✔ Congratulations! You passed!

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1. What is Big O Notation?

   1 / 1 point

   ○ documentation

   ◉ A way to measure the efficiency of an algorithm.

   ○ testing

   ○ linting

   ✓ **Correct**
   Big O Notation is used to describe the worst-case scenario for an algorithm. It is important to note that Big O Notation is not a measure of the actual time or space an algorithm takes but rather a way to compare the efficiency of different algorithms.

2. What are business use cases for the mathematical field of optimization?

   1 / 1 point

   ○ Designing a new product

   ○ Creating a new marketing campaign

   ◉ Finding the best route for a delivery driver

   ○ Developing a new software application

   ✓ **Correct**
   There are many business use cases for the mathematical field of optimization. Some examples include:

   1. Finding the best route for a delivery driver
   2. Scheduling employees to minimize overtime

3. Determining the most efficient production schedule for a factory
4. Planning the layout of a store to maximize customer traffic
5. Optimizing a website for search engine ranking

3. What is the traveling salesman problem?   **1 / 1 point**

(●) Given a list of cities and the distances between each pair of cities, the goal
      is to find the shortest possible route that visits each city and returns to the
      origin city

( ) A problem that is not NP-hard

( ) It solves in polynomial time

( ) There is precisely one way to solve the TSP

⊘ **Correct**
    The traveling salesman problem is a classic problem in computer
    science and mathematics. It starts with a list of cities and the distances
    between them; the goal is to find the shortest possible route that visits
    each city and returns to the origin city.

4. Describe how the gradient descent algorithm works?   **1 / 1 point**

( ) It does not require step size to be chosen properly

( ) It is not sensitive to the initialization point.

( ) The gradient descent algorithm is that it always converges to the global
    minimum

(●) The algorithm starts at a random point on the function. Next, it moves in
      the gradient direction (the function's derivative). It stops when it reaches
      a point where the gradient is zero.

⊘ **Correct**
    The gradient descent algorithm is an optimization algorithm used to find
    a function's local minimum. The algorithm works by starting at a
    random point on the function and then moving in the direction of the
    gradient (the derivative of the function) until it reaches a point where
    the gradient is zero.

5. The greedy coin problem is what type of programming problem?　　　　　**1 / 1 point**

    ◯ Brute force algorithms

    ◉ The greedy coin problem is a classic programming problem that can be solved using a greedy algorithm.

    ◯ Machine Learning algorithms

    ◯ Recursion algorithms

    ⊘ **Correct**
    A greedy algorithm follows the heuristic of making a locally optimum choice at each stage to reach a global optimum.

6. Which of the following is an example of a linear data structure?　　　　　**1 / 1 point**

    ◯ Heap

    ◯ Binary Tree

    ◯ Graph

    ◉ Linked List

    ⊘ **Correct**
    A linked list is a linear data structure in which elements are stored in nodes, and each node points to the next node in the sequence. This allows for efficient insertion and deletion of elements at any position in the list.

7. What is the purpose of Principal Component Analysis (PCA) in data science?　　　　　**1 / 1 point**

    ◉ To reduce the dimensionality of data while retaining most of the original information.

    ◯ To classify data into multiple categories.

    ◯ To cluster similar data points together.

    ◯ To impute missing values in the data.

    ⊘ **Correct**

This option is correct. PCA is a dimensionality reduction technique that aims to reduce the number of dimensions (features) in the data while retaining as much of the original information as possible. This is achieved by finding new axes (principal components) that capture the highest variance in the data.

8. Which of the following is a measure of central tendency?   **1 / 1 point**

◯ Range

◯ Interquartile Range

⦿ Median

◯ Standard Deviation

✓ **Correct**
This option is correct. The median is a measure of central tendency, which represents the middle value of a dataset when it is ordered from smallest to largest. If there is an even number of data points, the median is the average of the two middle values.

9. Which issue arises when a machine learning model performs well on the training data but poorly on new, unseen data?   **1 / 1 point**

◯ High bias

◯ Underfitting

⦿ Overfitting

◯ High variance

✓ **Correct**
This option is correct. Overfitting occurs when a model is too complex and captures the noise in the data, leading to excellent performance on the training data but poor performance on new, unseen data. The model essentially "memorizes" the training data, making it less able to generalize to new data.

10. Which of the following is a common method used to prevent overfitting in machine learning models?

○ Increasing the model's complexity

○ Reducing the number of input features

⦿ Regularization

○ Increasing the size of the training dataset

⊘ **Correct**

This option is correct. Regularization is a common technique used to prevent overfitting by adding a penalty term to the loss function. This penalty term discourages the model from fitting the training data too closely, thus reducing its complexity and improving its ability to generalize to new data.