

CS316: Introduction to AI and Data Science

Practice Major Exam

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Date: Monday, October 27, 2024
Duration: 60 Minutes

Instructions

- This exam allows the use of lectures notes authorized by the instructors.
- **The use of any AI tool during the exam will result in failing the course.**
- Electronic devices are not allowed except for a simple calculator.
- Read each question carefully and answer to the best of your ability.
- Write your name and student ID in the space provided below.

Student Information

Student ID:	Student Name:
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1 Interview Questions

Time: 10 minutes **Score:** 4 points **Mapped CLOs:** CLO 2

Question 1: Utilizing Pandas DataFrames in AI and Data Science

Time: 5 minutes **Score:** 2 points **Mapped CLOs:** CLO1, CLO 2 **Word Count:** 150

Pandas is a crucial library for data manipulation and analysis in Python, essential for AI and Data Science.

- Describe how Pandas DataFrames can be used to preprocess large datasets effectively, including operations such as handling missing data and data normalization.
- Discuss the benefits of using Pandas in preparing datasets for machine learning models, particularly when dealing with complex datasets like financial records or social media data.

Answer:

Question 2: Understanding Projection in PCA and Its Applications**Time:** 5 minutes **Score:** 2 points **Mapped CLOs:** CLO 1, CLO 2 **Word Count:** 150

- Explain the role of projection in Principal Component Analysis (PCA) and how it is used to capture the most significant features in a dataset.
- Discuss the mathematical process of projecting high-dimensional data onto a lower-dimensional subspace using PCA.
- Describe scenarios in various fields where projection via PCA is used to enhance the analysis and interpretation of complex datasets.

Answer:

2 Critical-Thinking Questions

Time: 10 minutes **Score:** 4 points **Mapped CLOs:** CLO 1, CLO 2

For this critical thinking question, provide the correct answer along with a brief, one-sentence explanation.

Question 1: Role of Determinants and Eigenvalues in Linear Algebra

Time: 5 minutes **Score:** 2 points **Mapped CLOs:** CLO 1, CLO 2 **Word Count:** 50

Determinants and eigenvalues are fundamental concepts in linear algebra, crucial for understanding system stability and transformations. What is the **PRIMARY** role of determinants and eigenvalues in the analysis of matrices in linear algebra? **A clear explanation of your answer is essential.**

- A) By providing a method for matrix inversion and solving linear systems.
- B) By determining the solvability of linear systems and their behavior under transformations.
- C) By optimizing computational algorithms for faster matrix calculations.
- D) By facilitating the simplification of matrix operations and reducing their complexity.

Answer:

Question 1: Interpreting Box Plot Results in Data Analysis**Time:** 5 minutes **Score:** 2 points **Mapped CLOs:** CLO 3 **Word Count:** 50

Box plots are a graphical representation commonly used in statistical analysis to depict groups of numerical data through their quartiles. What key aspects should be considered when interpreting the results of a box plot? It is important to clearly explain your answer.

Answer: