

Quiz 1: Machine Learning Fundamentals

Instructions

Select the best answer for each question. Questions 1-8 cover core concepts, while questions 9-10 are more challenging.

Questions

1. What is the primary goal of machine learning?

A) To memorize training data perfectly B) To create complex mathematical models C) To replace human decision-making entirely D) To generalize patterns from data to make predictions on unseen examples

2. Which of the following best describes the difference between traditional programming and machine learning?

A) Traditional programming uses data, while machine learning uses rules B) In traditional programming, humans provide rules; in machine learning, computers learn rules from data C) Traditional programming is faster, while machine learning is slower D) Traditional programming is obsolete, while machine learning is modern

3. What is a loss function in machine learning?

A) A function that measures how much information is lost during data preprocessing B) A function that measures how wrong the model's predictions are C) A function that determines how much memory the model uses D) A function that calculates the financial cost of implementing the model

4. In the context of machine learning, what is "overfitting"?

A) When a model requires too much computational power B) When a model is too simple to capture patterns in the data C) When a model takes too long to train D) When a model performs well on training data but poorly on new data

5. Which of the following is NOT a type of machine learning?

A) Deterministic learning B) Supervised learning C) Unsupervised learning D) Reinforcement learning

6. What is gradient descent used for in machine learning?

A) To preprocess and normalize data B) To evaluate model performance C) To minimize the loss function by adjusting model parameters D) To visualize high-dimensional data

7. In the bias-variance tradeoff, which scenario describes high bias?

A) The model memorizes the training data but fails to generalize B) The model is too simple and misses important patterns (underfitting) C) The model requires extensive computational resources D) The model changes significantly with small changes in training data

8. Which business application is LEAST likely to use supervised learning?

A) Predicting customer churn B) Forecasting sales C) Classifying emails as spam or not spam D) Discovering customer segments

9. A company is using machine learning to predict customer lifetime value. The model performs well on historical data but makes poor predictions for new customers. Which of the following is the MOST likely explanation and solution?

A) The model is underfitting; increase model complexity B) The model is overfitting; add regularization or gather more diverse training data C) The loss function is inappropriate; switch to a different loss function D) The learning rate is too high; decrease the learning rate

10. Consider a gradient descent optimization process for a loss function with multiple local minima. Which statement is TRUE?

A) Gradient descent will always find the global minimum regardless of starting point B) Using a very small learning rate guarantees finding the global minimum C) The optimization might converge to different solutions depending on initialization D) Adding more parameters to the model will eliminate local minima

Answers

1. D
2. B
3. B
4. D
5. A
6. C
7. B
8. D
9. B
10. C

Explanations

1. The primary goal of machine learning is to identify patterns in data that can generalize to new, unseen examples.
2. In traditional programming, humans explicitly program rules, while in machine learning, computers learn rules from data.
3. A loss function quantifies how incorrect a model's predictions are, providing a metric to minimize during training.
4. Overfitting occurs when a model learns the training data too well, including its noise and peculiarities, resulting in poor generalization.
5. Deterministic learning is not a standard type of machine learning. The main types are supervised, unsupervised, and reinforcement learning.
6. Gradient descent is an optimization algorithm used to minimize the loss function by iteratively adjusting model parameters.
7. High bias refers to a model that is too simple to capture the underlying patterns in the data, resulting in underfitting.
8. Discovering customer segments is typically an unsupervised learning task (clustering), not supervised learning.
9. Poor performance on new customers despite good performance on historical data suggests overfitting. The model has learned patterns specific to the training data rather than generalizable patterns.
10. Gradient descent is a local optimization method that can converge to different local minima depending on the initialization point.