1.Explain the term machine learning, and how does it work? Explain two machine learning applications in the business world. What are some of the ethical concerns that machine learning applications could raise?

Machine Learning (ML): Machine learning is a subset of artificial intelligence that involves the development of algorithms enabling systems to learn patterns and make decisions or predictions without explicit programming. It works by training models on data and improving their performance through experience.

Machine Learning Applications in Business:

Customer Segmentation: ML algorithms analyse customer data to identify patterns and segment customers based on behaviour, preferences, and demographics, enabling targeted marketing strategies.

Fraud Detection: ML algorithms detect unusual patterns or anomalies in financial transactions, helping businesses identify and prevent fraudulent activities.

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2. Describe the process of human learning:

i. Under the supervision of experts

Description: Learning under expert supervision involves direct guidance and instruction from knowledgeable individuals.

Example: Students learning a new programming language with the guidance of an experienced teacher.

ii. With the assistance of experts in an indirect manner

Description: Learning indirectly with expert assistance involves accessing resources, such as books or online courses, provided by experts.

Example: Self-study using programming tutorials on an online platform.

iii. Self-education

Description: Self-education involves independent learning without direct expert supervision or assistance.

Example: Learning a new hobby or skill through online resources and personal experimentation.

3. Provide a few examples of various types of machine learning.

Supervised Learning: Predicting house prices based on historical data.

Unsupervised Learning: Clustering customer segments based on purchasing behaviour.

Reinforcement Learning: Training an algorithm to play a game through trial and error.

4. Examine the various forms of machine learning.

Supervised Learning: Learns from labelled data with input-output pairs.

Unsupervised Learning: Extracts patterns from unlabelled data without predefined outputs.

Reinforcement Learning: Learns through interaction with an environment, receiving rewards or penalties.

5. Can you explain what a well-posed learning problem is? Explain the main characteristics that must be present to identify a learning problem properly.

Characteristics:

Clearly Defined Output: The desired output or prediction should be well-defined.

Accessible Data: Access to relevant and representative data for training and evaluation.

Measurable Performance: Clear metrics to evaluate the model's performance.

6. Is machine learning capable of solving all problems? Give a detailed explanation of your answer.

Explanation: Machine learning is powerful but may not be suitable for all problems. It requires adequate data, well-defined objectives, and may struggle with tasks requiring common sense, creativity, or ethical considerations.

7. What are the various methods and technologies for solving machine learning problems? Any two of them should be defined in detail.

Explanation: Machine learning is powerful but may not be suitable for all problems. It requires adequate data, well-defined objectives, and may struggle with tasks requiring common sense, creativity, or ethical considerations.

8. Can you explain the various forms of supervised learning? Explain each one with an example application.

Classification: Assigns labels or categories to input data (e.g., spam detection).

Regression: Predicts numerical values based on input features (e.g., predicting stock prices).

9. What is the difference between supervised and unsupervised learning? With a sample application in each region, explain the differences.

Supervised Learning: Has labelled data for training with a known output (e.g., image classification).

Unsupervised Learning: Deals with unlabelled data, discovering patterns without predefined outputs (e.g., clustering customer data).

10. Describe the machine learning process in depth.

Data Collection: Gather relevant data for training.

Data Preprocessing: Clean and prepare data for modelling.

Model Selection: Choose appropriate algorithms.

Training: Train models using labelled data.

Evaluation: Assess model performance on test data.

Prediction/Inference: Apply models to new, unseen data.

a. Make brief notes on any two of the following:

MATLAB: MATLAB is a programming language used for numerical computing, data analysis, and machine learning research.

Deep Learning Applications in Healthcare: Deep learning is applied in healthcare for tasks like medical image analysis, disease diagnosis, and drug discovery.

11. Make a comparison between: -

1. Generalization and abstraction

Generalization: The ability of a model to perform well on new, unseen data.

Abstraction: The process of simplifying complex concepts by focusing on essential features.

1. Learning that is guided and unsupervised

Generalization: The ability of a model to perform well on new, unseen data.

Abstraction: The process of simplifying complex concepts by focusing on essential features.

1. Regression and classification

Regression: Predicts continuous numerical values.

Classification: Assigns data to predefined categories or labels.