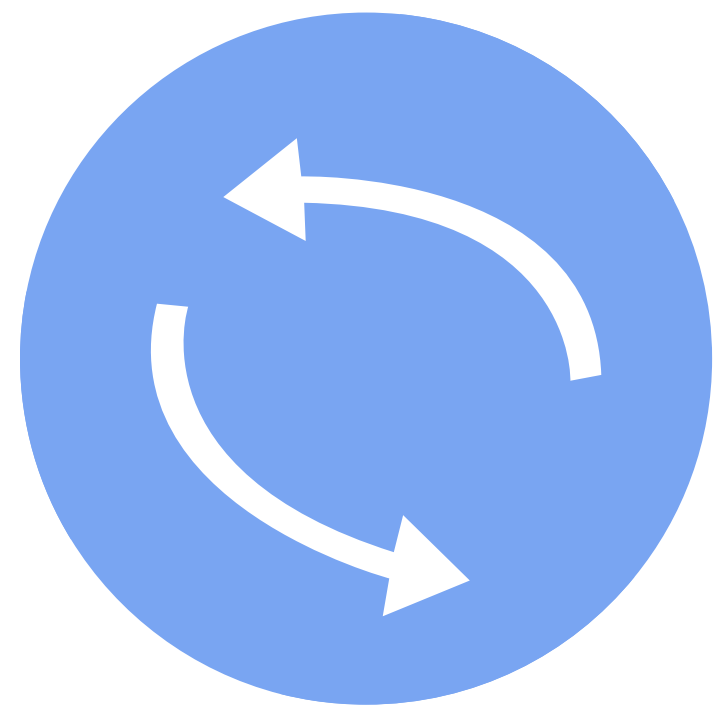


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MCS-224

30 MOST
REPEATED
QUESTIONS



Curated List of 30 Questions
that are seen to be repeated
frequently in the examinations.

By FarLearner.com

MCS-224 Most Repeated Questions

1 . Compare Artificial Intelligence (AI), Machine Learning and Deep Learning.

Found in Dec 2022 (1 a) , Dec 2023 (2 a) , Dec 2024 (1 b)

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Artificial Intelligence, Machine Learning, and Deep Learning are interconnected fields but differ in scope, complexity, and functioning. Artificial Intelligence is the broadest concept, referring to the ability of machines to mimic human intelligence such as reasoning, problem-solving, and decision-making. It includes rule-based systems, expert systems, and learning-based approaches.

Machine Learning is a subset of AI that enables systems to learn from data and improve performance without being explicitly programmed. Instead of fixed rules, ML algorithms identify patterns in data and make predictions or decisions. Common techniques include supervised, unsupervised, and reinforcement learning.

Deep Learning is a further subset of ML that uses artificial neural networks with multiple layers (deep neural networks). It is particularly effective for handling large and complex datasets such as images, speech, and natural language. Deep learning automatically extracts features from raw data, unlike traditional ML, which often requires manual feature engineering.

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In terms of hierarchy: AI → ML → Deep Learning. AI is the goal of intelligent behavior, ML is a method to achieve it, and deep learning is an advanced technique within ML. From this perspective, the progression shows increasing specialization and capability, with deep learning enabling highly complex tasks like image recognition and language translation.

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2 . What is Dimensionality Reduction ? Briefly discuss the ways to achieve it / Explain the term ‘Dimensionality Reduction’. Name the general techniques used to perform it.

Found in June 2022 (1 h) , June 2023 (2 b iv) , Dec 2023 (1 f) , Dec 2024 (1 h)

Dimensionality Reduction refers to the process of reducing the number of input variables (features) in a dataset while retaining the most important information. In real-world datasets, high dimensionality often leads to issues such as increased computational cost, overfitting, and difficulty in visualization—commonly known as the “curse of dimensionality.” Therefore, dimensionality reduction is essential for simplifying models and improving efficiency.

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There are two primary ways to achieve dimensionality reduction: feature selection and feature extraction. Feature selection involves choosing a subset of relevant features from the original dataset without altering them. Techniques such as filter methods (correlation, variance), wrapper methods, and embedded methods are commonly used. This approach helps remove redundant or irrelevant features.

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Feature extraction, on the other hand, transforms the original data into a new lower-dimensional space by creating new features. This is done by combining existing features while preserving meaningful structure in the data. It is particularly useful when original features are highly correlated.

Some general techniques used for dimensionality reduction include Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), and t-Distributed Stochastic Neighbor Embedding (t-SNE). PCA focuses on maximizing variance, LDA emphasizes class separability, and t-SNE is mainly used for visualization of high-dimensional data.

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In summary, dimensionality reduction improves model performance, reduces complexity, and enables better visualization of data, making it a crucial step in data preprocessing and machine learning.

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3 . What is Logistic Regression ? Briefly discuss the various types of logistic regressions.

Found in Dec 2022 (1 g) , June 2022 (4 b iii) , June 2023 (5 g) , Dec 2024 (1 c)

Logistic Regression is a supervised learning algorithm used for classification problems, where the output variable is categorical. Unlike linear regression, it predicts the probability of class using a sigmoid (logistic) function, which maps values between 0 and 1. Based on this probability, the model assigns data points to specific classes. It is widely used in applications like spam detection, medical diagnosis, and credit scoring.

Logistic regression works by establishing a relationship between the independent variables and the dependent variable. The model estimates the coefficients of the independent variables to predict the probability of the dependent variable belonging to a specific class.

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4 . Compare supervised learning and unsupervised learning / Briefly discuss the following: (ii) Supervised learning (iii) Unsupervised learning.

Found in Dec 2022 (2 b ii, iii) , June 2022 (1 f) , Dec 2024 (1 a)

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Supervised Learning and Unsupervised Learning are two fundamental approaches in machine learning, differing mainly in the type of data used and the learning objectives.

Supervised learning involves training a model using labeled data, where both input and corresponding output are known. The goal is to learn a mapping function that can predict outputs for new, unseen inputs. It is commonly used for classification and regression tasks. Examples include predicting house prices or classifying emails as spam or not spam. Algorithms such as linear regression, decision trees, and support vector machines fall under this category.

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Unsupervised learning, in contrast, deals with unlabeled data, where the model must find patterns or structure without predefined labels. Examples include clustering similar data points or identifying hidden patterns in data.

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5 . Differentiate between linear regression and polynomial regression techniques.

Found in Dec 2022 (1 h) , June 2022 (4 b i, iv) , June 2024 (4 c iii)

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Linear Regression and Polynomial Regression are both supervised learning methods used for predicting continuous values, but they differ in how they model relationships between variables.

Linear regression assumes a straight-line relationship between the independent variable(s) and the dependent variable. It fits a linear equation of the form $y = mx + c$, where the change in output is proportional to the change in input. This method is simple, easy to interpret, and computationally efficient. It works well when the data shows a linear trend but performs poorly when the relationship is more complex.

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Polynomial regression, on the other hand, is an extension of linear regression that models non-linear relationships by introducing polynomial terms such as x^2 , x^3 , etc. It fits a curved line to the data, which allows it to capture non-linear trends. However, polynomial regression can be more complex to interpret and may overfit to the training data if the degree of the polynomial is too high. [FarLearner.com](https://farlearner.com) provides a model through it uses linear regression.

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6 . Write algorithm for BFS (Breadth-First Search). Write the time complexity and space complexity of BFS.

Found in Dec 2022 (1 c) , Dec 2023 (2 c) , June 2023 (4 a ii)

Breadth-First Search (BFS) is a graph traversal technique that explores nodes level by level. It starts from a source node and visits all its neighboring nodes before moving to the next level. BFS uses a queue data structure to maintain the order of traversal.

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7 . Write DFS (Depth-First Search) algorithm. Give time and space complexity of DFS algorithm. Also give its advantage and disadvantage.

Found in June 2022 (1 c) , June 2023 (4 a ii) , June 2024 (2 c)

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Depth-First Search (DFS) is a graph traversal method that explores nodes as deep as possible before backtracking. It uses a stack data structure, either explicitly or via recursion.

Algorithm (DFS):

1. Start with a graph G and a source vertex s .
2. Mark all vertices as unvisited.
3. Call DFS(s):

- Mark s as visited and process it.
- For each adjacent vertex v of s :
 - If v is not visited, recursively call DFS(v).

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In summary, DFS is an efficient traversal technique for exploring graph structures deeply, though it may not always provide optimal solutions for shortest path problems.

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8 . Briefly discuss the Min-Max Search Strategy. What are the properties of Minimax Algorithm ? Also give advantages and disadvantages.

Found in Dec 2022 (3 a) , June 2023 (1 b) , June 2024 (2 b)

Minimax Algorithm (also called Min-Max Search Strategy) is used in two-player, zero-sum games such as chess or tic-tac-toe. The algorithm assumes that one player (MAX) tries to maximize the score while the opponent (MIN) tries to minimize it. It builds a game tree of possible moves and evaluates outcomes to choose the optimal move.

The algorithm works by exploring all possible game states up to a certain depth. Terminal nodes are assigned utility values, and values are propagated upward through the tree. The player whose turn it is chooses the move that maximizes their utility among the available moves, while the opponent chooses the move that minimizes their utility. This process repeats until the root node is reached, ensuring that the chosen move is optimal for the player who moves first, assuming both players play rationally.

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9 . Differentiate between the following: (i) Classification techniques and Regression techniques / How regression differs from classification ?

Found in Dec 2022 (3 b i) , June 2022 (4 b) , Dec 2023 (4 b)

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Classification and Regression are two fundamental types of supervised learning techniques, differing mainly in the nature of their output and application.

Classification techniques are used when the output variable is categorical. The goal is to assign input data into predefined classes or labels. For example, classifying emails as spam or not spam, or predicting whether a patient has a disease (yes/no). Classification models learn decision boundaries to separate different classes. Common algorithms include logistic regression, decision trees, k-nearest neighbors, and support vector machines.

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Regression techniques, on the other hand, are used when the output variable is continuous. The aim is to predict a numerical value based on input features. For instance, predicting house prices based on area and location, or forecasting revenue.

Regression models establish a relationship between dependent variables and independent variables. Examples include linear regression and polynomial regression.

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In summary, classification focuses on predicting discrete categories, while regression deals with continuous numerical predictions. Both are essential supervised learning techniques, chosen based on the type of problem and desired output.

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10 . Explain Turing test with suitable example / Explain Turing test, with the help of a block diagram. Also, discuss Chinese room test.

Found in Dec 2023 (1 b) , June 2023 (2 a) , June 2024 (1 b)

Turing Test, proposed by Alan Turing in 1950, is a method to evaluate whether a machine can exhibit human-like intelligence. In this test, a human judge interacts with both a machine and a human through text-based communication without knowing which is which. If the judge cannot reliably distinguish the machine from the human, the machine is said to have passed the Turing Test.

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