tagged lines of in codes which increases the readability of the code and make the code self-explanatory. Comments in Python are the lines in the code that are ignored by the

interpreter during the execution of the program. Comments enhance the readability of the code and help the programmers to understand the code very carefully. There are three Types of comments in Python:

- Single line Comments
- Multiline Comments
- Docstring Comments

Variables:

A variable is a memory address that can change and when a memory address cannot change then it is known as constant. Variable is the name of the memory location where data is stored. Once a variable is stored then space is allocated in memory. It defines a variable using a combination of numbers, letters, and the underscore character.

Constants:

Constant is a type of variable that holds values, whose value cannot be changed. In reality, we rarely use constants in Python. Offers several built-in constants, such as True, False, and None. Python also allows users to create their custom constants using the keyword None. Constants are stored in memory, and they are accessed using their respective names. Constants can be of any data type, including integers, floats, strings, and tuples.

Tokens:

Tokens are the smallest unit of the program. There are the following tokens in python. Tokens is shown in figure 3.4.

- Identifiers
- Literals
- Operators

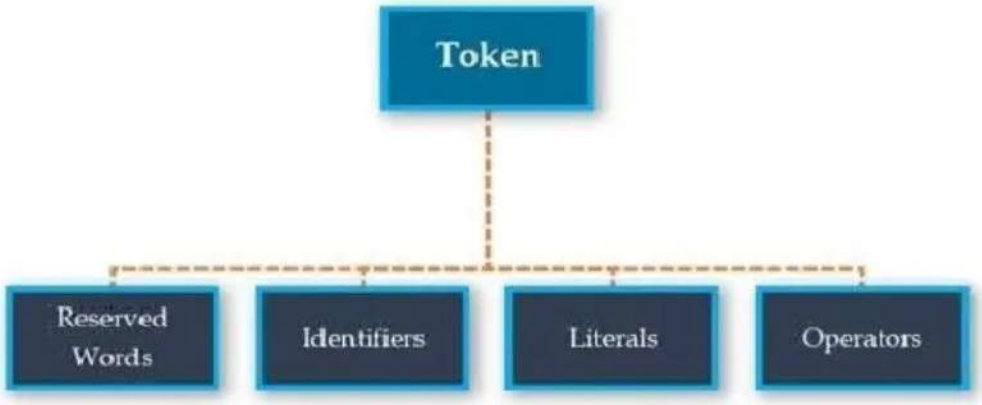

Figure 3.4: Tokens

Tokenization replaces a sensitive data element, for example, a bank account number, with a non-sensitive substitute, known as a token. The token is a randomized data string that has no essential or exploitable value or meaning. It is a unique identifier which retains all the pertinent information about the data without compromising its security.

Introduction of ML

A subset of machine learning is closely related to computational statistics, which focuses on making predictions using computers, but not all machine learning is statistical learning. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a related field of study, focusing on exploratory data analysis through unsupervised learning.

Some implementations of machine learning use data and neural networks in a way that mimics the working of a biological brain.[8][9]In its application across business problems, machine learning is also referred to as analytics. Machine learning (ML) is a field of inquiry devoted to understanding and building methods that 'learn', that is, methods that leverage data to improve performance on some set of tasks. It is seen as a part of intelligence. These ML algorithms help to solve different business problems like Regression, Classification, Forecasting, Clustering, and Associations, etc.

Machine Learning is a branch of manmade brain power science that is structures that can read the details. for example, a typewriter can learn to receive the email and determine the difference between spam and non-spam messages with each other. after preparation, the draft can place new messages in their envelopes using the settings. The process of creating machine learning algorithms. The techniques it uses and look inside the concepts that are require

4. TYPES OF MACHINE LEARNING

Based on the methods and way of learning, machine learning is divided into mainly four types, types of ML is shown in figure 4.1 which are:

- Supervised Machine Learning
- Unsupervised Machine Learning
- Semi-Supervised Machine Learning
- Reinforcement Learning

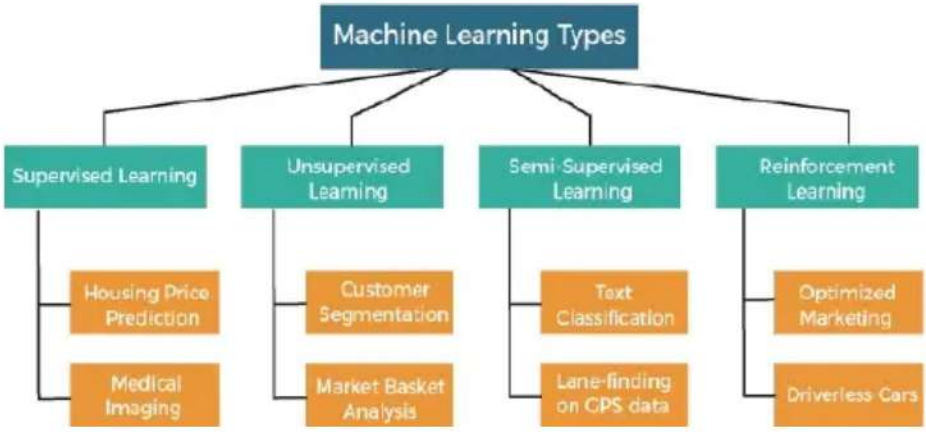

Figure 4.1: Types of Machine Learning

4.1 SUPERVISED LEARNING

In Supervised learning, you train the machine using data which is well "labeled". It means some data is already tagged with the correct answer. It can be compared to learning which takes place in the presence of a supervisor or a teacher.

The main goal of the supervised learning technique is to map the input variable(x) with the output variable(y). differences. Machines are instructed to find the hidden patterns from the input dataset. Supervised Learning process is shown in figure 4.2.

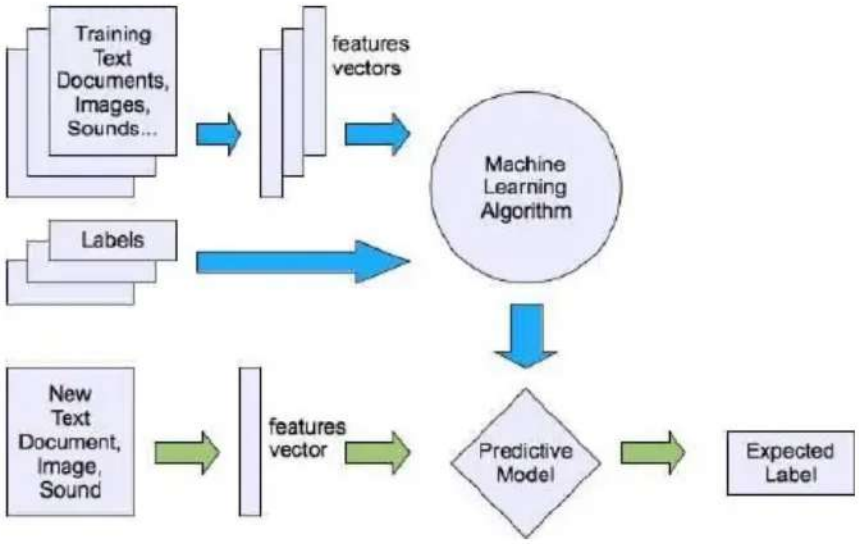

Figure 4.2: Supervised Learning

Now, the machine is well trained, so it will check all the features of the object, such as height, shape, color, eyes, ears, tail, etc., and find that it's a cat. This is the process of how the machine identifies the objects in Supervised Learning.

4.2 UNSUPERVISED MACHINE LEARNING

unsupervised learning is different from the Supervised learning technique; as its name suggests, there is no need supervision. It means, in unsupervised machine Learning, the machine is trained using unlabeled dataset, and the machine predicts the machine predicts the output without any supervision. Un-supervised Learning Process is shown in figure 4.3.

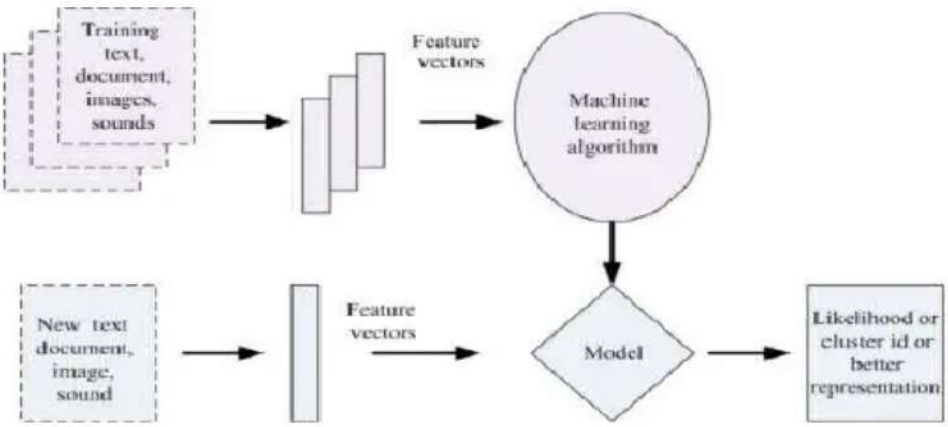

Figure 4.3: Unsupervised Learning

In unsupervised learning, the models are trained with the data that is neither classified nor labelled, and the model acts on that data without any supervision.

4.1 SEMI-SUPERVISED LEARNING

Semi-Supervised learning is a type of Machine Learning algorithm that lies between Supervised and Unsupervised machine learning. It represents the intermediate ground between Supervised (With Labelled training data) and Unsupervised learning (with no labelled training data) algorithms and uses the combination of labelled and unlabeled during the training period.

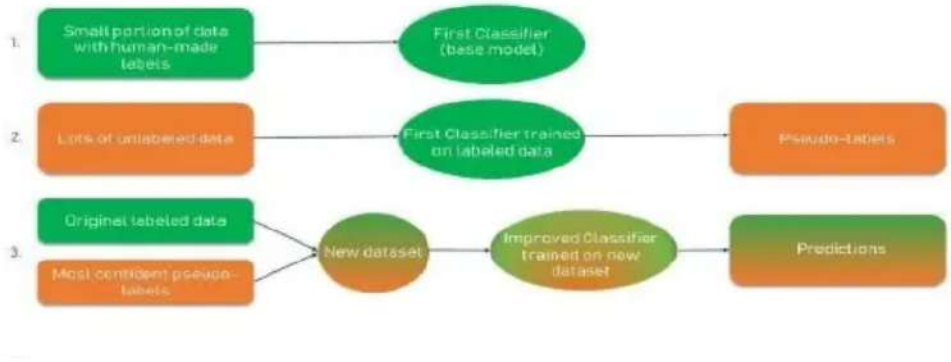

Figure 4.4: Semi-Supervised Learning

4.4 REINFORCEMENT LEARNING Reinforcement learning works on a feedback-based process, in which an AI agent (A software component) automatically experiences, and improving its performance. Agent gets rewarded for each good action and get punished for each bad action; hence the goal of reinforcement learning agent is to maximize the rewards. An example of reinforcement learning is to play a game, where the Game is the environment, moves of an agent at each step define states, and the goal of the agent is to get a high score. In reinforcement learning, there is no labelled data like supervised learning, and agents learn from their experiences only. The reinforcement learning process is similar to a human being; for example, a child learns various things by experiences in his day-to-day life. An

example of reinforcement learning is to play a game, where the Game is the environment, moves of an agent at each step define states, and the goal of the agent is to get a high score. Agent receives feedback in terms of punishment and reward. Reinforcement Learning Process is shown in figure 4.5.

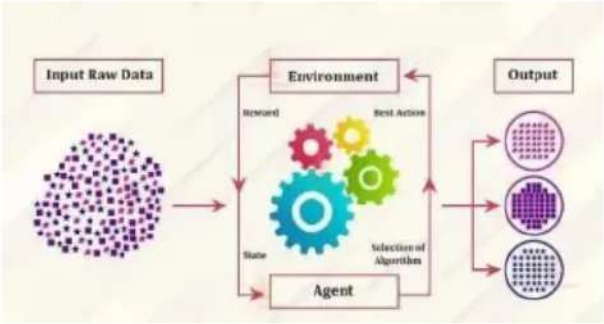

Figure 4.5: Reinforcement Learning Process

An example of reinforcement learning is to play a game, where the Game is the environment, moves of an agent at each step define states, and the goal of the agent is to get a high score.

5. ARCHITECTURE OF MACHINE LEARNING

Data Pipeline:

Data doesn't come in a structured format-it's up to the system itself to clean, categorize, and structure that information, so it is usable by the machine learning algorithms. The pipeline handles this by taking unstructured data, removing incomplete or corrupt data, applying classification, and storing that information for rapid retrieval. Architecture of Machine Learning Process is shown in figure 5.1

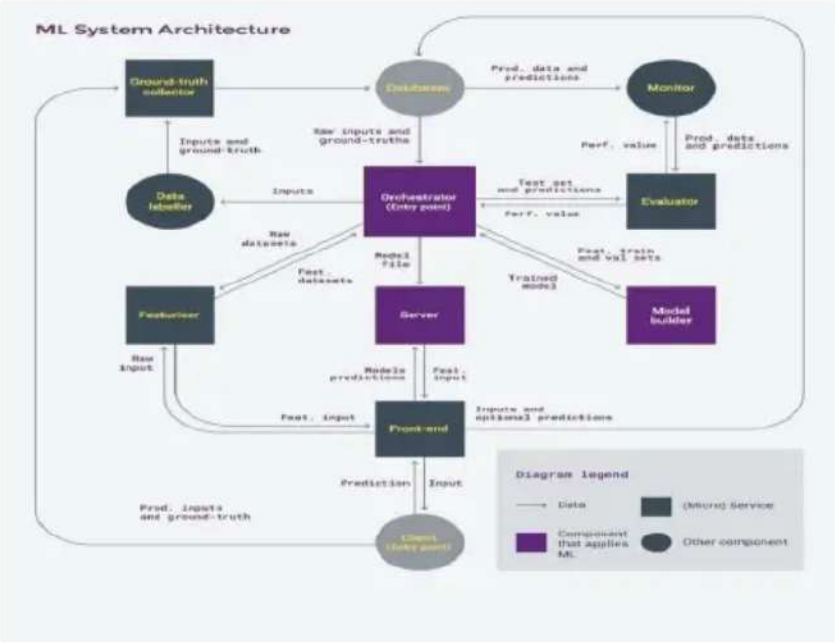

Figure 5.1: Architecture of Machine Learning

Training:

ML systems must be trained, and as such, information is streamed into a training staging area where the system learns how to use that data outside of a production environment.

Evaluation:

Once the training systems leverage the data and (hopefully) learn best practices, data scientists must evaluate the training results.

Computer Vision:

The worlds are composed of three-dimensional objects, but the inputs to the human and computer's TV cameras are two dimensional, applications of AI is shown in figure 5.3.

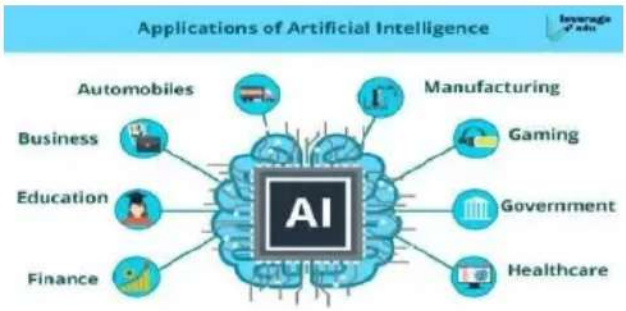

Figure 5.3: Applications of AI

The worlds are composed of three-dimensional objects, but the inputs to the human and computer's TV cameras are two dimensional, applications of AI is shown in figure 6.1.

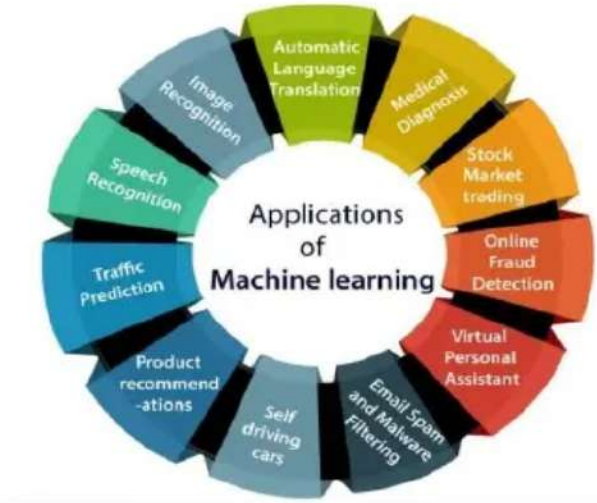

Figure 5.4: Applications of Machine Learning

The of Applications of Machine Learning

1. Image Processing
2. Robotics
3. Data Mining
4. Video games
5. Text Analysis
6. Healthcare

6.CONLUSION

The conclusion, the convergence of Artificial Intelligence and Machine Learning has artificial intelligence and machine learning department of engendered a technological renaissance, catalyzing improvements across industries while navigating intricate challenges. This synergy presents a crossroads where innovation and responsibility must coalesce. As we stand on the threshold of the future, it is imperative to harness the power of AI and ML for the collective betterment of humanity, ensuring that advancements are ethically sound, socially equitable, and economically sustainable. The journey undertaken in this paper embarks on unraveling the nuances of this synergy and sets the stage for the transformative chapters yet to unfold. However, the day-to-day development of AI is making it a comfortable technology, and people are connecting with it more. Therefore, we can conclude that it is a great technology, but each technique must be used in a limited way in order to be used effectively, without any harm.