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Analyze Covid Vaccination Progress Using Python

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crown iconAkshay Gupta — Updated On August 31st, 2022

Beginner Data Visualization Python

This article was published as a part of the Data Science Blogathon

Introduction

Hello Readers!!

Covid-19 has affected our lives very much in very accepts it could be economical, mentally, etc. In this blog, we are going to explore how the vaccination drive is going around the world. For the past 1 year, we have been hoping for vaccines so that we can enjoy our life as we were doing before.

Hope this vaccination drive will help millions of people and save them. We are going to first read the dataset, then clean and draw some beautiful visuals.

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Dataset

covid 19 vaccination

Image Source

IMPORT LIBRARIES

For analyzing data, we need some libraries. In this section, we are importing all the required libraries like pandas, NumPy, matplotlib, plotly, seaborn, and word cloud that are required for data analysis. Check the below code to import all the required libraries.

```python
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import plotly.express as px

import plotly.graph_objects as go

import matplotlib.patches as mpatches

from plotly.subplots import make_subplots

from wordcloud import WordCloud

import seaborn as sns

sns.set(color_codes = True)

sns.set(style="whitegrid")
```

import plotly.figure_factory as ff

from plotly.colors import n_colors

READ DATA AND BASIC INFORMATION

Read the CSV file using pandas read_csv() function and show the output using head() function.

 Covid Vaccination Progress | dataset head

Observation:

Dataset has columns like country, iso_code, date, total_vaccinations, people_vaccinated, people_fully vaccinated, etc. An initial look at the above table shows that data has null values too. We will deal with null values later.

info() function is used to get the overview of data like data type of feature, a number of null values in each column, and many more.

df.info()

info dataset

Observation:

The above picture shows that there are many null values in our dataset. We will deal with these null values later in this blog. There are two data types as seen from the table object means string and float.

The below function is used to get the total count of null values in each feature.

df.isnull().sum()

finding missing values | Covid Vaccination Progress

Observation:

The below picture shows tables like country, date, vaccines, source_name has 0 null values. Features like people_fully_vaccinated have a maximum of 2866 null values.

DATA CLEANING

Dataset has many null values as we have seen before. To get rid of it we need to clean the data first, After cleaning we will perform our further analysis. For cleaning the dataset we will perform many steps. Some of these steps are shown below

Handling and Filling null values

Change the data type of features

Handling strings like splitting.

Check the below code for all the data cleaning that we are performing here:

df.fillna(value = 0, inplace = True)

df.total_vaccinations = df.total_vaccinations.astype(int)

df.people_vaccinated = df.people_vaccinated.astype(int)

df.people_fully_vaccinated = df.people_fully_vaccinated.astype(int)

df.daily_vaccinations_raw = df.daily_vaccinations_raw.astype(int)

df.daily_vaccinations = df.daily_vaccinations.astype(int)

```
df.total_vaccinations_per_hundred = df.total_vaccinations_per_hundred.astype(int)

df.people_fully_vaccinated_per_hundred = df.people_fully_vaccinated_per_hundred.astype(int)

df.daily_vaccinations_per_million = df.daily_vaccinations_per_million.astype(int)

df.people_vaccinated_per_hundred = df.people_vaccinated_per_hundred.astype(int)

date = df.date.str.split('-', expand =True)

date

date split

df['year'] = date[0]

df['month'] = date[1]

df['day'] = date[2]

df.year = pd.to_numeric(df.year)

df.month = pd.to_numeric(df.month)

df.day = pd.to_numeric(df.day)

df.date = pd.to_datetime(df.date)

df.head()
```

to datetime conversion

SOME FEATURES

Let's get some details about our features using the below code

print('Data point starts from ',df.date.min(),'n')

print('Data point ends at ',df.date.max(),'n')

print('Total no of countries in the data set ',len(df.country.unique()),'n')

print('Total no of unique vaccines in the data set ',len(df.vaccines.unique()),'n')

features| Covid Vaccination Progress

Observation

Data points start from 2020-12-08

Data points end at 2021-02-28

Total Number of countries in the data set = 117

Total Number of Unique Vaccines in the data set = 22

df.info()

info of clean data

DATA VISUALIZATION

In this section, we are going to draw some visuals to get insights from our dataset. So let's started.

describe() function in pandas used to get the statistics of each feature present in our dataset. Some of the information we get include count, max, min, standard deviation, median, etc.

df.describe()

 Covid Vaccination Progress | describe dataset

unique() function in pandas helps to get unique values present in the feature.

df.country.unique()

Unique country values

```
def size(m,n):
    fig = plt.gcf();
    fig.set_size_inches(m,n);
```

Word Art of Countries

Word Cloud is a unique way to get information from our dataset. The words are shown in the form of art where the size proportional depends on how much the particular word repeated in the dataset. This is made by using the WordCloud library. Check the below code on how to draw word cloud

```
wordCloud = WordCloud(
    background_color='white',
    max_font_size = 50).generate(' '.join(df.country))
```

plt.figure(figsize=(15,7))

plt.axis('off')

plt.imshow(wordCloud)

plt.show()

 Covid Vaccination Progress | wordart countries

Total Vaccinated Till Date

In this section, we are going to see how many total vaccines have been used in each country. Check the below code for more information. The data shows the United States has administrated most vaccines in the world followed by China, United Kingdom, England, India and at the last some countries includes Saint Helena, San Marino has 0 vaccination.

```python
country_wise_total_vaccinated = {}

for country in df.country.unique() :

    vaccinated = 0

    for i in range(len(df)) :

        if df.country[i] == country :

            vaccinated += df.daily_vaccinations[i]

    country_wise_total_vaccinated[country] = vaccinated
# made a seperate dict from the df

    country_wise_total_vaccinated_df = pd.DataFrame.from_dict(country_wise_total_vaccinated,

                                orient='index',

                                columns = ['total_vaccinted_till_date'])
# converted dict to df

country_wise_total_vaccinated_df.sort_values(by = 'total_vaccinted_till_date', ascending = False, inplace = True)

country_wise_total_vaccinated_df
```

Total vaccinated

```python
fig = px.bar(country_wise_total_vaccinated_df,

        y = 'total_vaccinted_till_date',

        x = country_wise_total_vaccinated_df.index,

        color = 'total_vaccinted_till_date',
```

```python
        color_discrete_sequence= px.colors.sequential.Viridis_r

    )

fig.update_layout(

    title={

        'text' : "Vaccination till date in various countries",

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Countries",

    yaxis_title="Total vaccinated",

    legend_title="Total vaccinated"

)

fig.show()
```

vaccination till date in different countries | Covid Vaccination Progress

Observation

The United States has administrated most vaccines in the world followed by China, United Kingdom, England, India

Countries include Saint Helena, San Marino has 0 vaccination.

Country Wise Daily Vaccination

To check what is the vaccination trend in each country, check the below code. We are drawing the line plot where the x-axis is the date and the y-axis is the count of daily vaccination, Colours Is set to be the country.

```python
fig = px.line(df, x = 'date', y ='daily_vaccinations', color = 'country')

fig.update_layout(

    title={

        'text' : "Daily vaccination trend",

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Date",

    yaxis_title="Daily Vaccinations"

)

fig.show()
```

 Covid Vaccination Progress | daily vaccination trend

Observation:

There is a mixed kind of trend among each country. Sometimes a particular country shows a positive trend and sometimes it shows a negative trend.

Plot Till Date Function

helper function

```python
def plot_till_date(value1, value2, title, color1, color2) :

    so_far_dict = {}

    for dates in df.date.unique() :

        so_far_dict[dates], value1_count, value2_count = [], 0, 0

        for i in range(len(df)) :

            if df.date[i] == dates :

                value1_count += df[value1][i]

                value2_count += df[value2][i]

# if dates not in so_far_dict.keys() :

        so_far_dict[dates].append(value1_count)

        so_far_dict[dates].append(value2_count)

    so_far_df = pd.DataFrame.from_dict(so_far_dict, orient = 'index', columns=[value1, value2])

    so_far_df.reset_index(inplace = True)

# return so_far_df

    so_far_df.sort_values(by='index', inplace = True)

    plot = go.Figure(data=[go.Scatter(

        x = so_far_df['index'],

        y = so_far_df[value1],

        stackgroup='one',

        name = value1,
```

```
        marker_color= color1),

            go.Scatter(

    x = so_far_df['index'],

    y = so_far_df[value2],

    stackgroup='one',

    name = value2,

    marker_color= color2)

  ])

 plot.update_layout(

 title={

    'text' : title,

    'y':0.95,

    'x':0.5

  },

  xaxis_title="Date"

 )

 return plot.show()
```

People vaccinated vs people fully vaccinated in the world :

In this section, let's analyze how many people vaccinated vs the people which are fully vaccinated in the world. We are drawing a kind of curve where the x-axis is Date and the y-axis is the count of people that are fully vaccinated in the world

plot_till_date('people_fully_vaccinated', 'people_vaccinated','People vaccinated vs Fully vaccinated till date', '#c4eb28', '#35eb28')

people vaccinated vs fully vaccinated

Observation

People fully vaccinated in the world is around 50 million

People that are vaccinated in the world is around 50 million

The People vaccinated vs people fully vaccinated per hundred in the world

In this section, let's analyze how many people vaccinated vs the people which are fully vaccinated in the world per hundred. We are drawing a kind of curve where the x-axis is Date and the y-axis is the count of people that are fully vaccinated in the world per hundred

plot_till_date('people_fully_vaccinated_per_hundred', 'people_vaccinated_per_hundred', 'People vaccinated vs Fully vaccinated per hundred till date', '#0938e3','#7127cc')

people vaccinated vs fully vaccinated | covid vaccination progress

Observation

People fully vaccinated in the world per hundred is around 2

People that are vaccinated in the world is around 7

Pie-Plot

In this section, we are going to draw pip-plots. For more details check the below code:

```python
def plot_pie(value, title, color) :

    new_dict = {}

    for v in df[value].unique() :

        value_count = 0

        for i in range(len(df)) :

            if df[value][i] == v :

                value_count += 1

        new_dict[v] = value_count
# print(new_dict)
    new_df = pd.DataFrame.from_dict(new_dict, orient = 'index', columns = ['Total'])

    if color == 'plasma' :

        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,

                title = title,

                color_discrete_sequence=px.colors.sequential.Plasma)

    elif color == 'rainbow' :

        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,
```

```python
            title = title,

                color_discrete_sequence=px.colors.sequential.Rainbow)
    else :

        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,

                title = title)
    fig.update_layout(

        title={

            'y':0.95,

            'x':0.5

        },

        legend_title = value

    )

    return fig.show()

    plot_pie('vaccines', 'Various vaccines and their uses', 'plasma')
```

pie plot| covid vaccination progress

Most Used Vaccine

Let's see what all vaccines are used in the different part of the world:

```python
df.vaccines.unique()
```

unique vaccines

Word art of Vaccines

Word Cloud is a unique way to get information from our dataset. The words are shown in the form of art where the size proportional depends on how much the particular word repeated in the dataset. This is made by using the WordCloud library. Check the below code on how to draw word cloud

```
wordCloud = WordCloud(

    background_color='white',

    max_font_size = 50).generate(' '.join(df.vaccines))

plt.figure(figsize=(12,5))

plt.axis('off')

plt.imshow(wordCloud)

plt.show()
```

wordcloud vaccines

Daily vaccination trend per million

In this section, we will what is the trend of vaccination per million. We are going to draw a line plot where the x-axis is Date and the y-axis is daily vaccination per million. Check the below code for more information:

```
fig = px.line(df, x = 'date', y ='daily_vaccinations_per_million', color = 'country')

fig.update_layout(

    title=
```

```
        'text' : "Daily vaccination trend per million",

            'y':0.95,

            'x':0.5

        },

    xaxis_title="Date",

    yaxis_title="Daily Vaccinations per million"

)

fig.show()
```

covid vaccination progress | daily vaccination trend per million

Observation

Seychelles and Israel has the highest number of vaccinations per million

On 10th Jan Gibraltar has the highest vaccination per million

Total vaccinated – India vs the USA

In this section, we will see what is the trend of vaccination among two great countries India and the USA. We are going to draw a line plot where the x-axis is Date and the y-axis is daily vaccination. Check the below code for more information:


```
india_usa = [df[df.country == 'United States'], df[df.country == 'India']]

result = pd.concat(india_usa)

fig = px.line(result, x = 'date', y ='total_vaccinations', color = 'country')
```

```python
fig.update_layout(

    title={

        'text' : "Total vaccinated - India vs USA",

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Date",

    yaxis_title="Total Vaccinations"

)

fig.show()
```

total vaccinated India vs USA

Observation

The USA has started vaccination drive very early

India is moving quite steadily despite it has started vaccination late.

MAPS

In this section, we are going to see how vaccinations are going in different countries using maps. The colour signifies how many people have been vaccinated. Check the below maps for more details.

Most vaccinated country

plot_map('total_vaccinations','Most vaccinated country', None)

most vaccinated countries

Vaccines Used in Different countries

plot_map('vaccines','Vaccines Used in Different countries', None)

vaccines used in different countries

People fully vaccinated in Different countries

plot_map('people_fully_vaccinated','People fully vaccinated in Different countries', 'haline')

people fully vaccinated in different countries

Key Observations:

Sputnik V is mostly used In Asia, Africa, and South America

Most of the countries are not fully vaccinated

Modena and Pfizer are mostly used in North America and Europe

Pfizer/BioNTech are mostly used in the world, its around 47.6%

Covishield and Covaxin are in the 10th position

China has started Mass VaAnalytics Vidhya

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Hope this vaccination drive will help millions of people and save them. We are going to first read the dataset, then clean and draw some beautiful visuals.

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Dataset

covid 19 vaccination

Image Source

IMPORT LIBRARIES

For analyzing data, we need some libraries. In this section, we are importing all the required libraries like pandas, NumPy, matplotlib, plotly, seaborn, and word cloud that are required for data analysis. Check the below code to import all the required libraries.

```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import plotly.express as px

import plotly.graph_objects as go

import matplotlib.patches as mpatches

from plotly.subplots import make_subplots

from wordcloud import WordCloud

import seaborn as sns

sns.set(color_codes = True)

sns.set(style="whitegrid")

import plotly.figure_factory as ff

from plotly.colors import n_colors
```

READ DATA AND BASIC INFORMATION

Read the CSV file using pandas read_csv() function and show the output using head() function.

 Covid Vaccination Progress | dataset head

Observation:

Dataset has columns like country, iso_code, date, total_vaccinations, people_vaccinated, people_fully vaccinated, etc. An initial look at the above table shows that data has null values too. We will deal with null values later.

info() function is used to get the overview of data like data type of feature, a number of null values in each column, and many more.

df.info()

info dataset

Observation:

The above picture shows that there are many null values in our dataset. We will deal with these null values later in this blog. There are two data types as seen from the table object means string and float.

The below function is used to get the total count of null values in each feature.

df.isnull().sum()

finding missing values | Covid Vaccination Progress

Observation:

The below picture shows tables like country, date, vaccines, source_name has 0 null values. Features like people_fully_vaccinated have a maximum of 2866 null values.

DATA CLEANING

Dataset has many null values as we have seen before. To get rid of it we need to clean the data first, After cleaning we will perform our further analysis. For cleaning the dataset we will perform many steps. Some of these steps are shown below

Handling and Filling null values

Change the data type of features

Handling strings like splitting.

Check the below code for all the data cleaning that we are performing here:

df.fillna(value = 0, inplace = True)

df.total_vaccinations = df.total_vaccinations.astype(int)

df.people_vaccinated = df.people_vaccinated.astype(int)

df.people_fully_vaccinated = df.people_fully_vaccinated.astype(int)

df.daily_vaccinations_raw = df.daily_vaccinations_raw.astype(int)

df.daily_vaccinations = df.daily_vaccinations.astype(int)

df.total_vaccinations_per_hundred = df.total_vaccinations_per_hundred.astype(int)

df.people_fully_vaccinated_per_hundred = df.people_fully_vaccinated_per_hundred.astype(int)

```python
df.daily_vaccinations_per_million = df.daily_vaccinations_per_million.astype(int)

df.people_vaccinated_per_hundred = df.people_vaccinated_per_hundred.astype(int)

date = df.date.str.split('-', expand =True)

date

date split

df['year'] = date[0]

df['month'] = date[1]

df['day'] = date[2]

df.year = pd.to_numeric(df.year)

df.month = pd.to_numeric(df.month)

df.day = pd.to_numeric(df.day)

df.date = pd.to_datetime(df.date)

df.head()
```

to datetime conversion

SOME FEATURES

Let's get some details about our features using the below code


```python
print('Data point starts from ',df.date.min(),'n')
```

print('Data point ends at ',df.date.max(),'n')

print('Total no of countries in the data set ',len(df.country.unique()),'n')

print('Total no of unique vaccines in the data set ',len(df.vaccines.unique()),'n')

features| Covid Vaccination Progress

Observation

Data points start from 2020-12-08

Data points end at 2021-02-28

Total Number of countries in the data set = 117

Total Number of Unique Vaccines in the data set = 22

df.info()

info of clean data

DATA VISUALIZATION

In this section, we are going to draw some visuals to get insights from our dataset. So let's started.

describe() function in pandas used to get the statistics of each feature present in our dataset. Some of the information we get include count, max, min, standard deviation, median, etc.

df.describe()

 Covid Vaccination Progress | describe dataset

unique() function in pandas helps to get unique values present in the feature.

df.country.unique()

Unique country values

```python
def size(m,n):

    fig = plt.gcf();

    fig.set_size_inches(m,n);
```

Word Art of Countries

Word Cloud is a unique way to get information from our dataset. The words are shown in the form of art where the size proportional depends on how much the particular word repeated in the dataset. This is made by using the WordCloud library. Check the below code on how to draw word cloud

```python
wordCloud = WordCloud(

    background_color='white',

    max_font_size = 50).generate(' '.join(df.country))

plt.figure(figsize=(15,7))

plt.axis('off')

plt.imshow(wordCloud)

plt.show()
```

 Covid Vaccination Progress | wordart countries

Total Vaccinated Till Date

In this section, we are going to see how many total vaccines have been used in each country. Check the below code for more information. The data shows the United States has administrated most vaccines in the world followed by China, United Kingdom, England, India and at the last some countries includes Saint Helena, San Marino has 0 vaccination.


```python
country_wise_total_vaccinated = {}
```

```python
for country in df.country.unique() :

    vaccinated = 0

    for i in range(len(df)) :

        if df.country[i] == country :

            vaccinated += df.daily_vaccinations[i]

    country_wise_total_vaccinated[country] = vaccinated
# made a seperate dict from the df

    country_wise_total_vaccinated_df = pd.DataFrame.from_dict(country_wise_total_vaccinated,

                                orient='index',

                                columns = ['total_vaccinted_till_date'])
# converted dict to df

country_wise_total_vaccinated_df.sort_values(by = 'total_vaccinted_till_date', ascending = False, inplace = True)

country_wise_total_vaccinated_df

Total vaccinated

fig = px.bar(country_wise_total_vaccinated_df,

        y = 'total_vaccinted_till_date',

        x = country_wise_total_vaccinated_df.index,

        color = 'total_vaccinted_till_date',

        color_discrete_sequence= px.colors.sequential.Viridis_r

        )
```

```python
fig.update_layout(

    title={

        'text' : "Vaccination till date in various countries",

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Countries",

    yaxis_title="Total vaccinated",

    legend_title="Total vaccinated"

)

fig.show()
```

vaccination till date in different countries | Covid Vaccination Progress

Observation

The United States has administrated most vaccines in the world followed by China, United Kingdom, England, India

Countries include Saint Helena, San Marino has 0 vaccination.

Country Wise Daily Vaccination

To check what is the vaccination trend in each country, check the below code. We are drawing the line plot where the x-axis is the date and the y-axis is the count of daily vaccination, Colours Is set to be the country.

```python
fig = px.line(df, x = 'date', y ='daily_vaccinations', color = 'country')
```

```python
fig.update_layout(

    title={

        'text' : "Daily vaccination trend",

        'y':0.95,

        'x':0.5

      },

    xaxis_title="Date",

    yaxis_title="Daily Vaccinations"

)

fig.show()
```

 Covid Vaccination Progress | daily vaccination trend

Observation:

There is a mixed kind of trend among each country. Sometimes a particular country shows a positive trend and sometimes it shows a negative trend.

Plot Till Date Function


```python
# helper function

def plot_till_date(value1, value2, title, color1, color2) :

    so_far_dict = {}
```

```python
    for dates in df.date.unique() :

        so_far_dict[dates], value1_count, value2_count = [], 0, 0

        for i in range(len(df)) :

            if df.date[i] == dates :

                value1_count += df[value1][i]

                value2_count += df[value2][i]

# if dates not in so_far_dict.keys() :

        so_far_dict[dates].append(value1_count)

        so_far_dict[dates].append(value2_count)

    so_far_df = pd.DataFrame.from_dict(so_far_dict, orient = 'index', columns=[value1, value2])

    so_far_df.reset_index(inplace = True)

# return so_far_df

    so_far_df.sort_values(by='index', inplace = True)

    plot = go.Figure(data=[go.Scatter(

            x = so_far_df['index'],

            y = so_far_df[value1],

            stackgroup='one',

            name = value1,

            marker_color= color1),

                    go.Scatter(
```

```python
        x = so_far_df['index'],

        y = so_far_df[value2],

        stackgroup='one',

        name = value2,

        marker_color= color2)

    ])

    plot.update_layout(

    title={

        'text' : title,

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Date"

    )

    return plot.show()
```

People vaccinated vs people fully vaccinated in the world :

In this section, let's analyze how many people vaccinated vs the people which are fully vaccinated in the world. We are drawing a kind of curve where the x-axis is Date and the y-axis is the count of people that are fully vaccinated in the world

```python
plot_till_date('people_fully_vaccinated', 'people_vaccinated','People vaccinated vs Fully vaccinated till date', '#c4eb28', '#35eb28')
```

people vaccinated vs fully vaccinated

Observation

People fully vaccinated in the world is around 50 million

People that are vaccinated in the world is around 50 million

The People vaccinated vs people fully vaccinated per hundred in the world

In this section, let's analyze how many people vaccinated vs the people which are fully vaccinated in the world per hundred. We are drawing a kind of curve where the x-axis is Date and the y-axis is the count of people that are fully vaccinated in the world per hundred

```
plot_till_date('people_fully_vaccinated_per_hundred', 'people_vaccinated_per_hundred', 'People vaccinated vs Fully vaccinated per hundred till date', '#0938e3','#7127cc')
```

people vaccinated vs fully vaccinated | covid vaccination progress

Observation

People fully vaccinated in the world per hundred is around 2

People that are vaccinated in the world is around 7

Pie-Plot

In this section, we are going to draw pip-plots. For more details check the below code:

```python
def plot_pie(value, title, color) :

    new_dict = {}

    for v in df[value].unique() :

        value_count = 0

        for i in range(len(df)) :

            if df[value][i] == v :

                value_count += 1

        new_dict[v] = value_count

# print(new_dict)

    new_df = pd.DataFrame.from_dict(new_dict, orient = 'index', columns = ['Total'])

    if color == 'plasma' :

        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,

                title = title,

                color_discrete_sequence=px.colors.sequential.Plasma)

    elif color == 'rainbow' :

        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,

                title = title,

                color_discrete_sequence=px.colors.sequential.Rainbow)
```

```python
    else :
        fig = px.pie(new_df, values= 'Total',

                names = new_df.index,

                title = title)
    fig.update_layout(

        title={

            'y':0.95,

            'x':0.5

        },

        legend_title = value

    )

    return fig.show()

    plot_pie('vaccines', 'Various vaccines and their uses', 'plasma')
```

pie plot| covid vaccination progress

Most Used Vaccine

Let's see what all vaccines are used in the different part of the world:

```python
df.vaccines.unique()
```

unique vaccines

Word art of Vaccines

Word Cloud is a unique way to get information from our dataset. The words are shown in the form of art where the size proportional depends on how much the particular word repeated in the dataset. This is made by using the WordCloud library. Check the below code on how to draw word cloud

```
wordCloud = WordCloud(

    background_color='white',

    max_font_size = 50).generate(' '.join(df.vaccines))

plt.figure(figsize=(12,5))

plt.axis('off')

plt.imshow(wordCloud)

plt.show()
```

wordcloud vaccines

Daily vaccination trend per million

In this section, we will what is the trend of vaccination per million. We are going to draw a line plot where the x-axis is Date and the y-axis is daily vaccination per million. Check the below code for more information:

```
fig = px.line(df, x = 'date', y ='daily_vaccinations_per_million', color = 'country')

fig.update_layout(

    title=

        'text' : "Daily vaccination trend per million",

        'y':0.95,
```

```
        'x':0.5
      },
   xaxis_title="Date",
   yaxis_title="Daily Vaccinations per million"
)
fig.show()
```

covid vaccination progress | daily vaccination trend per million

Observation

Seychelles and Israel has the highest number of vaccinations per million

On 10th Jan Gibraltar has the highest vaccination per million

Total vaccinated – India vs the USA

In this section, we will see what is the trend of vaccination among two great countries India and the USA. We are going to draw a line plot where the x-axis is Date and the y-axis is daily vaccination. Check the below code for more information:

```
india_usa = [df[df.country == 'United States'], df[df.country == 'India']]

result = pd.concat(india_usa)

fig = px.line(result, x = 'date', y ='total_vaccinations', color = 'country')

fig.update_layout(
   title={
```

```
        'text' : "Total vaccinated - India vs USA",

        'y':0.95,

        'x':0.5

    },

    xaxis_title="Date",

    yaxis_title="Total Vaccinations"

)

fig.show()
```

total vaccinated India vs USA

Observation

The USA has started vaccination drive very early

India is moving quite steadily despite it has started vaccination late.

MAPS

In this section, we are going to see how vaccinations are going in different countries using maps. The colour signifies how many people have been vaccinated. Check the below maps for more details.

Most vaccinated country

plot_map('total_vaccinations','Most vaccinated country', None)

most vaccinated countries

Vaccines Used in Different countries

plot_map('vaccines','Vaccines Used in Different countries', None)

vaccines used in different countries

People fully vaccinated in Different countries

plot_map('people_fully_vaccinated','People fully vaccinated in Different countries', 'haline')

people fully vaccinated in different countries

Key Observations:

Sputnik V is mostly used In Asia, Africa, and South America

Most of the countries are not fully vaccinated

Modena and Pfizer are mostly used in North America and Europe

Pfizer/BioNTech are mostly used in the world, its around 47.6%

Covishield and Covaxin are in the 10th position

China has started Mass Vaccination first

Daily vaccination is highest in the USA thought the USA has started vaccination late as compared to China

End Notes

So in this article, we had a detailed discussion on Covid Vaccination Progress. Hope you learn something from this blog and it will help you in the future. Thanks for reading and your patience. Good luck!ccination first

Daily vaccination is highest in the USA thought the USA has started vaccination late as compared to China

End Notes

So in this article, we had a detailed discussion on Covid Vaccination Progress. Hope you learn something from this blog and it will help you in the future. Thanks for reading and your patience. Good luck!