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Class	10th	Chapter	06
Subject	Computer Science	Board	Punjab

CHAPTER 06: Introduction to Artificial Intelligence (AI) and Machine Learning (ML)

EXERCISE SOLUTIONS

Multiple Choice Questions (MCQs)

1. What is Artificial Intelligence (AI)?

(a) Solving math problems by hand (b) Machines performing tasks like humans (c) Sending emails using a computer (d) Watching videos online

Correct Answer: (b) Machines performing tasks like humans

2. Which of the following is an example of AI?

(a) A chatbot replying to your questions (b) Using a whiteboard (c) A TV remote (d) Typing on a keyboard

Correct Answer: (a) A chatbot replying to your questions

3. What is Machine Learning (ML)?

(a) Teaching humans to use machines (b) Teaching machines to learn from data like human (c) Learning computer hardware basics (d) A machine without internet

Correct Answer: (b) Teaching machines to learn from data like human

4. Which app recommends videos using ML?

(a) Google Maps (b) Microsoft Paint (c) YouTube (d) Windows Media Player

Correct Answer: (c) YouTube

5. In supervised learning, the data is:

(a) Unorganized (b) Without any answers (c) Labeled with correct answers (d) Only text-based

Correct Answer: (c) Labeled with correct answers

6. Which of the following is an example of unsupervised learning?

(a) Predicting student marks (b) Identifying spam emails (c) Marking quizzes (d) Grouping students by interest without labels

Correct Answer: (d) Grouping students by interest without labels

7. Google Assistant is an example of:

(a) A game app (b) A word processor (c) A smart assistant using AI (d) A calculator

Correct Answer: (c) A smart assistant using AI

8. What skill is essential for a data analyst?

(a) Painting (b) Basic drawing (c) Interpreting and visualizing data (d) Flying drones

Correct Answer: (c) Interpreting and visualizing data

9. AI is mostly used for:

(a) Handwriting notes (b) Making phone calls (c) Charging phones (d) Smart decision making and automation

Correct Answer: (d) Smart decision making and automation

10. A chatbot on JazzCash is an example of:

(a) Cloud computing (b) Data visualization (c) AI in business (d) Unsupervised learning

Correct Answer: (c) AI in business

Short Answer Questions

1. What is the difference between AI and ML?

Answer:

- **Artificial Intelligence (AI):** A broad field of computer science focused on creating smart machines capable of simulating human intelligence, decision-making, and problem-solving.
- **Machine Learning (ML):** A specific subset of AI where algorithms learn patterns directly from data to make predictions or decisions without being explicitly programmed.

2. Give one real-life example of AI used in Pakistan.

Answer:

An automated **AI customer service chatbot on JazzCash or Easypaisa**, which handles customer inquiries, verifies balance queries, and guides users through financial transactions automatically.

3. How does supervised learning work?

Answer:

Supervised learning works by training a model using a **labeled dataset**, which contains both input features and the corresponding correct target answers (labels). The algorithm learns the mapping relationship between inputs and outputs so it can accurately predict the correct label for new, unseen data.

4. Define confusion matrix.

Answer:

A confusion matrix is a tabular summary performance metric used in machine learning classification tasks. It compares the actual ground-truth values against the predicted values generated by the model across four categories: True Positives (TP), True Negatives (TN), False Positives (FP), and False Negatives (FN).

5. How can businesses use AI?

Answer:

Businesses use AI to:

1. **Automate Customer Support:** Using AI chatbots to answer FAQs 24/7.
2. **Personalize Marketing & Recommendations:** Suggesting targeted products to customers based on browsing history.
3. **Fraud Detection:** Monitoring banking transactions in real time to prevent fraudulent activities.

6. Give one example each of a smart assistant and a recommendation system.
Answer:

- **Smart Assistant:** Google Assistant (or Apple Siri).
- **Recommendation System:** YouTube (or Netflix) movie/video recommendation engine.

7. What kind of data is used in unsupervised learning?
Answer:
Unsupervised learning uses **unlabeled data** (data without pre-defined answers, correct target outputs, or categories). The algorithm independently identifies hidden patterns, structure, or natural groupings within the dataset.

Long Answer Questions

1. Explain supervised and unsupervised learning with suitable examples.
Answer:

- **Supervised Learning:**
  - **Definition:** A machine learning approach where the algorithm is trained on a labeled dataset containing both input features and correct target outputs.
  - **Mechanism:** The model learns the underlying mapping rule from inputs to outputs, adjusting its internal parameters until prediction errors are minimized.
  - **Example: Email Spam Detection.** The model is trained on thousands of emails labeled explicitly as "Spam" or "Not Spam". Once trained, it classifies incoming emails automatically.
- **Unsupervised Learning:**
  - **Definition:** A machine learning approach where the algorithm processes unlabeled data to discover hidden structures, correlations, or natural groupings without human guidance.
  - **Mechanism:** The model analyzes structural similarities, distributions, and distance metrics among data points.
  - **Example: Customer Segmentation in E-Commerce.** Grouping online shoppers into distinct clusters based on shopping frequency and spending habits without prior labels.

2. Explain how model performance is evaluated in machine learning using the following metrics:
(a) Confusion Matrix
(b) Accuracy

(c) Precision

Answer:

a) Confusion Matrix:

A 2 × 2table used to evaluate classification performance by summarizing outcomes:

- **True Positive (TP):** Correctly predicted positive class.
- **True Negative (TN):** Correctly predicted negative class.
- **False Positive (FP):** Incorrectly predicted positive (Type I Error).
- **False Negative (FN):** Incorrectly predicted negative (Type II Error).

b) Accuracy:

Measures the ratio of total correct predictions (both positive and negative) to the total number of evaluated samples.

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}}$$

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c) Precision:

Measures the accuracy of positive predictions made by the model—out of all instances predicted as positive, how many were actually positive.

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

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3. A model predicts if students will pass (1) or fail (0). Out of 20 students:

- **True Positives (TP) = 8**
- **True Negatives (TN) = 6**
- **False Positives (FP) = 4**
- **False Negatives (FN) = 2**

You are required to (a) fill the confusion matrix, and (b) calculate accuracy.

Answer:

(a) Filled Confusion Matrix Table:

	Predicted: Pass (1)	**Predicted: Fail (0)**
Actual: Pass (1)	**TP = 8**	**FN = 2**
Actual: Fail (0)	**FP = 4**	**TN = 6**

(b) Accuracy Calculation:

Formula:

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}}$$

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$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}}$$

Substitution: •

$$\text{Accuracy} = \frac{8 + 6}{8 + 6 + 4 + 2}$$

$$\text{Accuracy} = \frac{8 + 6}{8 + 6 + 4 + 2}$$

$$\text{Accuracy} = \frac{14}{20}$$

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$$\text{Accuracy} = 0.70 \text{ or } 70\%$$

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Final Result: The model accuracy is **70%** (or **0.7**). •

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