1. What is machine learning, and how does it differ from traditional programming?

ML is a sunset of Ai . Ml focus on developing an algorithm that can learn and improve from the data

With being program again .feeding data .

Traditional programming is based on rule and static

1. Explain the difference between supervised and unsupervised learning

Supervise required lable data while unsupervised works with **unlabeled** data

Supervise goal is to mapping between input data with aim to predict a unseen data

Unsupervised is used to find hiddin patyten or structure within the data it self

1. What is over fitting, and how can it be prevented in a machine learning model?

**Overfitting** refers to a situation where a machine learning model becomes too focused on the specific details of the training data, losing its ability to generalize to unseen data.

**Reduce model complexity:** Use simpler models with fewer parameters or features

1. Describe the bias-variance trade off in machine learning.

In machine learning, the **bias-variance trade-off** is a fundamental concept that affects the **generalizability** and **predictive accuracy** of your models. It essentially describes the tension between two opposing forces:

1. What are hyper parameters in machine learning, and how do they differ from parameters?

**Control the learning algorithm itself**, setting the **high-level architecture and behavior** of the model.

**Tuned manually** before training based on experience, domain knowledge, or trial and error.

**Learned by the model** during the training process.

1. Explain the concept of cross-validation and why it is important.

Cross-validation is a fundamental technique in machine learning used to **evaluate the performance of a model on unseen data**. It involves dividing the available data into multiple folds, using one fold for validation and training the model on the remaining folds.

1. What is the curse of dimensionality in machine learning?

Refers to the challenges that arise when analyzing data with many features or dimensions. As the number of dimensions increases, several issues can plague machine learning models:

1. Differentiate between regression and classification algorithms.

****Regression:**** The goal of regression algorithms is to predict a continuous numeric value.

****Classification:**** The objective of classification algorithms is to predict the categorical class labels or group membership of an input.

1. What is the purpose of feature scaling in machine learning?

Feature scaling is a preprocessing step in machine learning that involves transforming the features (variables) of a dataset to a standardized or consistent scale.

1. Describe the difference between bagging and boosting.  
   Bagging involves creating multiple subsets of the training dataset through bootstrap sampling. Bootstrap sampling means randomly selecting samples from the original dataset

Boosting, in contrast, involves training a sequence of base models sequentially.

1. Explain the concept of precision and recall in the context of classification.

Precision is a measure of the accuracy of the positive predictions made by the mode

Recall is a measure of the ability of the model to capture all the positive instances in the dataset.

1. What is the ROC curve, and how is it used to evaluate classification models?

The Receiver Operating Characteristic (ROC) curve is a graphical representation that illustrates the performance of a binary classification model across different classification thresholds.

1. Discuss the difference between a generative and discriminative model.

they learn the underlying data distribution and can generate new samples from that distribution

Dis ocus on learning the boundary or decision boundary between different classes directly

1. What is the role of activation functions in neural networks?

Neural networks are composed of layers of interconnected nodes (neurons), and activation functions determine the output of each neuron, allowing the network to learn complex patterns and relationships in the data.

1. How does back propagation work in the training of neural networks?

It is a supervised learning algorithm that adjusts the weights and biases of the network to minimize the difference between the predicted output and the actual output. The backpropagation algorithm consists of two main phases: forward pass and backward pass.

16. What is reinforcement learning, and provide an example of its application.

17. Explain the concept of clustering and provide examples of clustering algorithms.

18. Discuss the differences between online and batch learning in machine learning.

19. What is transfer learning, and how is it used in machine learning?

20. Describe the challenges and ethical considerations in deploying machine learning models in real-world scenarios.