KINGSTON
ENGINEERING COLLEGE

COLLEGE CODE: 5113

APPLIED DATA SCIENCE

Project No.5- COVID -19 VACCINE ANALYSIS

BATCH MEMBERS:

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INTRODUCTION:

Analyzing COVID-19 vaccines is a critical component of the global response to the ongoing pandemic caused by the novel coronavirus, SARS-CoV-2. These vaccines have been developed at an unprecedented pace and are essential tools in controlling the spread of the virus and reducing the severity of the disease. Vaccine analysis involves a multifaceted approach that encompasses various aspects, including efficacy, safety, distribution, public acceptance, and their impact on the pandemic One of the primary aspects of analyzing COVID-19 vaccines is assessing their efficacy and effectiveness.

ABOUT THE DATA:

Where did we get the dataset?

Kaggle:

The dataset provided on Kaggle, https://www.kaggle.com/datasets/gpreda/covid-world-vaccinationprogress,

offers a valuable resource for our project aimed at forecasting covid-19 vaccine analysis.

Dataset Details:

The data (country vaccinations) contains the following information:

Country- this is the country for which the vaccination information is provided;

Country ISO Code - ISO code for the country;

Date - date for the data entry; for some of the dates we have only the daily vaccinations, for others, only the (cumulative) total;

Total number of vaccinations - this is the absolute number of total immunizations in the country;

Total number of people vaccinated - a person, depending on the immunization scheme, will receive one or more (typically 2) vaccines; at a certain moment, the number of vaccination might be larger than the number of people;

Total number of people fully vaccinated - this is the number of people that received the entire set of immunization according to the immunization scheme (typically 2); at a certain moment in time, there might be a certain number of people that received one vaccine

and another number (smaller) of people that received all vaccines in the scheme;

BEGINNING WITH THE PROJECT

To begin building a project for air quality analysis and prediction, we first need to load the dataset.

We have a dataset file in a common format like CSV, here are the steps to load the dataset:

1.Importing the required Libraries(data.csv):

In this step, we import the necessary Python libraries and modules to work with our data and perform various data processing and machine learning tasks.

```
import pandas as pd
import numpy as np
from sklearn.preprocessing import Imputer
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.preprocessing import OneHotEncoder
```

2.Importing the data set(read data set; create matrix):

This step involves loading our dataset into memory. We use libraries like pandas to read data from a CSV file or other formats. After loading, we create a feature matrix (often denoted as X) and a target vector (often denoted as Y).

```
dataset =
    pd.read_csv('"C:\Users\haris\OneDrive\Documents\country_wise_latest.csv"')
X = dataset.iloc[:, :-1].values
Y = dataset.iloc[:,-1].values
```

3.Handling the Missing Data.(sklearn.preprocessing library contains class called imputer, helps in missing data):

Datasets often have missing values. The sklearn.preprocessing.Imputer class is used to address this issue. You can specify a strategy for imputing missing values, such as replacing them with the mean, median, or mode of the column.

```
imputer = Imputer(missing_values='NaN', strategy='mean',
    axis=0)
imputer = imputer.fit(X[:, columns_with_missing_data])
X[:, columns_with_missing_data] = imputer.transform(X[:,
    columns_with_missing_data])
```

4.Encoding Categorical Data.(one-hot encoding):

One-hot encoding is a technique used to convert categorical data into a numerical format. Each category becomes a binary feature (0 or 1) in a new column, making it suitable for machine learning algorithms.

```
Encode=OneHotEncode(categoricalfeatures=categoricalcolumn)
X = encode.fit_transform(X).toarray()
```

5.Splitting the data set into test set and training set.(import train train_test_split)(X_train,X_test, Y_train,Y_test):

Before building a machine learning model, it's essential to divide our dataset into two sets: a training set and a test set. The training set is used to train the model, while the test set is used to evaluate its performance.

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y,
    test_size=0.2, random_state=0)
```

6.Feature Scaling.(import StandardScaler):

Feature scaling ensures that all features have the same scale, typically with a mean of 0 and a standard deviation of 1.

```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

PREPROCESSING THE DATASET:

Preprocessing of data in a dataset refers to the various techniques and operations applied to the data before using it for analysis, modeling, Here's a more detailed explanation of data preprocessing within the context of a dataset:

1. Data Cleaning:

Handling Missing Values: Identify and deal with missing data, which may involve filling in missing values, removing rows with missing data, or using imputation techniques.

Dealing with Duplicates: Detect and remove duplicate records to ensure data integrity.

2. Data Transformation:

Feature Scaling: Normalize or standardize numerical features to bring them to a similar scale. This is important for algorithms sensitive to feature scales.

Feature Encoding: Convert categorical variables into a numerical format using techniques like one-hot encoding or label encoding.

Feature Engineering: Create new features or modify existing ones to capture relevant information and patterns in the data.

Binning: Group continuous data into bins or categories to simplify analysis.

Log Transformation: Apply logarithmic transformations to features when necessary to make their distribution more normal.

3. Data Reduction:

Dimensionality Reduction: Reduce the number of features, often using techniques like Principal Component Analysis (PCA) or feature selection to select the most relevant variables.

Outlier Detection and Handling: Identify and deal with outliers, which can distort analysis and modeling results.

PERFORMING DIFFERENT ANALYSIS:

Performing different types of analysis on a dataset depends on the goals of your analysis and the nature of the data. Here are some common types of analysis that you might perform on a dataset:

Descriptive Analysis:

Summarize and describe the main characteristics of the dataset, including measures of central tendency, dispersion, and visualizations such as histograms, box plots, and bar charts.

Exploratory Data Analysis (EDA):

Explore the dataset to uncover patterns, relationships, and anomalies.

Visualize data using scatter plots, heatmaps, and correlation matrices.

Identify potential outliers and trends.

Statistical Analysis:

Conduct hypothesis testing and statistical inference to make inferences about the data.

Perform t-tests, ANOVA, chi-squared tests, and other statistical tests as appropriate.

Code:

Analyzing a COVID-19 dataset involves various tasks such as loading data, cleaning it, visualizing trends, and performing statistical analysis. Here's a Python code example that demonstrates how to perform basic COVID-19 data analysis using a sample dataset. You can adjust this code to work with your specific COVID-19 dataset:

```
import pandas as pd
import matplotlib.pyplot as plt

url = "https://www.kaggle.com/datasets/gpreda/covid-world-vaccination-progress"
covid_data = pd.read_csv(url)
covid_data = covid_data.transpose()
covid_data.columns = covid_data.iloc[0]
covid_data = covid_data[1:]
covid_data.index = pd.to_datetime(covid_data.index)
countries_to_analyze = ['US', 'India', 'China']
covid_data = covid_data[countries_to_analyze]
plt.figure(figsize=(12, 6))
for country in countries_to_analyze:
    plt.plot(covid_data.index, covid_data[country], label=country)

plt.xlabel('Date')
plt.ylabel('Confirmed Cases')
plt.title('COVID-19 Daily Confirmed Cases')
plt.legend()
plt.grid(True)
plt.show()
```

CONCLUSION:

In our analysis of the COVID-19 vaccine dataset, we have examined various aspects of vaccine distribution, effectiveness, and public response.

Our analysis revealed that vaccine distribution efforts have been substantial, with a significant number of vaccine doses administered worldwide. This has contributed to the global effort to control the spread of COVID-19.