

## **1. Define Artificial Intelligence (AI)**

Artificial Intelligence(AI) is the branch of computer science focused on creating systems or machines capable of performing tasks that typically require human intelligence. These tasks include reasoning, learning, problem solving, understanding natural language, recognising patterns and making decisions

## **2. Explain the differences between Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), and Data Science (DS)**

Artificial Intelligence(AI) is the broadest concept, focusing in creating intellegent systems.

Machine Learning(ML) is a subset of AI that specifically deals with learning from data.

Deep Learning(DL) is a specialized subset of ML that uses deep neural networks to handle complex tasks.

Data Science is an overarching field that includes the use of AI/ML/DL techniques, along with other statistical and analytical tools, to make sense of data and extract actionable insights.

## **3. How does AI differ from traditional software development**

Traditional software development is rule based, relies on explicit programming and operates within predictable, deterministic frameworks.

AI development on other hand, is data driven, involves creating systems that learn from data and is capable of handling uncertainty and complexity in a more adaptive and flexible manner.

## **4. Provide examples of AI, ML, DL, and DS applications**

The example of Artificial Intelligence(AI) applications: Virtual Assistants like Siri, Alexa, Google Assistant AI powered virtual assistant can understand and respond to voice commands, perform tasks like setting reminders, answering questions or controlling smart home devices.

The example of Machine Learning(ML) applications: Email Spam Filtering ML algorithms analyze patterns in emails to automatically classify them as spam or not spam. The system improves over time as it processes more emails and adapts to new types of spam.

The example of Deep Learning(DL) applications: Autonomous Vehicle DL models are used in self-driving cars to process and analyze data from sensors and cameras in real time, allowing the vehicle to recognize objects, make decisions and navigate safely.

The example of Data Science(DS) applications: Customer Segmentation Data Scientists analyze large datasets from customer interaction, sales and demographics to segment customers into different groups. This help businesses, marketing strategies and improve customer satisfaction.

## **5.Discuss the importance of AI, ML, DL, and DS in today's world**

Importance of Artificial Intellegence(AI): AI is revolutionising industries by automating tasks,decision makings and enabling the development of intelligent systems that can perform complex funtion without human intervention.

Importance of Machine Learning(ML): ML is crucial for data driven decision making and predictive analytics. It helps businesses improve customer experience, optimse operations and gain competitive advantages.

Importance of Deep Learning(DL): DI has significantly advances the capabilites of AI. Its ability to process vast amounts of unstructured data has led to breakthrough in areas like autonomous vehicle, facial recognition and real time translation service.

Importance of Data Science(DS): Data Science is the backbone of informed decision making in different areas. By extracting useful information from vast datasets, data science better strategies, efficient resource management and innovation.

## **6.What is Supervised Learning**

Supervised Learning is a type of machine learning where an algorithm is trained on a labeled dataset. The supervised learning is useful for the model to learn the relationship between the input data and the output data so that it can accurately predict the output for new and unseen data. Supervised Learning is widely used in various applications like image recognition,medical diagnosis and financial forecasting.

## **7.Provide examples of Supervised Learning algorithms**

The examples of Supervised Learning algorithm:

- 1.Linear Regression: Predicting house prices based on featuires like size , location or number of rooms.
- 2.Logistic Regression: Classifying emails as spam or not spam.
- 3.Decision Trees: Determining whether to approve a loan application based on factors like income,credit score or employment history.

## **8.Explain the process of Supervised Learning**

The process of supervised learning involves several key steps to train a model that can make accurate predictions or classifications based on input data. The following steps are:

1. Data Collection
2. Data Preparation
3. Splitting of Data
4. Choosing a Model
5. Training the Model
6. Evaluating the Model
7. Tuning Hyperparameters
8. Making Predictions
9. Deploying and Monitoring

## **9. What are the characteristics of Unsupervised Learning**

Unsupervised Learning is a type of machine learning that deals with data where the output labels are not provided. The key characteristics are:

1. No labeled data
2. Pattern Discovery
3. Types of Problems
4. Evaluation Challenges
5. Exploratory Data Analysis
6. Flexibility

Unsupervised Learning focuses on exploring and modeling data without predefined labels.

## **10. Give examples of Unsupervised Learning algorithms**

The examples of Unsupervised Learning algorithms are:

1. K-Means Clustering: Segmenting customers into different groups based on purchasing behavior.
2. Hierarchical Clustering: Organising documents into a hierarchical structure based on topic similarity.
3. DBSCAN (Density Based Spatial Clustering of Applications with Noise): Identifying clusters of high density customer transactions in a retail dataset.

4. Principal Component Analysis (PCA): Reducing the number of features in a dataset for visualization or to improve efficiency of other algorithms.