Unit 4: Machine Learning and Applications of AI – Answers

⭐ 2 Marks Questions (With Context)

1. What is Machine Learning?
Machine Learning (ML) is a subset of Artificial Intelligence (AI) that enables systems to learn from data and improve their performance over time without being explicitly programmed. It helps in recognizing patterns and making decisions.

2. Mention the Forms/Types of Machine Learning
There are three main types of ML:

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning

3. What is Supervised Machine Learning?
Supervised learning involves training a model on a labeled dataset, where both input and output are provided. The model learns the mapping and is then tested on new data. Example: Predicting house prices.

4. What is Unsupervised Machine Learning?
Unsupervised learning is used when the data is not labeled. The model tries to find patterns and groupings within the data. Example: Customer segmentation, clustering.

5. What is Regression?
Regression is a supervised learning technique used to predict continuous numeric values. Example: Predicting salary based on years of experience.

6. What is Classification?
Classification is the process of categorizing data into predefined classes. It is a type of supervised learning. Example: Spam or non-spam email classification.

7. Define Decision Tree.
A decision tree is a flowchart-like structure used for decision-making. Each internal node represents a test on an attribute, each branch represents the outcome, and each leaf node represents a final decision.

8. What is ANN (Artificial Neural Network)?
ANN is a computing system inspired by biological neural networks. It consists of interconnected nodes (neurons) arranged in layers that process data by adjusting the connection weights.

9. Mention the Layers of ANN

1. Input Layer
2. Hidden Layer(s)
3. Output Layer
   Each layer transforms the data before passing it to the next.

10. What is SVM (Support Vector Machine)?
SVM is a supervised learning algorithm used for classification and regression. It finds the best boundary (hyperplane) that separates different classes of data.

11. Mention any 4 Applications of AI

1. Self-driving Cars
2. Chatbots and Virtual Assistants
3. Fraud Detection
4. Healthcare Diagnosis

⭐ 5 Marks Questions (Elaborated Answers)

1. Explain Decision Tree
A decision tree is a model used for both classification and regression tasks. It breaks down a dataset into smaller subsets while simultaneously developing an associated decision tree.

Key points:

1. The tree starts from a root node and ends in leaf nodes.
2. Internal nodes represent decision criteria based on features.
3. Leaf nodes represent final outcomes or classifications.

4. Algorithms like ID3, C4.5, and CART are commonly used to build trees.
5. It is easy to interpret and visualize but may suffer from overfitting.

2. Explain Supervised Machine Learning

Supervised learning is a type of ML where the model learns from labeled training data.

Steps:

1. Input data with known outputs is provided.
2. A learning algorithm maps input to output.
3. Model is evaluated using test data.
4. Example algorithms: Linear Regression, Decision Trees, SVM, K-NN.
5. Applications: Spam detection, speech recognition, medical diagnosis.

3. Explain the Architecture of ANN

ANN consists of multiple layers of interconnected nodes (neurons).

Architecture:

1. **Input Layer**: Takes in raw data features.
2. **Hidden Layers**: Perform computations using weights, biases, and activation functions. There can be one or many hidden layers.
3. **Output Layer**: Produces the final output or prediction.
4. Activation functions such as ReLU, sigmoid, and tanh introduce non-linearity.
5. Weights are updated using backpropagation to reduce error during training.

⭐ 10 Marks Question (Detailed Answer)

1. Explain any 4 Applications of AI in Detail

1. Healthcare

- AI is used in medical imaging, diagnostics, personalized treatment plans, and drug discovery.

- Example: AI models can detect cancer from X-rays or MRIs with high accuracy.

2. Autonomous Vehicles

- Self-driving cars use AI for real-time object detection, decision-making, and navigation.

- Technologies like computer vision, deep learning, and reinforcement learning power these systems.

3. Finance and Fraud Detection

- AI helps detect anomalies in transactions that may indicate fraud.

- Chatbots assist in customer service, while algorithms aid in stock trading predictions.

4. Virtual Assistants and Chatbots

- Assistants like Siri, Alexa, and Google Assistant use NLP (Natural Language Processing) to understand and respond to user queries.

- Businesses deploy AI chatbots to handle customer queries 24/7.

Each of these applications showcases the power of AI in transforming industries and improving efficiency, accuracy, and user experiences.

End of Unit 4 Answers