UNIT- 1

1. Suppose that price of 2 ball and 1 bat is 100 units, then What will be representation of problems in Linear Algebra in the form of x and y?
A. 2x + y = 100
B. 2x + 2y = 100
C. 2x + y = 200
D. x + y = 100
View Answer
Ans : A
2. What is the first step in linear algebra?
A. Let's complicate the problem
B. Solve the problem
C. Visualise the problem
D. None Of the above
View Answer
Ans : C
3. A linear equation in three variables represents a?

A. flat objects
B. line
C. Planes
D. Both A and C
View Answer
Ans : C
4. How many ways a set of three planes can intersect?
A. 3
B. 4
C. 5
D. 6
View Answer
Ans : B
5. Which of the following is not a type of matrix?
A. Square Matrix
B. Scalar Matrix
C. Trace Matrix
D. Term Matrix
View Answer
Ans : D

6. The matrix which is the sum of all the diagonal elements of a square matrix?
A. Diagonal matrix
B. Trace matrix
C. Identity matrix
D. Both A and B
View Answer

Ans : B

7. Multiplication of a matrix with a scalar constant is called?
A. Complex multiplication
B. Linear multiplication
C. Scalar multiplication
D. Constant multiplication
View Answer
Ans : C

8. Which of the following is false?

A. we have a constant scalar 'c' and a matrix 'A'. Then multiplying 'c' with 'A' gives : c[Cij] = [c*Aij]
B. The multiplication of two matrices of orders i*j and j*k results into a matrix of order i*k.
C. Two matrices will be compatible for multiplication only if the number of columns of the first matrix and the number of rows of the second one are same.
D. Transposition simply means interchanging the row and column index.
View Answer
Ans : A

9. Which of the following is correct method to solve matrix equations?

A. Row Echelon Form
B. Inverse of a Matrix
C. Both A and B
D. None Of the above
View Answer
Ans : C
10. _____ is equal to the maximum number of linearly independent row vectors in a matrix.

A. Row matrix
B. Rank of a matrix
C. Term matrix
D. Linear matrix
View Answer
Ans : B
11. What is true regarding Determinant of a Matrix?

A. The concept of determinant is applicable to square matrices only.
B. To find determinant, subtract diagonal elements together.
C. determinant is a vector value that can be computed from the elements of a Trace matrix
D. Both A and C
View Answer
Ans : A

12. Vectors whose direction remains unchanged even after applying linear transformation with the matrix are called?

A. Eigenvalues
B. Eigenvectors
C. Cofactor matrix
D. Minor of a matrix
View Answer
13. The concept of Eigen values and vectors is applicable to?
A. Scalar matrix
B. Identity matrix
C. Upper triangular matrix
D. Square matrix
View Answer
Ans : D
14. What will be output for the following code?

```
A<-matrix(c(30,31,40,41,50,51,60,61,70),nrow = 3,byrow = T)

e <- eigen(A)

e$values

e$vectors
```

A. 148.737576 5.317459 -4.055035
B. 147.737576 5.317459 -3.055035
C. 147.737576 6.317459 -3.055035
D. 146.737576 4.317459 -4.055035
View Answer
Ans : B
Explanation: 147.737576 5.317459 -3.055035 is the output for the following code.
15. Singular matrix are?

A. non-invertible
B. invertible
C. Both non-invertible and invertible
D. None Of the above
View Answer
Ans : A
16. Singular Value Decomposition is some sort of generalisation of _____ decomposition.
A. Singular
B. Eigen vector
C. Eigen value
D. None Of the above
View Answer
Ans : C
17. What Will be output of det(A)?

B<-matrix(c(30,31,40,41,50,51,60,61,70),nrow = 3,byrow = T)
A<-solve(B)
det(A)
A. 0.0004166667
B. -0.0004166668
C. 0.0004166668
D. -0.0004166667
View Answer
Ans : D
18. The cofactor is always preceded by a?

A. positive (+) sign
B. negative (-) sign
C. positive (+) or negative (-) sign
D. With decimal
View Answer
Ans : C
19. Which of the following is correct application for Eigenvectors?

A. computer vision
B. physics
C. machine learning
D. All of the above
View Answer
Ans : D
20. Which of the following is false?

A. Order of matrix : If a matrix has 3 rows and 4 columns, order of the matrix is 3*4 i.e. row*column.
B. Row matrix : A matrix consisting only of columns.
C. Column matrix : The matrix which consists of only 1 column.
D. Row matrix : A matrix consisting only of row.
View Answer
Ans : B

Which of the following operations are defined for vectors in linear algebra?
a) Addition and multiplication
b) Addition and division
c) Multiplication and subtraction
d) Addition and subtraction
Answer: a) Addition and multiplication

What is the modulus of a vector?
a) The square root of the sum of squares of its components
b) The sum of its components
c) The product of its components
d) The absolute value of its components
Answer: a) The square root of the sum of squares of its components

The dot product of two vectors is:
a) A scalar
b) A vector
c) A matrix
d) Undefined
Answer: a) A scalar

What does the cosine of the angle between two vectors represent?
a) The magnitude of the vectors
b) The projection of one vector onto another
c) The angle between the vectors
d) The dot product of the vectors
Answer: b) The projection of one vector onto another

Which matrix transformation preserves distances and angles between vectors?
a) Orthogonal transformation
b) Scalar transformation
c) Identity transformation
d) Singular transformation
Answer: a) Orthogonal transformation

What is the determinant of an identity matrix?
a) 0
b) 1
c) -1
d) Undefined
Answer: b) 1

When solving simultaneous equations using matrices, which operation is used?
a) Division
b) Subtraction
c) Addition
d) Multiplication
Answer: d) Multiplication

Which property of a matrix determines if it is invertible?
a) Determinant
b) Trace
c) Eigenvalues
d) Eigenvectors
Answer: a) Determinant

Eigenvectors of a matrix are associated with:
a) Its inverse
b) Its eigenvalues
c) Its determinant
d) Its trace
Answer: b) Its eigenvalues

What type of matrix has its transpose equal to its inverse?
a) Orthogonal matrix
b) Diagonal matrix
c) Identity matrix
d) Singular matrix
Answer: a) Orthogonal matrix

What is the result of adding two vectors with magnitudes 3 and 4 respectively, if they are perpendicular to each other?
A) 1
B) 5
C) 7
D) 12
Answer: B) 5

The modulus of a vector represents its:
A) Magnitude
B) Direction
C) Both magnitude and direction
D) Scalar component
Answer: A) Magnitude

When two vectors are orthogonal, their dot product is:
A) Always positive
B) Always negative
C) Always zero
D) Always undefined
Answer: C) Always zero

Changing basis involves expressing vectors in terms of:
A) Different coordinate systems
B) Different dimensions
C) Different magnitudes
D) Different origins
Answer: A) Different coordinate systems

The solution to a system of linear equations can be represented by:
A) A point
B) A line
C) A plane
D) All of the above
Answer: D) All of the above

What type of matrix transformation preserves distances and angles?
A) Orthogonal transformation

B) Diagonal transformation
C) Symmetric transformation
D) Skew-symmetric transformation
Answer: A) Orthogonal transformation

The inverse of a matrix exists only if its determinant is:
A) 0
B) 1
C) Greater than 1
D) Not defined
Answer: A) 0

Matrices changing basis involves finding:
A) The determinant of the matrix
B) The eigenvalues of the matrix
C) The eigenvectors of the matrix
D) The change of basis matrix
Answer: D) The change of basis matrix

The eigenvectors corresponding to different eigenvalues of a matrix are:
A) Linearly dependent
B) Linearly independent
C) Orthogonal
D) Identical
Answer: B) Linearly independent

The trace of a matrix is the sum of its:
A) Diagonal elements
B) Off-diagonal elements
C) Eigenvalues
D) Determinant
Answer: A) Diagonal elements

The rank of a matrix is equal to the number of:
A) Columns
B) Rows
C) Non-zero rows after row reduction
D) Eigenvalues
Answer: C) Non-zero rows after row reduction

A matrix is said to be positive definite if:
A) All its elements are positive
B) Its determinant is positive
C) All its eigenvalues are positive
D) It has a positive trace

Answer: C) All its eigenvalues are positive

Which of the following is not a type of matrix transformation?
A) Translation
B) Scaling
C) Rotation
D) Reflection
Answer: A) Translation

The number of solutions to a system of linear equations depends on:
A) The number of variables
B) The number of equations
C) Both A and B
D) Neither A nor B
Answer: C) Both A and B

In a 3x3 matrix, the determinant can be computed using:
A) Cross multiplication
B) Row reduction
C) Expansion by minors
D) Finding the trace
Answer: C) Expansion by minors

The inverse of an orthogonal matrix is equal to its:
A) Transpose
B) Negative
C) Trace
D) Determinant
Answer: A) Transpose

Which matrix transformation preserves areas?
A) Orthogonal transformation
B) Diagonal transformation
C) Symmetric transformation
D) Skew-symmetric transformation
Answer: A) Orthogonal transformation

The eigenvalues of a diagonal matrix are:
A) Always zero
B) The elements on the diagonal
C) The off-diagonal elements
D) Always complex
Answer: B) The elements on the diagonal

If a matrix has a determinant of zero, it is:
A) Invertible

B) Singular
C) Orthogonal
D) Symmetric
Answer: B) Singular

The cross product of two vectors is another vector that is:
A) Perpendicular to both
B) Parallel to both
C) In the same direction as one
D) Undefined
Answer: A) Perpendicular to both

The determinant of an identity matrix is:
A) 0
B) 1
C) -1
D) Undefined
Answer: B) 1

The rank of a matrix is equal to the number of:
A) Columns
B) Rows
C) Non-zero rows after row reduction
D) Eigenvalues
Answer: C) Non-zero rows after row reduction

What is the determinant of a matrix that has two identical rows?
A) 0
B) 1
C) -1
D) Undefined
Answer: A) 0

Which of the following is not an eigenvalue of a 3x3 identity matrix?
A) 1
B) -1
C) 0
D) 3
Answer: B) -1

The inverse of a diagonal matrix is obtained by:
A) Taking the inverse of each diagonal element
B) Changing the sign of each diagonal element
C) Transposing the matrix
D) Multiplying each diagonal element by its cofactor
Answer: A) Taking the inverse of each diagonal element

Which of the following is true about eigenvalues of a matrix?

A) They can be complex
B) They are always positive
C) They are the same as the original matrix
D) They are always integers
Answer: A) They can be complex

The eigenvectors corresponding to different eigenvalues of a matrix are:
A) Linearly dependent
B) Linearly independent
C) Orthogonal
D) Identical
Answer: B) Linearly independent

Singular value decomposition (SVD) is useful for:
A) Solving linear systems
B) Finding eigenvalues
C) Matrix factorization
D) Determining rank
Answer: C) Matrix factorization

The trace of a matrix is the sum of its:
A) Diagonal elements
B) Off-diagonal elements
C) Eigenvalues
D) Determinant
Answer: A) Diagonal elements

A matrix is orthogonal if and only if:
A) Its inverse is equal to its transpose
B) Its determinant is zero
C) Its eigenvalues are all positive
D) It has a rank equal to its number of rows
Answer: A) Its inverse is equal to its transpose

What is the definition of a derivative in multivariate calculus?
A) The rate of change of a function with respect to one variable
B) The limit of the difference quotient as the independent variable approaches a value
C) The slope of the tangent line to the curve at a point
D) All of the above

Answer: D) All of the above

What is the chain rule used for in multivariate calculus?
A) To differentiate composite functions
B) To find the maximum and minimum values of a function
C) To calculate the area under a curve
D) To evaluate limits of multivariate functions

Answer: A) To differentiate composite functions

What is the Jacobian matrix used for?
A) To compute the determinant of a matrix
B) To find the eigenvalues of a matrix
C) To represent partial derivatives of a vector-valued function
D) To calculate the slope of a tangent line

Answer: C) To represent partial derivatives of a vector-valued function

What does the Hessian matrix represent?
A) Second partial derivatives of a scalar-valued function
B) First partial derivatives of a scalar-valued function
C) First partial derivatives of a vector-valued function
D) Second partial derivatives of a vector-valued function

Answer: A) Second partial derivatives of a scalar-valued function

Which rule is used to differentiate a composition of functions with multiple variables?
A) Product rule
B) Chain rule
C) Quotient rule
D) Power rule

Answer: B) Chain rule

What is the purpose of linearization in multivariate calculus?
A) To approximate a complicated function with a simpler, linear function
B) To find the area under a curve
C) To compute definite integrals
D) To find the antiderivative of a function

Answer: A) To approximate a complicated function with a simpler, linear function

Which of the following is used to express a function as an infinite sum of powers of the independent variable?
A) Linearization
B) Power series
C) Taylor series
D) Jacobian matrix

Answer: C) Taylor series

What is the multivariate Taylor series expansion used for?
A) To find the maximum and minimum values of a function
B) To calculate the slope of a tangent line
C) To approximate a multivariate function near a point

D) To compute the determinant of a matrix

Answer: C) To approximate a multivariate function near a point

What does the Jacobian matrix represent?
A) First partial derivatives of a scalar-valued function
B) Second partial derivatives of a vector-valued function
C) First partial derivatives of a vector-valued function
D) Second partial derivatives of a scalar-valued function

Answer: C) First partial derivatives of a vector-valued function

What is the Hessian matrix used for?
A) Representing second partial derivatives of a scalar-valued function
B) Representing second partial derivatives of a vector-valued function
C) Representing first partial derivatives of a scalar-valued function
D) Representing first partial derivatives of a vector-valued function

Answer: A) Representing second partial derivatives of a scalar-valued function

What is the multivariate chain rule used for?
A) To find the maximum value of a function
B) To differentiate composite functions with multiple variables
C) To calculate the area under a curve in multiple dimensions
D) To compute definite integrals in multivariable calculus

Answer: B) To differentiate composite functions with multiple variables

In building approximate functions, what is linearization primarily used for?
A) Approximating a function with a linear function
B) Finding the antiderivative of a function
C) Calculating the area under a curve
D) Determining the maximum and minimum values of a function

Answer: A) Approximating a function with a linear function

Which series represents an infinite sum of powers of the independent variable used in approximation?
A) Linear series
B) Polynomial series
C) Power series
D) Exponential series

Answer: C) Power series

What is the primary purpose of linearization in building approximate functions?
A) To find the maximum and minimum values of a function
B) To approximate a complicated function with a simpler, linear function
C) To calculate the area under a curve

D) To compute definite integrals

Answer: B) To approximate a complicated function with a simpler, linear function

Which method is used to express a function as an infinite sum of powers of the independent variable in building approximate functions?
A) Linearization
B) Power series
C) Multivariate Taylor series
D) Exponential series

Answer: B) Power series

What is the purpose of the multivariate Taylor series in building approximate functions?
A) To find the maximum and minimum values of a function
B) To calculate the area under a curve
C) To approximate a multivariate function near a point
D) To find the antiderivative of a function

Answer: C) To approximate a multivariate function near a point

What does the Jacobian matrix primarily help in multivariate calculus?
A) To calculate the area under a curve
B) To represent first partial derivatives of a vector-valued function
C) To represent second partial derivatives of a scalar-valued function
D) To represent first partial derivatives of a scalar-valued function

Answer: B) To represent first partial derivatives of a vector-valued function

In building approximate functions, what does linearization involve?
A) Approximating a function with a quadratic function
B) Approximating a function with a linear function
C) Approximating a function with a cubic function
D) Approximating a function with an exponential function

Answer: B) Approximating a function with a linear function

Which of the following methods is used to approximate a multivariate function by a simpler function that is linear or quadratic in the neighborhood of a point?
A) Multivariate chain rule
B) Linearization
C) Multivariate Taylor series
D) Power series

Answer: B) Linearization

Which of the following series represents an expansion of a function into an infinite sum of terms, where each term is a power of the independent variable multiplied by a coefficient?

A) Power series
B) Exponential series
C) Fourier series
D) Taylor series

Answer: D) Taylor series

What is the Hessian matrix used for in multivariate calculus?
A) Representing first partial derivatives of a scalar-valued function
B) Representing second partial derivatives of a vector-valued function
C) Representing second partial derivatives of a scalar-valued function
D) Representing first partial derivatives of a vector-valued function

Answer: C) Representing second partial derivatives of a scalar-valued function

Which of the following is NOT a property of the Jacobian matrix?
A) It represents the derivative of a vector-valued function.
B) It is a square matrix.
C) It represents the gradient of a scalar-valued function.
D) It is used to transform coordinates in multiple dimensions.

Answer: C) It represents the gradient of a scalar-valued function.

What is the main purpose of the multivariate chain rule?
A) To find the maximum and minimum values of a function
B) To differentiate composite functions with multiple variables
C) To calculate the definite integral of a function
D) To compute the area under a curve

Answer: B) To differentiate composite functions with multiple variables

What is the derivative of a constant matrix?
A) Zero matrix
B) Identity matrix
C) Diagonal matrix
D) Inverse matrix

Answer: A) Zero matrix

What is the derivative of a scalar-valued function with respect to a vector?
A) Jacobian matrix
B) Hessian matrix
C) Gradient vector
D) Taylor series

Answer: C) Gradient vector

In linearization, what does the linear approximation represent?

A) The tangent line to the curve at a point
B) The area under the curve
C) The maximum value of the function
D) The integral of the function

Answer: A) The tangent line to the curve at a point

Which of the following is a characteristic of the Hessian matrix?
A) It represents the first partial derivatives of a scalar-valued function.
B) It is a square matrix of second partial derivatives.
C) It represents the derivative of a vector-valued function.
D) It is used for linearization.

Answer: B) It is a square matrix of second partial derivatives.

What does the multivariate Taylor series allow us to do?
A) Approximate a multivariate function near a point
B) Compute the definite integral of a function
C) Find the maximum and minimum values of a function
D) Calculate the area under a curve

Answer: A) Approximate a multivariate function near a point

Which of the following methods is used to find the partial derivatives of a vector-valued function with respect to each variable?
A) Multivariate chain rule
B) Jacobian matrix
C) Power series
D) Linearization

Answer: B) Jacobian matrix

What is the derivative of a vector with respect to a scalar?
A) Gradient vector
B) Hessian matrix
C) Jacobian matrix
D) Taylor series

Answer: C) Jacobian matrix

In building approximate functions, what does linearization involve?
A) Approximating a function with a quadratic function
B) Approximating a function with a linear function
C) Approximating a function with a cubic function
D) Approximating a function with an exponential function

Answer: B) Approximating a function with a linear function

Which of the following methods is used to approximate a multivariate function by a simpler function that is linear or quadratic in the neighborhood of a point?
A) Multivariate chain rule
B) Linearization
C) Multivariate Taylor series
D) Power series

Answer: B) Linearization

What does the Hessian matrix represent in multivariate calculus?
A) Second partial derivatives of a scalar-valued function
B) Second partial derivatives of a vector-valued function
C) First partial derivatives of a scalar-valued function
D) First partial derivatives of a vector-valued function

Answer: A) Second partial derivatives of a scalar-valued function

What is the primary purpose of linearization in building approximate functions?
A) To find the maximum and minimum values of a function
B) To approximate a complicated function with a simpler, linear function
C) To calculate the area under a curve
D) To compute definite integrals

Answer: B) To approximate a complicated function with a simpler, linear function

Which of the following is NOT a property of the Taylor series?
A) It represents a function as an infinite sum of terms.
B) It is centered around a specific point.
C) It is used for linearization.
D) It converges to the function it approximates.

Answer: C) It is used for linearization.

What does the Jacobian matrix represent in multivariate calculus?
A) Second partial derivatives of a scalar-valued function
B) Second partial derivatives of a vector-valued function
C) First partial derivatives of a scalar-valued function
D) First partial derivatives of a vector-valued function

Answer: D) First partial derivatives of a vector-valued function

Which of the following methods is used to approximate a multivariate function by a simpler function that is linear or quadratic in the neighborhood of a point?
A) Multivariate chain rule
B) Linearization
C) Multivariate Taylor series
D) Power series

Answer: B) Linearization

What is the purpose of the multivariate Taylor series in building approximate functions?
A) To find the maximum and minimum values of a function
B) To calculate the area under a curve
C) To approximate a multivariate function near a point
D) To find the antiderivative of a function

Answer: C) To approximate a multivariate function near a point

UNIT- 2

What library in Python is commonly used for data manipulation and analysis?
A) NumPy
B) Pandas
C) Matplotlib
D) Scikit-learn
Answer: B) Pandas

Which of the following is not a data structure provided by Pandas?
A) Series
B) DataFrame
C) Array
D) Panel
Answer: C) Array

In Pandas, what method is used to load CSV data into a DataFrame?
A) read_csv()
B) load_csv()
C) import_csv()
D) open_csv()
Answer: A) read_csv()

What function is used in Matplotlib to create scatter plots?
A) plot()
B) scatter()
C) draw_scatter()
D) create_scatter()
Answer: B) scatter()

Which library provides high-level interface for drawing attractive and informative statistical graphics?
A) Matplotlib
B) Seaborn
C) Plotly
D) Bokeh

Answer: B) Seaborn

What command is used to display the first few rows of a DataFrame in Pandas?
A) display()
B) head()
C) show()
D) first()
Answer: B) head()

Which of the following is used to visualize the distribution of a single continuous variable?
A) Bar plot
B) Histogram
C) Box plot
D) Pie chart
Answer: B) Histogram

Which of the following is a valid parameter for customizing the color of a plot in Matplotlib?
A) line_color
B) color
C) plot_color
D) line_color
Answer: B) color

What function is used in Pandas to calculate summary statistics of numerical columns in a DataFrame?
A) describe()
B) summary()
C) stats()
D) summarize()
Answer: A) describe()

In Matplotlib, what function is used to add a title to a plot?
A) title()
B) add_title()
C) set_title()
D) plot_title()
Answer: C) set_title()

Which library in Python provides interactive visualization capabilities?
A) Seaborn
B) Plotly
C) Matplotlib
D) Bokeh
Answer: D) Bokeh

What function is used to create a line plot in Matplotlib?
A) plot()
B) line()
C) create_line()

D) draw_line()
Answer: A) plot()

Which of the following is not a valid data type in Pandas?
A) String
B) Object
C) Float64
D) Int64
Answer: A) String

Which of the following is used to represent missing values in Pandas?
A) NaN
B) None
C) Null
D) Empty
Answer: A) NaN

What method is used to save a plot as an image file in Matplotlib?
A) save()
B) export()
C) savefig()
D) exportfig()
Answer: C) savefig()

Which function is used to remove duplicate rows from a DataFrame in Pandas?
A) remove_duplicates()
B) drop_duplicates()
C) delete_duplicates()
D) clean_duplicates()
Answer: B) drop_duplicates()

In Matplotlib, what method is used to customize the x-axis labels?
A) set_x_labels()
B) xlabel()
C) set_xlabel()
D) x_axis_labels()
Answer: C) set_xlabel()

Which library in Python is primarily used for creating static, animated, and interactive visualizations in web browsers?
A) Plotly
B) Seaborn
C) Matplotlib
D) Bokeh
Answer: A) Plotly

What method is used to change the data type of a column in Pandas?
A) change_type()

B) convert_type()
C) astype()
D) datatype()
Answer: C) astype()

In Seaborn, which function is used to create a box plot?
A) boxplot()
B) create_boxplot()
C) draw_boxplot()
D) plot_box()
Answer: A) boxplot()

Which method is used to rename columns in a Pandas DataFrame?
A) rename_columns()
B) change_columns()
C) set_columns()
D) rename()
Answer: D) rename()

What is the primary purpose of using hue parameter in Seaborn plots?
A) To adjust the figure size
B) To customize the font size
C) To add color differentiation based on a categorical variable
D) To adjust the transparency of plot elements
Answer: C) To add color differentiation based on a categorical variable

Which of the following methods can be used to filter rows based on a condition in Pandas DataFrame?
A) filter()
B) select()
C) query()
D) subset()
Answer: C) query()

In Matplotlib, what method is used to add a legend to a plot?
A) add_legend()
B) legend()
C) set_legend()
D) create_legend()
Answer: B) legend()

What is the purpose of using the sns.set() function in Seaborn?
A) To set the color palette for the plot
B) To set the figure size
C) To set the font size
D) To set the plot style
Answer: D) To set the plot style

Which function is used to remove rows with missing values in Pandas DataFrame?

A) drop_null()
B) remove_null()
C) dropna()
D) removena()
Answer: C) dropna()

In Matplotlib, what function is used to create a histogram?
A) plot_hist()
B) histogram()
C) create_hist()
D) hist()
Answer: D) hist()

Which function is used to create a correlation matrix plot in Seaborn?
A) correlation_matrix()
B) plot_corr()
C) heatmap()
D) correlation_plot()
Answer: C) heatmap()

What is the primary purpose of converting categorical data into numerical format?
A) To reduce the size of the dataset
B) To improve the interpretability of the data
C) To make the data compatible with machine learning algorithms
D) To decrease the computational complexity of the analysis
Answer: C) To make the data compatible with machine learning algorithms

Which method is commonly used to convert categorical variables into numerical format in Python?
A) One-Hot Encoding
B) Label Encoding
C) Ordinal Encoding
D) Binary Encoding
Answer: A) One-Hot Encoding

What does a correlation matrix represent?
A) The frequency of data points in a dataset
B) The relationship between different variables in a dataset
C) The distribution of data points in a dataset
D) The summary statistics of a dataset
Answer: B) The relationship between different variables in a dataset

In a correlation matrix, a correlation coefficient close to +1 indicates:
A) Strong negative correlation
B) Weak negative correlation
C) Strong positive correlation
D) Weak positive correlation
Answer: C) Strong positive correlation

Which of the following is a correct interpretation of a correlation coefficient of -0.8?
A) Strong positive correlation
B) No correlation
C) Moderate negative correlation
D) Strong negative correlation
Answer: D) Strong negative correlation

Which type of graph is suitable for visualizing the distribution of a single continuous variable?
A) Scatter plot
B) Histogram
C) Box plot
D) Pie chart
Answer: B) Histogram

What is the primary purpose of a scatter plot?
A) To visualize the distribution of a single variable
B) To compare the distribution of multiple variables
C) To display the relationship between two continuous variables
D) To show the frequency distribution of categorical variables
Answer: C) To display the relationship between two continuous variables

Which of the following graphs is used to display the relationship between two continuous variables along with the line of best fit?
A) Scatter plot
B) Histogram
C) Box plot
D) Line plot
Answer: A) Scatter plot

What does a box plot primarily illustrate?
A) Frequency distribution of categorical variables
B) Summary statistics of a dataset
C) Distribution of a single continuous variable
D) Relationship between two continuous variables
Answer: B) Summary statistics of a dataset

Which of the following is not a valid type of graph for visualizing categorical data?
A) Bar plot
B) Line plot
C) Pie chart
D) Stacked bar plot
Answer: B) Line plot

What is the primary goal of Dimensionality Reduction techniques?
A) To increase the computational complexity of the dataset
B) To reduce the size of the dataset
C) To improve the interpretability of the data
D) To introduce noise into the dataset

Answer: C) To improve the interpretability of the data

UNIT-3

Which of the following is a Dimensionality Reduction technique suitable for unsupervised learning?
A) PCA (Principal Component Analysis)
B) LDA (Linear Discriminant Analysis)
C) Kernel PCA
D) t-SNE (t-Distributed Stochastic Neighbor Embedding)
Answer: A) PCA (Principal Component Analysis)

What is the first step in Principal Component Analysis (PCA)?
A) Normalizing the data
B) Finding the covariance matrix
C) Centering the data
D) Calculating eigenvalues and eigenvectors
Answer: C) Centering the data

In PCA, what is the next step after centering the data?
A) Normalizing the data
B) Finding the covariance matrix
C) Calculating eigenvalues and eigenvectors
D) Scaling the data
Answer: B) Finding the covariance matrix

What does each eigenvector in PCA represent?
A) Principal Components
B) Features of the dataset
C) Observations in the dataset
D) Dimensions of the dataset
Answer: A) Principal Components

How are the principal components ordered in PCA?
A) In descending order of eigenvalues
B) In ascending order of eigenvalues
C) In random order
D) In order of their indices
Answer: A) In descending order of eigenvalues

In Linear Discriminant Analysis (LDA), what is the primary objective?
A) To maximize the variance within classes
B) To minimize the variance between classes
C) To maximize the variance between classes

D) To minimize the variance within classes
Answer: C) To maximize the variance between classes

What is the difference between PCA and LDA?
A) PCA is supervised while LDA is unsupervised
B) PCA maximizes the variance whereas LDA maximizes the class separability
C) PCA is used for regression while LDA is used for classification
D) PCA reduces the dimensionality by discarding features, whereas LDA transforms the features
Answer: B) PCA maximizes the variance whereas LDA maximizes the class separability

Which of the following is true about the transformation in LDA?
A) It maximizes the variance of the entire dataset
B) It is a linear transformation
C) It reduces the dimensionality without considering class information
D) It minimizes the class separability
Answer: B) It is a linear transformation

What is the kernel trick used for in Kernel PCA?
A) It transforms the data into a higher-dimensional space
B) It computes the eigenvalues and eigenvectors efficiently
C) It scales the data before performing PCA
D) It selects the appropriate number of principal components automatically
Answer: A) It transforms the data into a higher-dimensional space

In Kernel PCA, what type of kernel function is commonly used?
A) Linear kernel
B) Polynomial kernel
C) RBF (Radial Basis Function) kernel
D) Sigmoid kernel
Answer: C) RBF (Radial Basis Function) kernel

Which of the following is a disadvantage of PCA?
A) It doesn't handle nonlinear relationships well
B) It's computationally expensive
C) It requires labeled data
D) It's less interpretable compared to the original features
Answer: A) It doesn't handle nonlinear relationships well

What is the dimensionality of the reduced space in PCA?
A) Equal to the original dimensionality
B) Less than the original dimensionality
C) Greater than the original dimensionality
D) Unpredictable
Answer: B) Less than the original dimensionality

Which of the following is an application of Kernel PCA?
A) Text classification
B) Image compression

C) Stock market prediction
D) Social network analysis
Answer: B) Image compression

What does the 'explained variance ratio' represent in PCA?
A) The amount of variance explained by each principal component
B) The percentage of variance explained by the entire dataset
C) The proportion of variance retained after dimensionality reduction
D) The ratio of eigenvalues to the total variance
Answer: A) The amount of variance explained by each principal component

Which of the following techniques is not a dimensionality reduction method?
A) PCA
B) LDA
C) Decision Trees
D) Autoencoders
Answer: C) Decision Trees

Which step is essential after transforming the data in PCA?
A) Scaling the data
B) Visualizing the transformed data
C) Normalizing the data
D) Interpreting the transformed features
Answer: D) Interpreting the transformed features

Which algorithm can be used to implement Kernel PCA efficiently?
A) Singular Value Decomposition (SVD)
B) Gradient Descent
C) Gaussian Process Regression
D) Kernel Trick
Answer: D) Kernel Trick

Which of the following is a limitation of Kernel PCA?
A) It's computationally efficient for large datasets
B) It doesn't handle nonlinear relationships well
C) It's only applicable to linearly separable datasets
D) It doesn't require tuning of hyperparameters
Answer: B) It doesn't handle nonlinear relationships well

What is the primary advantage of using LDA over PCA for classification tasks?
A) LDA doesn't assume any underlying distribution of the data
B) LDA performs better on high-dimensional datasets
C) LDA considers class information during dimensionality reduction
D) LDA is computationally more efficient than PCA
Answer: C) LDA considers class information during dimensionality reduction

In Kernel PCA, what is the role of the kernel function?
A) It maps the data to a higher-dimensional space

B) It calculates the eigenvalues of the covariance matrix
C) It computes the class separability
D) It performs dimensionality reduction
Answer: A) It maps the data to a higher-dimensional space

Which of the following techniques is a linear dimensionality reduction method?
A) PCA
B) t-SNE
C) Autoencoders
D) Kernel PCA
Answer: A) PCA

Which step of PCA is responsible for reducing the dimensionality of the dataset?
A) Calculating eigenvalues and eigenvectors
B) Centering the data
C) Finding the covariance matrix
D) Selecting the principal components
Answer: D) Selecting the principal components

Which of the following is an advantage of Kernel PCA over PCA?
A) Kernel PCA is computationally faster
B) Kernel PCA handles nonlinear relationships better
C) Kernel PCA doesn't require centering the data
D) Kernel PCA produces interpretable features
Answer: B) Kernel PCA handles nonlinear relationships better

What does the scatter matrix represent in Linear Discriminant Analysis (LDA)?
A) The within-class scatter
B) The between-class scatter
C) The covariance matrix of the features
D) The mean vectors of each class
Answer: B) The between-class scatter

Which of the following statements about PCA and LDA is true?
A) PCA is a supervised technique, while LDA is unsupervised.
B) LDA is used for feature extraction, while PCA is used for classification.
C) PCA maximizes the variance, while LDA maximizes the class separability.
D) LDA is more suitable for dimensionality reduction in high-dimensional spaces compared to PCA.
Answer: C) PCA maximizes the variance, while LDA maximizes the class separability.

Which method is used to compute the scatter matrices in Linear Discriminant Analysis (LDA)?
A) Covariance matrices
B) Correlation matrices
C) Mean vectors
D) Eigenvalues and eigenvectors
Answer: A) Covariance matrices

Which of the following statements about Kernel PCA is true?

A) Kernel PCA projects data onto a lower-dimensional space by maximizing the variance.
B) Kernel PCA always performs better than PCA for linearly separable datasets.
C) Kernel PCA doesn't require choosing the number of principal components.
D) Kernel PCA is less susceptible to overfitting compared to PCA.
Answer: C) Kernel PCA doesn't require choosing the number of principal components.

Which technique is commonly used for visualization of high-dimensional datasets?
A) PCA
B) LDA
C) Kernel PCA
D) t-SNE
Answer: D) t-SNE

What is the main drawback of using t-SNE for dimensionality reduction?
A) It is computationally expensive for large datasets.
B) It cannot capture linear relationships between variables.
C) It requires labeled data for effective visualization.
D) It is sensitive to the choice of hyperparameters.
Answer: A) It is computationally expensive for large datasets.

What statistical measure describes the central tendency of a dataset?
A) Standard deviation
B) Variance
C) Mean
D) Range
Answer: C) Mean

In a dataset, if a variable has a high standard deviation, what does it indicate?
A) The data points are closely clustered around the mean
B) The data points are spread out from the mean
C) The data points have similar values
D) The data points are missing
Answer: B) The data points are spread out from the mean

What is the purpose of finding the principal components in PCA?
A) To maximize the variance between data points
B) To minimize the variance within classes
C) To project the data onto a lower-dimensional subspace
D) To scale the data points
Answer: C) To project the data onto a lower-dimensional subspace

In the context of PCA, what does the term "orthogonal projections" refer to?
A) Projecting data points onto a space perpendicular to the principal components
B) Transforming data points onto a non-linear subspace
C) Finding the variance-covariance matrix of the dataset
D) Scaling the dataset to have unit variance
Answer: A) Projecting data points onto a space perpendicular to the principal components

Which of the following is an objective of PCA?
A) To minimize the variance between data points
B) To maximize the variance within classes
C) To reduce the dimensionality of the dataset while preserving the variance
D) To maximize the standard deviation of the dataset
Answer: C) To reduce the dimensionality of the dataset while preserving the variance

How are the principal components computed in PCA?
A) By finding the eigenvectors of the covariance matrix of the dataset
B) By calculating the mean of each variable in the dataset
C) By performing a linear regression on the dataset
D) By applying a non-linear transformation to the data
Answer: A) By finding the eigenvectors of the covariance matrix of the dataset

What does the term "explained variance" represent in PCA?
A) The proportion of variance retained after dimensionality reduction
B) The total variance of the original dataset
C) The variance introduced by the noise in the dataset
D) The variance between data points
Answer: A) The proportion of variance retained after dimensionality reduction

In PCA, how are the coordinates of the projected data onto the principal components found?
A) By taking the dot product of the data with the principal components
B) By dividing the data by the eigenvalues of the covariance matrix
C) By applying a sigmoid function to the data
D) By subtracting the mean from the data
Answer: A) By taking the dot product of the data with the principal components

Which step in PCA involves ordering the eigenvalues in descending order?
A) Centering the data
B) Computing the covariance matrix
C) Calculating the explained variance ratio
D) Selecting the principal components
Answer: D) Selecting the principal components

What is the significance of ordering the eigenvalues in PCA?
A) It determines the number of principal components to retain
B) It calculates the variance explained by each principal component
C) It computes the mean of the dataset
D) It scales the dataset to have unit variance
Answer: A) It determines the number of principal components to retain

What is the primary objective of dimensionality reduction using PCA?
A) To increase the number of features in the dataset
B) To improve the interpretability of the data
C) To reduce the computational complexity of the dataset
D) To decrease the variance of the dataset

Answer: B) To improve the interpretability of the data

How does PCA achieve dimensionality reduction?
A) By eliminating noisy data points from the dataset
B) By selecting a subset of features that contribute the most to the variance
C) By transforming the original features into a new set of orthogonal features
D) By clustering similar data points together
Answer: C) By transforming the original features into a new set of orthogonal features

What does each principal component represent in PCA?
A) A feature of the original dataset
B) A linear combination of the original features
C) A measure of the variance in the dataset
D) An outlier in the dataset
Answer: B) A linear combination of the original features

How are the principal components ordered in PCA?
A) In ascending order of eigenvalues
B) In random order
C) In descending order of eigenvalues
D) In alphabetical order
Answer: C) In descending order of eigenvalues

What is the significance of eigenvalues in PCA?
A) They represent the variance explained by each principal component
B) They determine the number of principal components to retain
C) They measure the distance between data points
D) They indicate the presence of outliers in the dataset
Answer: A) They represent the variance explained by each principal component

In PCA, what is the effect of reducing the number of principal components?
A) It increases the dimensionality of the dataset
B) It decreases the interpretability of the dataset
C) It preserves the variance while reducing the dimensionality
D) It increases the computational complexity of the dataset
Answer: C) It preserves the variance while reducing the dimensionality

What is the primary advantage of PCA over other dimensionality reduction techniques?
A) It can handle nonlinear relationships in the data
B) It is computationally efficient for large datasets
C) It does not require labeled data for training
D) It does not make any assumptions about the underlying distribution of the data
Answer: C) It does not require labeled data for training

Which of the following statements is true regarding the principal components in PCA?
A) Each principal component captures a unique aspect of the data
B) The first principal component captures the least amount of variance in the data
C) Principal components are always orthogonal to each other

D) Principal components are not affected by scaling or normalization of the data
Answer: C) Principal components are always orthogonal to each other

What is the main consideration when selecting the number of principal components to retain in PCA?
A) The number of features in the original dataset
B) The computational complexity of the algorithm
C) The amount of variance explained by the retained components
D) The type of machine learning algorithm used for analysis
Answer: C) The amount of variance explained by the retained components

What is the relationship between the original features and the principal components in PCA?
A) Principal components are identical to the original features
B) Principal components are linear combinations of the original features
C) Principal components are nonlinear transformations of the original features
D) Principal components are unrelated to the original features
Answer: B) Principal components are linear combinations of the original features