assignment-2-smartinternz

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0.1 Section A : DataWrangling

0.1.1 1) What is the primary objective of data wrangling?

Ans:) The primary objective of data wrangling is:

b) Data cleaning and transformation**

Data wrangling involves preparing raw data for analysis by cleaning, transforming, and organizing it into a usable format. This includes tasks such as handling missing or erroneous data, removing duplicates, transforming data types, and restructuring data sets. While data visualization, statistical analysis, and machine learning modeling are all downstream tasks that may utilize the wrangled data, the core focus of data wrangling is on preparing the data itself.

0.1.2 2) Explain the technique used to convert categorical data into numerical data. How does it help in data analysis?

Ans) Technique used to convert categorical data into numerical data:

One common technique is Label Encoding, where each category is assigned a unique numerical label. For example, if you have categories like "Red," "Green," and "Blue," they can be encoded as 0, 1, and 2 respectively. This technique helps in data analysis by allowing machine learning algorithms to work with categorical data since many algorithms require numerical inputs. However, care should be taken when using Label Encoding, as the assigned numerical values may imply an ordinal relationship between categories, which may not be appropriate. Another technique is One-Hot Encoding.

0.1.3 3) How does LabelEncoding differ from OneHotEncoding?

Ans) Difference between LabelEncoding and OneHotEncoding:

LabelEncoding: Assigns a unique numerical label to each category. It's suitable for ordinal categorical data where there is an inherent order among categories.

One-Hot Encoding: Creates binary columns for each category, where each column represents one category with a value of 0 or 1. It's suitable for nominal categorical data where there is no order among categories.

0.1.4 4) Describe a commonly used method for detecting outliers in a dataset. Why is it important to identify outliers?

Ans) Commonly used method for detecting outliers in a dataset:

One commonly used method for detecting outliers is through the use of the Interquartile Range (IQR). Outliers are identified as data points that fall below Q1 - 1.5 x IQR or above Q3 + 1.5 x IQR, where Q1 is the first quartile,Q3 is the third quartile, and IQR is the interquartile range (the difference between the third and first quartiles). It's important to identify outliers because they can significantly impact statistical analysis and machine learning models. Outliers may skew the distribution of data, affect the mean and standard deviation, and influence the results of predictive models.

0.1.5 5) Explain how outliers are handled using the Quantile Method.

Ans:) The Quantile Method involves setting thresholds based on the quantiles of the data distribution. Outliers are identified as data points that fall below the lower quantile (e.g., 5th percentile) or above the upper quantile (e.g., 95th percentile). By defining thresholds based on quantiles, this method is less sensitive to extreme values compared to methods like standard deviation or Z-score.

0.1.6 6) Discuss the significance of a Box Plot in data analysis. How does it aid in identifying potential outliers?

Ans) A Box Plot (or Box-and-Whisker Plot) visually summarizes the distribution of a dataset by displaying the median, quartiles, and potential outliers. It aids in data analysis by providing the following information:

Median (Q2): The middle value of the dataset, indicating the central tendency.

Quartiles (Q1 and Q3): The first quartile (25th percentile) and third quartile (75th percentile), representing the spread of the middle 50% of the data.

Interquartile Range (IQR): The range between the first and third quartiles, which provides a measure of data dispersion.

Whiskers: Lines extending from the box that indicate the range of the data, excluding outliers.

Outliers: Individual data points that fall beyond the whiskers, potentially indicating anomalous or extreme values. Box plots help in identifying potential outliers by visually highlighting data points that lie beyond the whiskers, making them useful tools for data exploration and outlier detection.

0.2 Section B: Regression Analysis

0.2.1 7. What type of regression is employed when predicting a continuous target variable?

Ans) Linear Regression is employed when predicting a continuous target variable. Linear regression assumes a linear relationship between the independent variables and the dependent variable.

0.2.2 8) Identify and explain the two main types of regression.

Ans) Two main types of regression:

Linear Regression: Linear regression is a statistical method used to model the relationship between a dependent variable and one or more independent variables. It assumes a linear relationship between the independent and dependent variables.

Non-linear Regression: Non-linear regression is a form of regression analysis in which the relationship between the independent variables and the dependent variable is modeled as a non-linear function. This can include polynomial regression, exponential regression, logarithmic regression, etc.

0.2.3 9) When would you use Simple Linear Regression? Provide an example scenario.

Ans) Simple Linear Regression is used when there is a linear relationship between one independent variable and one dependent variable. It is suitable when you want to predict a continuous target variable based on a single predictor variable.

Example scenario: Predicting house prices based on the square footage of the house. Here, square footage is the independent variable, and house price is the dependent variable.

0.2.4 10) . In Multi Linear Regression, how many independent variables are typically involved?

Ans) Number of independent variables in Multi Linear Regression:

In Multi Linear Regression, there are typically multiple independent variables involved. Hence, the term "multi" indicates the presence of more than one independent variable.

0.2.5 11) When should Polynomial Regression be utilized? Provide a scenario where

Ans) Polynomial Regression should be utilized when the relationship between the independent and dependent variables is non-linear. It is suitable when the data points seem to follow a curved trend rather than a straight line.

Example scenario: Predicting the growth of plants based on time. The growth rate may not be linear over time; instead, it might follow a quadratic or cubic pattern.

0.2.6 12) What does a higher degree polynomial represent in Polynomial Regression? How does it affect the model's complexity?

Ans) A higher degree polynomial in Polynomial Regression represents a more complex relationship between the independent and dependent variables. As the degree of the polynomial increases, the model's complexity increases. Higher-degree polynomials allow the model to fit more intricate patterns in the data but may also lead to overfitting if not carefully controlled.

0.2.7 13) Highlight the key difference between Multi Linear Regression and Polynomial Regression.

Ans) Multi Linear Regression: Involves predicting a continuous target variable based on multiple independent variables, assuming a linear relationship.

Polynomial Regression: Involves predicting a continuous target variable based on one or more independent variables, but allows for non-linear relationships by including polynomial terms of the independent variables.

0.2.8 14) Explain the scenario in which Multi Linear Regression is the most appropriate regression technique.

Ans) Multi Linear Regression is most appropriate when you have multiple independent variables that you believe have a linear relationship with the dependent variable. It's suitable for situations where you want to understand how several factors collectively influence the outcome.

Example scenario: Predicting a student's final exam score based on variables such as study hours, previous exam scores, attendance, and participation.

0.2.9 15) What is the primary goal of regression analysis?

Ans) The primary goal of regression analysis is to understand and quantify the relationship between one or more independent variables and a dependent variable. It aims to predict the value of the dependent variable based on the values of the independent variables.

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