Data Science & AI

PART-A (THEORY SECTION)

Q1. What is Machine Learning?

A. Definition of Machine Learning:
Machine Learning is a branch of Artificial Intelligence that enables computers to learn and improve from experience without being explicitly programmed. It focuses on developing algorithms that can analyze data, identify patterns, and make decisions or predictions.

B. How machines learn from data:
Machines learn from data by using mathematical models and algorithms. These models are trained on large datasets where the system finds patterns and relationships between input features and output labels. Once trained, the model can make predictions or decisions on new, unseen data.

C. Example of ML in real life:
A common example is email spam filtering, where a machine learning model learns to classify emails as “spam” or “not spam” based on past examples. Other examples include recommendation systems (like Netflix or YouTube) and voice assistants (like Siri or Alexa).

Q2. Types of Machine Learning

Machine Learning is mainly divided into three types based on how the model learns from data:

1. Supervised Learning:
In supervised learning, the model is trained on labeled data, meaning both input and output are known. The system learns to map inputs to the correct outputs.
Example: Predicting house prices based on size, location, and features.

2. Unsupervised Learning:
In unsupervised learning, the data is unlabeled, and the model tries to find hidden patterns or groupings in the data without prior knowledge.
Example: Customer segmentation in marketing based on purchasing behavior.

3. Reinforcement Learning:
In reinforcement learning, the model learns by interacting with an environment and receiving feedback in the form of rewards or penalties. It aims to take actions that maximize cumulative rewards.
Example: A self-driving car learning to navigate roads safely through trial and error.

Q3. What is a Dataset?

A. Meaning of dataset:
A dataset is a collection of data used for analysis or model training in machine learning. It consists of samples or records that include features inputs and, in some cases, labels outputs. Datasets are the foundation for building and evaluating ML models.

b. Types of datasets:

1. Structured Data:
   Data organized in rows and columns, easy to store and analyze in databases or spreadsheets.
   Example: Excel file containing employee names, salaries, and departments.

2. Unstructured Data:
   Data without a predefined format, such as text, images, videos, or audio files.
   Example: Tweets, YouTube videos, or customer reviews.

3. Semi-Structured Data:
   Data that has some structure but not completely organized into rows and columns.
   Example: JSON or XML files used in web data exchange.

C. Real examples:

- Structured: Titanic data set
- Unstructured: Recorded customer support calls
- Semi-Structured: Web server logs in JSON format

Q4. What is a Model in AI?

A. What is a model:
A model in AI is a program that learns patterns from data and makes predictions or decisions. It acts as the “brain” of the AI system.

b. How model improves during training:
During training, the model adjusts its internal parameters called weights to minimize errors in prediction. This process continues until the model’s performance reaches an acceptable level, allowing it to generalize well to new data.

C. What is prediction in model output:
A prediction is the model’s output when it processes new input data. It can be a category such as spam or not spam or a numerical value such as price prediction Prediction reflects what the model has learned from past data.

Q5. Differences between Data Science and Artificial Intelligence

Data Science	Artificial Intelligence
1.Extract useful insights and knowledge from data	2.Create systems that can simulate human intelligence
2.Data analysis, visualization, and prediction	2.Decision-making, automation, and intelligent behavior
3.Python, R, SQL, Power BI, Pandas, NumPy	3.TensorFlow, PyTorch, OpenCV, Keras
4.Analyzing customer trends using data visualization	4.Building a chatbot that understands natural language

Q6. Applications of Machine Learning

Machine Learning is widely used in various real-world domains. Some common applications include:

1. Email Spam Detection : Filtering unwanted or malicious emails.
2. Fraud Detection : Identifying suspicious financial transactions.
3. Self-Driving Cars : Enabling vehicles to navigate without human input.
4. Recommendation Systems : Suggesting movies, songs, or products such as Netflix, Amazon.
5. Voice Assistants : Powering speech recognition systems like Siri and Alexa.
6. Healthcare Diagnosis : Predicting diseases from medical data and images.
7. Image Recognition : Detecting objects, faces, or handwriting in photos.
8. Customer Support Chatbots : Providing automated responses to user queries.

Part- B (Practical section)

Short introduction :

The following picture is of a image training model name ™ image model ,where I trained a model on two different types of images first class contains images of Dogs and second class contains images of Cates, so after training model when I give a sample image of a cate at right side ,then u can see below that predicts its probability 100 percent to cate class.