FINAL GROUP PROJECT REPORT

Partial fulfilment for the award of the

Post Graduate Certification

in Data Analytics for Engineers

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SUBMITTED BY:

Amal Kannan

Hari Sankar

Himali Patkar

Sumayya PP

Yashvardhan Rana

Under the Guidance of

Miss.Shalini Kumari

Technical Trainer

Edubridge

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Edubridge India

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EduBridge

AKNOWLEDGMENT

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ABSTRACT

In this report, we completed the analysis of a single dataset of vaccination data using 5 tools . We got dataset from Kaggle .This vaccination data contains covid vaccination details of India in 202.

Tools used

- Python
- R
- Excel
- Tableau
- SAS

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CONTENTS

1.INTRODUCTION

A COVID-19 vaccine is a vaccine intended to provide acquired immunity against COVID-19.Prior to the COVID-19 pandemic, work to develop a vaccine against the coronavirus diseases .This dataset contains latest Covid-19 India state-wise vaccination data as on August 7, 2021. This dataset can be used to analyze covid condition in India. This dataset is great for Exploratory Data Analysis.

Dataset Columns :

- State
- Total cases
- active cases
- Discharged cases
- Deaths
- Total vaccination doses
- Dose 1
- Dose 2

2. ANALYSIS

2. 1. PYTHON

Jupyter notebook is used for analysis of data set. Firstly, import all libraries. Then read the data set and done EDA analysis. Then done Machine learning. We used linear regression for ML approach.

import libraries

```
In [99]: import pandas as pd
         import numpy as np
         import matplotlib.pyplot as plt
         import seaborn as sns
         import warnings
         warnings.filterwarnings("ignore")
```

read file

```
In [100]: d=pd.read_csv("C:/Users/AJAS AJ7/Desktop/Sumayya\Kaggle Datsets/vaccination_data_latest.csv")
```

view data

```
In [101]: d
```

Out[101]:

	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	308179	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	23390769	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	868372	685988	182384
3	Assam	572546	11719	555470	5357	12089630	9977914	2111716
4	Bihar	725122	357	715119	9646	26796305	22501851	4294454
5	Chandigarh	61970	27	61132	811	892796	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	12448461	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	653551	576133	77418
8	Delhi	1436623	516	1411042	25065	10559677	7684071	2875606
9	Goa	171705	992	167556	3157	1370190	1081299	288891

Set the index

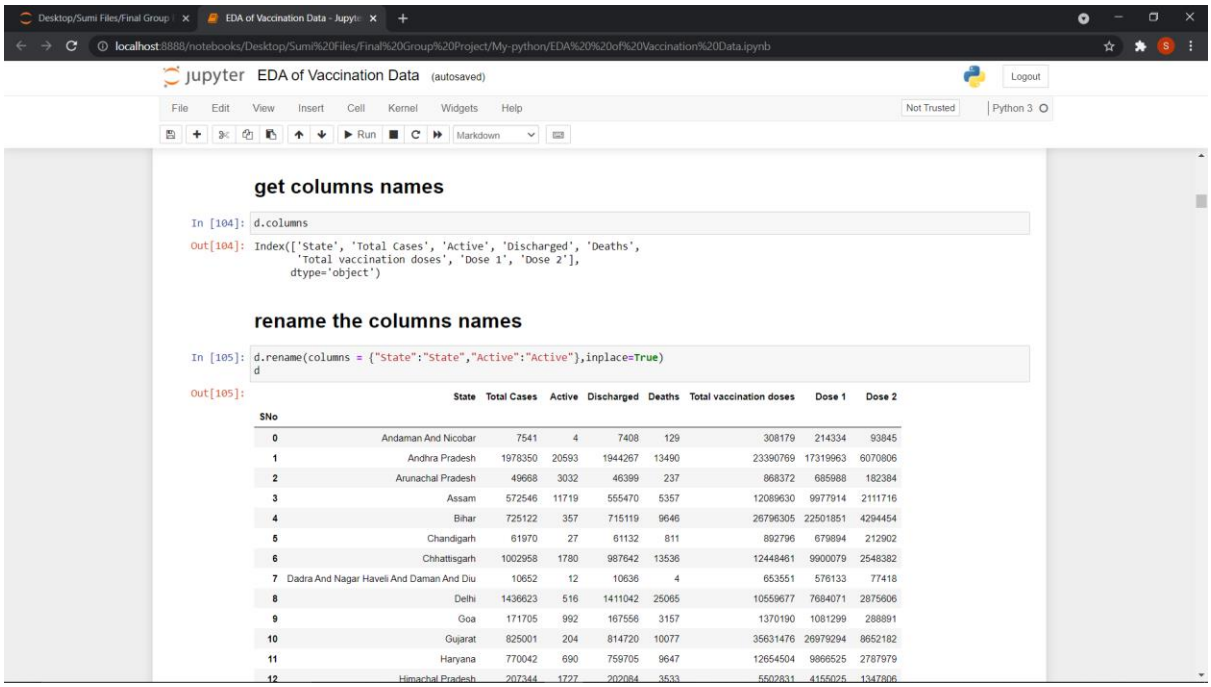
```
In [102]: #d.set_index("name")
```

give index a name

```
In [103]: d.index.name = "SNo"
          d
```

Out[103]:

SNo	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	308179	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	23390769	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	868372	685988	182384
3	Assam	572546	11719	555470	5357	12089630	9977914	2111716
4	Bihar	725122	357	715119	9646	26796305	22501851	4294454
5	Chandigarh	61970	27	61132	811	892796	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	12448461	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	653551	576133	77418
8	Delhi	1436623	516	1411042	25065	10559677	7684071	2875606
9	Goa	171705	992	167556	3157	1370190	1081299	288891
10	Gujarat	825001	204	814720	10077	35631476	26979294	8652182
11	Haryana	770042	690	759705	9647	12654504	9866525	2787979
12	Himachal Pradesh	207344	1727	202084	3533	5502831	4155025	1347806
13	Jammu And Kashmir	322286	1404	316496	4386	6603777	5175592	1428185
14	Jharkhand	347336	226	341980	5130	10094104	8159801	1934303
15	Karnataka	2915317	24354	2854222	36741	32350283	25190326	7159957



Desktop/Sumi Files/Final Group | EDA of Vaccination Data - Jupyter

localhost:8888/notebooks/Desktop/Sumi%20Files/Final%20Group%20Project/My-python/EDA%20%20of%20Vaccination%20Data.ipynb

jupyter EDA of Vaccination Data (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 3

Run Markdown

get columns names

In [104]:
```
d.columns
```

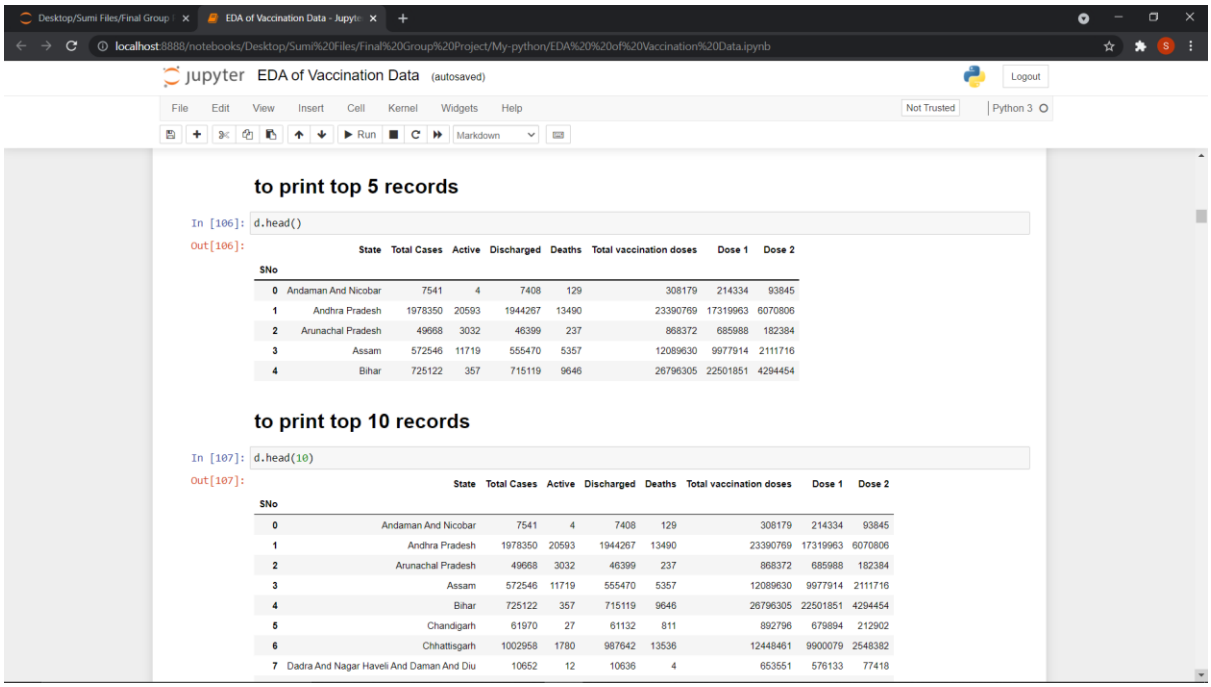
Out[104]:
```
Index(['State', 'Total Cases', 'Active', 'Discharged', 'Deaths',
       'Total vaccination doses', 'Dose 1', 'Dose 2'],
      dtype='object')
```

rename the columns names

In [105]:
```
d.rename(columns = {"State":"State","Active":"Active"},inplace=True)
d
```

Out[105]:

SNo	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	308179	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	23390769	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	868372	685988	182384
3	Assam	572546	11719	555470	5357	12089630	9977914	2111716
4	Bihar	725122	357	715119	9646	26796305	22501851	4294454
5	Chandigarh	61970	27	61132	811	892796	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	12448461	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	653551	576133	77418
8	Delhi	1436623	516	1411042	25065	10559677	7684071	2875606
9	Goa	171705	992	167556	3157	1370190	1081299	288891
10	Gujarat	825001	204	814720	10077	35631476	26979294	8652182
11	Haryana	770042	690	759705	9647	12654504	9866525	2787979
12	Himachal Pradesh	207344	1727	202084	3533	5502831	4155025	1347806



Desktop/Sumi Files/Final Group | EDA of Vaccination Data - Jupyter

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jupyter EDA of Vaccination Data (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Not Trusted Python 3

Run Markdown

to print top 5 records

In [106]:
```
d.head()
```

Out[106]:

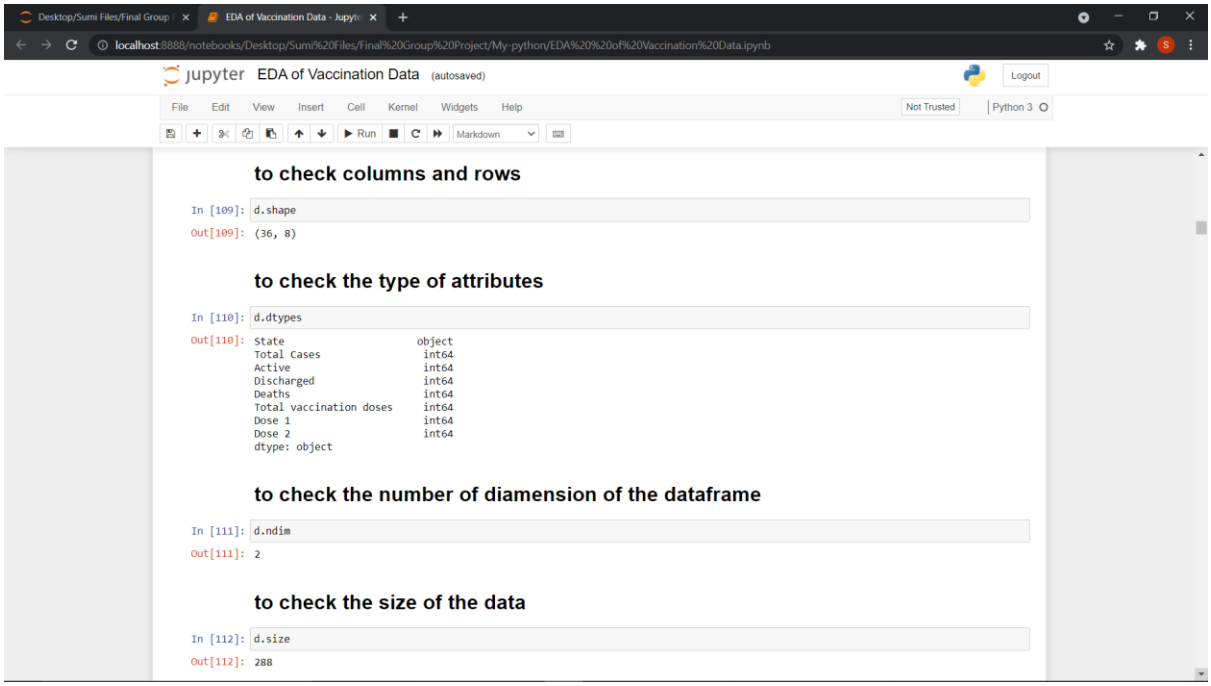
SNo	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	308179	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	23390769	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	868372	685988	182384
3	Assam	572546	11719	555470	5357	12089630	9977914	2111716
4	Bihar	725122	357	715119	9646	26796305	22501851	4294454

to print top 10 records

In [107]:
```
d.head(10)
```

Out[107]:

SNo	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	308179	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	23390769	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	868372	685988	182384
3	Assam	572546	11719	555470	5357	12089630	9977914	2111716
4	Bihar	725122	357	715119	9646	26796305	22501851	4294454
5	Chandigarh	61970	27	61132	811	892796	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	12448461	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	653551	576133	77418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EDA of Vaccination Data - Jupyter
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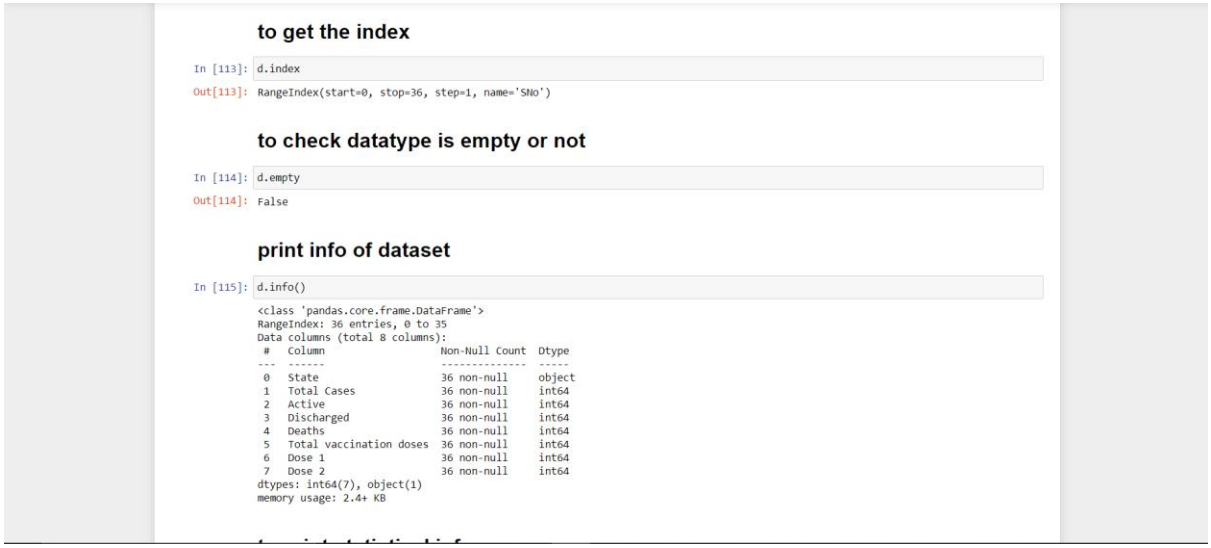
jupyter EDA of Vaccination Data (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3
Run
Markdown
to check columns and rows
In [109]: d.shape
Out[109]: (36, 8)
to check the type of attributes
In [110]: d.dtypes
Out[110]: State object
Total Cases int64
Active int64
Discharged int64
Deaths int64
Total vaccination doses int64
Dose 1 int64
Dose 2 int64
dtype: object
to check the number of diamension of the dataframe
In [111]: d.ndim
Out[111]: 2
to check the size of the data
In [112]: d.size
Out[112]: 288


to get the index
In [113]: d.index
Out[113]: RangeIndex(start=0, stop=36, step=1, name='SNo')
to check datatype is empty or not
In [114]: d.empty
Out[114]: False
print info of dataset
In [115]: d.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 36 entries, 0 to 35
Data columns (total 8 columns):
Column Non-Null Count Dtype
0 State 36 non-null object
1 Total Cases 36 non-null int64
2 Active 36 non-null int64
3 Discharged 36 non-null int64
4 Deaths 36 non-null int64
5 Total vaccination doses 36 non-null int64
6 Dose 1 36 non-null int64
7 Dose 2 36 non-null int64
dtypes: int64(7), object(1)
memory usage: 2.4+ KB

to print statistical info

In [116]:
```
d.describe()
```

Out[116]:

	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
count	3.600000e+01	36.000000	3.600000e+01	36.000000	3.600000e+01	3.600000e+01	3.600000e+01
mean	8.859829e+05	11448.694444	8.626628e+05	11871.416667	1.382116e+07	1.075671e+07	3.064444e+06
std	1.282199e+06	31839.162320	1.239847e+06	22952.890569	1.475343e+07	1.167673e+07	3.254998e+06
min	7.541000e+03	4.000000	7.408000e+03	4.000000	6.749100e+04	5.077200e+04	1.671900e+04
25%	6.657275e+04	326.000000	6.136675e+04	799.750000	8.866900e+05	6.844645e+05	2.106880e+05
50%	4.599410e+05	1387.000000	4.487250e+05	5243.500000	1.007573e+07	7.365391e+06	2.023010e+06
75%	9.892878e+05	9166.000000	9.721065e+05	13501.500000	2.374833e+07	1.805431e+07	4.802555e+06
max	6.341759e+06	178722.000000	6.130137e+06	133717.000000	5.329553e+07	4.497465e+07	1.184617e+07

In [117]:
```
d.describe(include="all")
```

Out[117]:

	State	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
count	36	3.600000e+01	36.000000	3.600000e+01	36.000000	3.600000e+01	3.600000e+01	3.600000e+01
unique	36	NaN	NaN	NaN	NaN	NaN	NaN	NaN
top	Uttarakhand	NaN	NaN	NaN	NaN	NaN	NaN	NaN
freq	1	NaN	NaN	NaN	NaN	NaN	NaN	NaN
mean	NaN	8.859829e+05	11448.694444	8.626628e+05	11871.416667	1.382116e+07	1.075671e+07	3.064444e+06
std	NaN	1.282199e+06	31839.162320	1.239847e+06	22952.890569	1.475343e+07	1.167673e+07	3.254998e+06
min	NaN	7.541000e+03	4.000000	7.408000e+03	4.000000	6.749100e+04	5.077200e+04	1.671900e+04
25%	NaN	6.657275e+04	326.000000	6.136675e+04	799.750000	8.866900e+05	6.844645e+05	2.106880e+05
50%	NaN	4.599410e+05	1387.000000	4.487250e+05	5243.500000	1.007573e+07	7.365391e+06	2.023010e+06
75%	NaN	9.892878e+05	9166.000000	9.721065e+05	13501.500000	2.374833e+07	1.805431e+07	4.802555e+06

30	False	False	False	False	False	False	False	False
31	False	False	False	False	False	False	False	False
32	False	False	False	False	False	False	False	False
33	False	False	False	False	False	False	False	False
34	False	False	False	False	False	False	False	False
35	False	False	False	False	False	False	False	False

sum of missing value

In [121]:
```
d.isna().sum()
```

Out[121]:
```
State                    0
Total Cases              0
Active                   0
Discharged               0
Deaths                   0
Total vaccination doses  0
Dose 1                   0
Dose 2                   0
dtype: int64
```

In [122]:
```
d.isnull().sum()
```

Out[122]:
```
State                    0
Total Cases              0
Active                   0
Discharged               0
Deaths                   0
Total vaccination doses  0
Dose 1                   0
Dose 2                   0
dtype: int64
```

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drop the column

```
In [123]: d.drop("Total vaccination doses",axis=1,inplace=True)
          d
```

Out[123]:

SNo	State	Total Cases	Active	Discharged	Deaths	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	685988	182384
3	Assam	572546	11719	555470	5357	9977914	2111716
4	Bihar	725122	357	715119	9646	22501851	4294454
5	Chandigarh	61970	27	61132	811	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	576133	77418
8	Delhi	1436623	516	1411042	25065	7684071	2875606
9	Goa	171705	992	167556	3157	1081299	288891
10	Gujarat	825001	204	814720	10077	26979294	8652182
11	Haryana	770042	690	759705	9647	9866525	2787979

to check duplicate value

```
In [124]: d.duplicated()
```

Out[124]:

```
SNo
0     False
1     False
2     False
3     False
4     False
5     False
6     False
7     False
8     False
9     False
10    False
11    False
12    False
13    False
14    False
15    False
16    False
17    False
18    False
19    False
20    False
21    False
22    False
23    False
24    False
25    False
26    False
27    False
28    False
29    False
30    False
31    False
```

to check sum of duplicate values

```
In [125]: d.duplicated().sum()
```

Out[125]:

```
0
```

to check number of unique values in a dataset

```
In [126]: d.nunique()
```

Out[126]:

```
State          36
Total Cases    36
Active         36
Discharged     36
Deaths         36
Dose 1         36
Dose 2         36
dtype: int64
```

to get the unique values of a column

```
In [127]: d["State"].unique()
```

Out[127]:

```
array(['Andaman And Nicobar', 'Andhra Pradesh', 'Arunachal Pradesh',
       'Assam', 'Bihar', 'Chandigarh', 'Chhattisgarh',
       'Dadra And Nagar Haveli And Daman And Diu', 'Delhi', 'Goa',
       'Gujarat', 'Haryana', 'Himachal Pradesh', 'Jammu And Kashmir',
       'Jharkhand', 'Karnataka', 'Kerala', 'Ladakh', 'Lakshadweep',
       'Madhya Pradesh', 'Maharashtra', 'Manipur', 'Meghalaya', 'Mizoram',
       'Nagaland', 'Odisha', 'Puducherry', 'Punjab', 'Rajasthan',
       'Sikkim', 'Tamil Nadu', 'Telengana', 'Tripura', 'Uttar Pradesh',
```

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count the the values of a column

In [129]:
```
d.State.value_counts()
```

Out[129]:
```
Uttarakhand                                1
Telengana                                  1
Sikkim                                     1
Mizoram                                    1
Andaman And Nicobar                        1
Assam                                      1
Goa                                        1
Jammu And Kashmir                          1
Maharashtra                                1
Bihar                                      1
Manipur                                    1
Himachal Pradesh                           1
Punjab                                     1
Madhya Pradesh                             1
Lakshadweep                                1
Karnataka                                  1
Chandigarh                                 1
Andhra Pradesh                             1
Ladakh                                     1
Uttar Pradesh                              1
Jharkhand                                  1
Tamil Nadu                                 1
Gujarat                                    1
Arunachal Pradesh                          1
Rajasthan                                  1
Meghalaya                                  1
Delhi                                      1
Dadra And Nagar Haveli And Daman And Diu   1
Kerala                                     1
Odisha                                     1
West Bengal                                1
```

maximum values using sort function

to show highest top 5 records with highest Dose 1 Vaccinated State

In [131]:
```
d.sort_values("Dose 1",ascending=False).head(5)
```

Out[131]:

SNo	State	Total Cases	Active	Discharged	Deaths	Dose 1	Dose 2
33	Uttar Pradesh	1708689	619	1685299	22771	44974649	8320884
20	Maharashtra	6341759	77905	6130137	133717	34530719	11846167
19	Madhya Pradesh	791937	158	781265	10514	28719654	5519239
10	Gujarat	825001	204	814720	10077	26979294	8652182
28	Rajasthan	953793	233	944606	8954	26474741	8145985

In [132]:
```
d.sort_values("Dose 1",ascending=False).head(1)
```

Out[132]:

SNo	State	Total Cases	Active	Discharged	Deaths	Dose 1	Dose 2
33	Uttar Pradesh	1708689	619	1685299	22771	44974649	8320884

mean

In [149]:
```
d.mean()
```

Out[149]:
```
Total Cases    8.859829e+05
Active         1.144869e+04
Discharged     8.626628e+05
Deaths         1.187142e+04
Dose 1         1.075671e+07
Dose 2         3.064444e+06
dtype: float64
```

max

In [150]:
```
d.max()
```

Out[150]:
```
State          West Bengal
Total Cases        6341759
Active              178722
Discharged         6130137
Deaths              133717
Dose 1            44974649
Dose 2            11846167
dtype: object
```

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Check if there is exists 0 or negative values in columns

In [151]:
```
print((d==0).sum()[(d==0).sum() > 0])
```

```
Series([], dtype: int64)
```

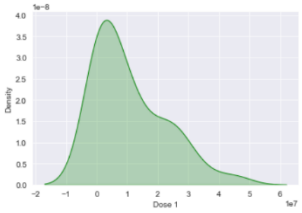
replace null value with zero

In [152]:
```
d["Dose 1"].fillna(0,inplace=True)
d
```

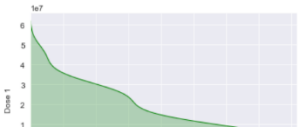
Out[152]:

SNo	State	Total Cases	Active	Discharged	Deaths	Dose 1	Dose 2
0	Andaman And Nicobar	7541	4	7408	129	214334	93845
1	Andhra Pradesh	1978350	20593	1944267	13490	17319963	6070806
2	Arunachal Pradesh	49668	3032	46399	237	685988	182384
3	Assam	572546	11719	555470	5357	9977914	2111716
4	Bihar	725122	357	715119	9646	22501851	4294454
5	Chandigarh	61970	27	61132	811	679894	212902
6	Chhattisgarh	1002958	1780	987642	13536	9900079	2548382
7	Dadra And Nagar Haveli And Daman And Diu	10652	12	10636	4	576133	77418
8	Delhi	1436623	516	1411042	25065	7684071	2875606
9	Goa	171705	992	167556	3157	1081299	288891
10	Gujarat	825001	204	814720	10077	26979294	8652182
11	Haryana	770042	690	759705	9647	9866525	2787979
12	Himachal Pradesh	207344	1727	202084	3533	4155025	1347806

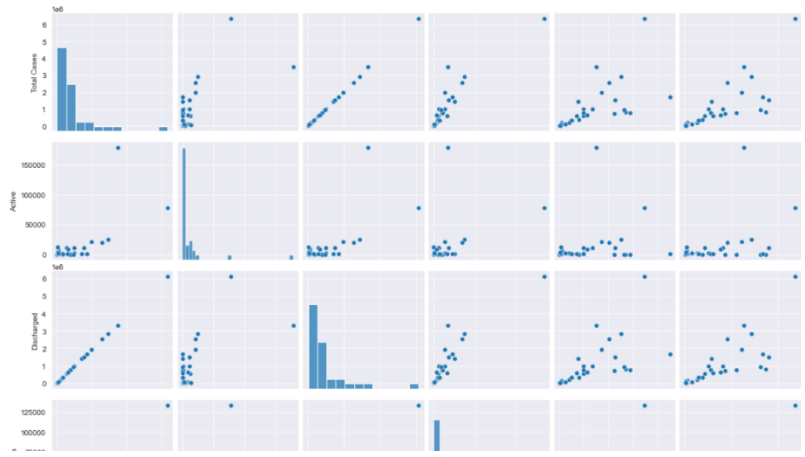
In [161]:
```
sns.kdeplot(d["Dose 1"],color="green",shade=True)
plt.show()
```



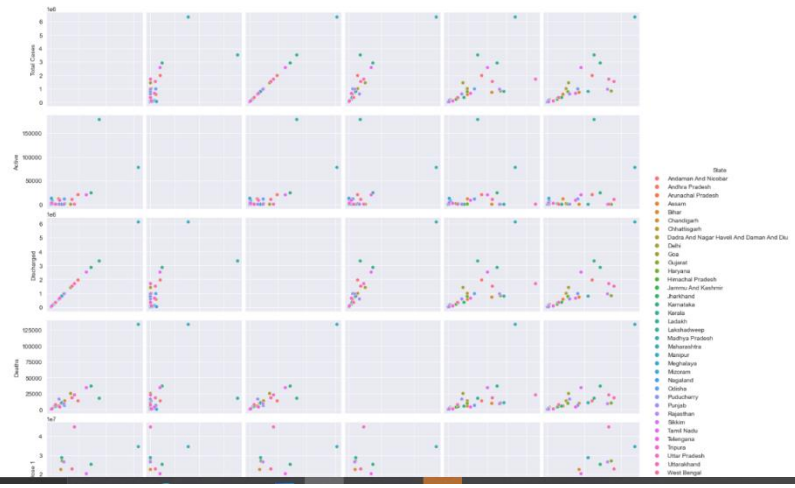
In [162]:
```
sns.kdeplot(d["Dose 1"],color="green",vertical=True,shade=True)
plt.show()
```



In [164]:
```
sns.pairplot(d)
plt.show()
```



```
In [177]: sns.pairplot(d, diag_kind='kde',hue='State')
          plt.show()
```

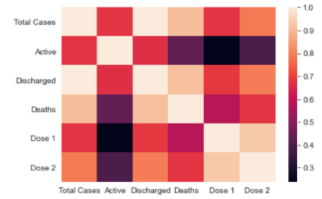


Heat map

correlation

d.corr()

```
In [178]: sns.heatmap(d.corr())
          plt.show()
```

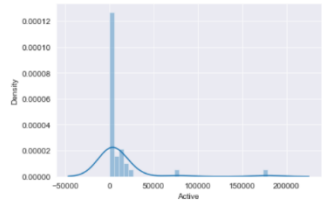



```
In [179]: sns.heatmap(d.corr(),cmap="RdBu")
          plt.show()
```

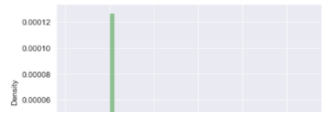
Dist plot

Seaborn distplot lets you show a histogram with a line on it.This can be shown in all kinds of variations. A distplot plot a univariate distribution of observations.

```
In [186]: sns.distplot(d.Active)
          plt.show()
```




```
In [187]: sns.distplot(d.Active,color="green")
          plt.show()
```

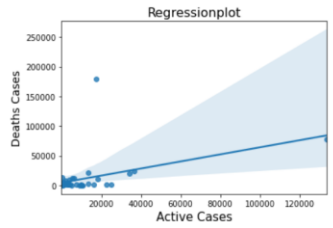


LINEAR REGRESSION:

Linear Regression in Python Linear Regression is a machine learning algorithm based on supervised learning. Linear Regression is a predictive model that is used for finding the linear relationship between a dependent variable and one or more independent variables.

LINEAR REGRESSION

```
In [116]: sns.regplot(y=data["Active"],x=data["Deaths"])
          plt.title("Regressionplot",size=16)
          plt.xlabel("Active Cases",size=15)
          plt.ylabel("Deaths Cases",size=14)
          plt.show()
```




```
In [117]: data.corr()
```

Out[117]:

	Total Cases	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
Total Cases	1.000000	0.678344	0.999882	0.910559	0.709719	0.676837	0.788803
Active	0.678344	1.000000	0.667871	0.430221	0.275594	0.239117	0.391355
Discharged	0.999882	0.667871	1.000000	0.912101	0.715604	0.683056	0.793169
Deaths	0.910559	0.430221	0.912101	1.000000	0.609315	0.581222	0.676718
Total vaccination doses	0.709719	0.275594	0.715604	0.609315	1.000000	0.996723	0.956979

display the shape

```
In [119]: X=data.iloc[:,2:]
          Y=data.iloc[:,1]
```

```
In [120]: X.head()
```

Out[120]:

	Active	Discharged	Deaths	Total vaccination doses	Dose 1	Dose 2
0	4	7408	129	308179	214334	93845
1	20593	1944267	13490	23390769	17319963	6070806
2	3032	46399	237	868372	685988	182384
3	11719	555470	5357	12089630	9977914	2111716
4	357	715119	9646	26796305	22501851	4294454

```
In [121]: Y
```

Out[121]:

```
0       7541
1    1978350
2      49668
3     572546
4     725122
5      61970
6    1002958
7      10652
8    1436623
9     171705
10    825001
11    770042
12    207344
13    322286
```

import the library to train ,test and split

In [122]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.3)
```

In [123]:
```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(27, 6)
(9, 6)
(27,)
(9,)
```

In [124]:
```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_train, Y_train)
```

Out[124]:
```
LinearRegression()
```

In [125]:
```
Y_pred = regressor.predict(X_test)
```

In [126]:
```
Y_pred
```

Out[126]:
```
array([  68107., 1978350.,  725122.,  791937., 1002958.,  770042.,
        121421.,  984731.,  825001.,  648388.,   43530.])
```

In [127]:
```
accuracy = regressor.score(X_test,Y_pred)
"Accuracy: {}%".format(int(round(accuracy*100)))
```

Out[127]:
```
'Accuracy: 100%'
```

Comparing actual vs predicted

Comparing actual vs predicted

In [128]:
```
df = pd.DataFrame({"Actual": Y_test,"Predicted": Y_pred})
df
```

Out[128]:

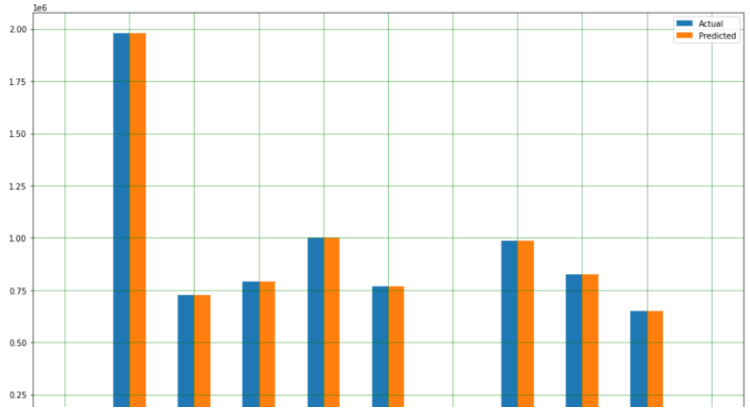
	Actual	Predicted
22	68107	68107.0
1	1978350	1978350.0
4	725122	725122.0
19	791937	791937.0
6	1002958	1002958.0
11	770042	770042.0
26	121421	121421.0
25	984731	984731.0
10	825001	825001.0
31	648388	648388.0
23	43530	43530.0

Visualising the comparison

In [130]:
```
df.plot(kind="bar",figsize=(16,10))
plt.grid(which="major",linestyle="-",linewidth="0.5",color="green")
plt.grid(which="minor",linestyle=":",linewidth="0.5",color="black")
plt.show()
```


Visualising the comparison

In [130]:
```
df.plot(kind="bar",figsize=(16,10))
plt.grid(which="major",linestyle="-",linewidth="0.5",color="green")
plt.grid(which="minor",linestyle=":",linewidth="0.5",color="black")
plt.show()
```



2.2. R

Exploratory Data Analysis (**EDA**) in R is the process of analyzing and visualizing the data to get a better understanding of the data and glean insight from it. There are various steps involved when doing EDA but the following are the common steps that a data analyst can take when performing EDA:

1. Import the data
2. Clean the data
3. Process the data
4. Visualize the data

Here I added the contents of EDA & Linear Regression in R of vaccination data

Import libraries first

```
library(ggplot2)
library(dplyr)
library(choroplethr)
library(choroplethrMaps)
library(openintro)
library(tidyverse)
library(scales)
```

```
library(corrgram)
print(getwd)

# read the dataset named vaccination data
d<-read.csv("C:/Users/Sumi/vaccination_data_latest.csv")
print(d)

# print head and tail rows
print(head(d))
print(tail(d))

# summary of the dataset
print(summary(d))
print(summary(d$Total.Cases))
plot(d$Total.Cases)

# dimention of dataset
print(dim(d))

# column names of the dataset
print(names(d))

# details of death
print(d$Deaths)

# length of the dataset
print(length(d$Active))
```

```
# structure of the dataset
print(str(d))

# glimpse of the dataset
print(glimpse(d))



#  check unique values
print(unique(d))



# statistical values
print(is.na(d))
print(is.data.frame(d))
print(is.name(d))
print(ncol(d))
print(nrow(d))
print(max(d$Active))
print(min(d$Active))
print(sort(d$Active))
print(which.max(d$Active))
print(which.min(d$Active))
print(mean(d$Active))
print(mean(d$Active,trim=0.10))
print(var(d$Active))
```

```
print(median(d$Active))
print(mad(d$Active))# mean absolute division
print(sd(d$Active))
print(mode(d$Active))
print(range(d$Active))
print(scale(d$Active))
print(sd(d$Total.Cases/sqrt(length(d$Active))))
print(max(d$Total.Cases-min(d$Active)))
print(quantile(d$Active))
print(quantile(d$Active,c(0.75)))
print(IQR(d$Active))
print(t.test(d$Active))

# data visualisation



# plotting of total cases
plot(d$Total.Cases,col="red",xlab="X-axis",ylab="Y-axis",main="total
cases")



# plotting of total vaccination doses
plot(d$Total.vaccination.doses,col="red",xlab="X-axis",ylab="Y-
axis",main="total vaccination doses taken")



# fisrt dose and second dose vaccination
```

```
plot(x=d$Dose.1,y=d$Dose.2,main="first and second dose
vaccines",xlab="dose1",ylab="dose2",col="blue")


# geographical plot of states releated to total cases

statewise_totalcase=d %>% group_by(State) %>%
summarise(Total.Cases)

View(statewise_totalcase)


# geographical plot of states releated to active cases

statewise_activecases=d %>% group_by(State) %>% summarise(Active)

View(statewise_activecases)


# statewise total vaccination

statewise_vaccination=d %>% group_by(State) %>%
summarise(Total.vaccination.doses) %>% arrange((desc
                                        (Total.vaccination.doses)))

View(statewise_vaccination)


# statewise vaccination details(dose1 and dose2)

statewise_vaccination_doses=d %>% group_by(State) %>%
summarise(Dose.1,Dose.2)

View(statewise_vaccination_doses)
```

```
# statewise covid details(total,active and discharged cases)
statewise_details=d %>% group_by(State) %>%
summarise(Total.Cases,Active,Discharged)
View(statewise_details)


# statewise dose 1 vaccination using ggplot
statewisedose1=ggplot(d,aes(x=Dose.1,y=State,fill=Dose.1))+geom_col()
print(statewisedose1)


# statewise dose 2 vaccination using bargraph
statewisedose2=ggplot(d,aes(x=Dose.2,y=State,fill=Dose.2))+geom_col(
)
print(statewisedose2)


# statewise total vaccination doses  using scatter plot
statewisetotalvaccination=ggplot(d,aes(x=Total.vaccination.doses,y=Stat
e,fill=Total.vaccination.doses))+geom_point()
print(statewisetotalvaccination)


# statewise total cases using scatter plot
statewisetotalcases=ggplot(d,aes(x=Total.Cases,y=State,fill=Total.Cases)
)+geom_point()
```

```
print(statewisetotalcases)
```

```
# statewise active cases in dotplot
statewiseactivecases=ggplot(d,aes(x=Active,y=State,fill=Active))+geom_
jitter()
print(statewiseactivecases)
```

```
# active cases compared to total cases using lineplot
totalcases=ggplot(d,aes(x=Active,y=Total.Cases,fill=Active))+geom_line
()
print(totalcases)
```

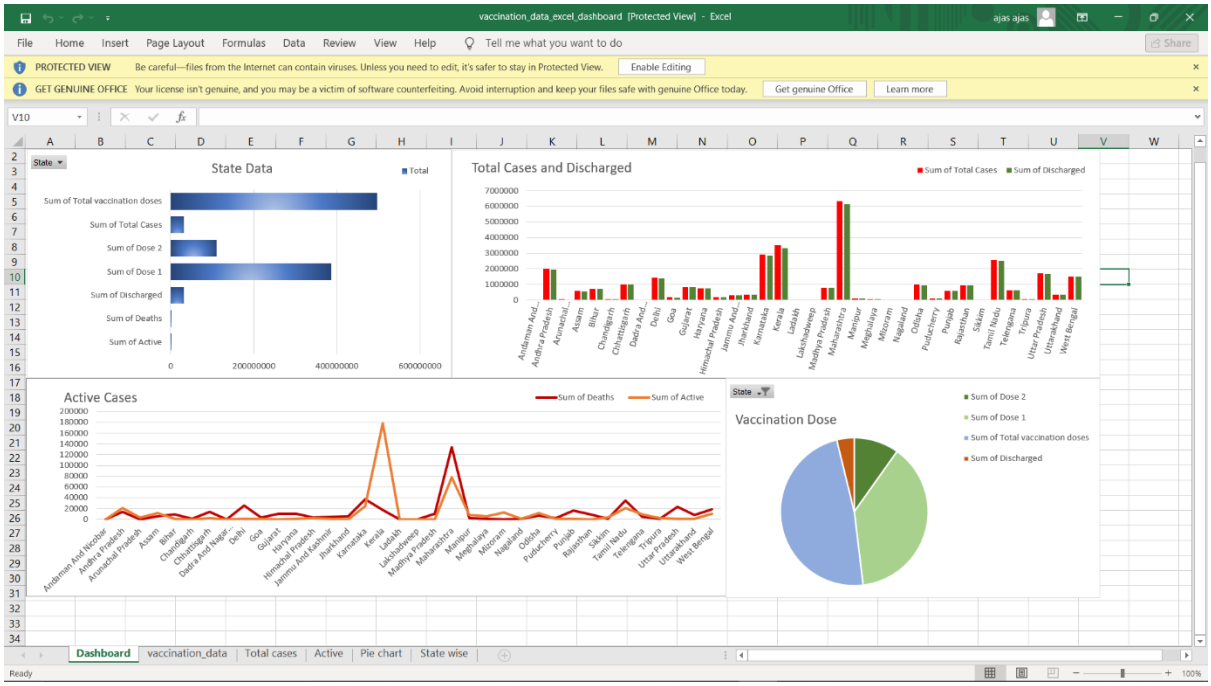
```
# statewise active cases using boxplot
totalcases=ggplot(d,aes(x=Active,y=State,fill=Active),size=3.0)+geom_b
oxplot()
print(totalcases)
```

```
# active cases compared to total cases using barplot
vaccination<-table(d$Active,d$Total.Cases)
```

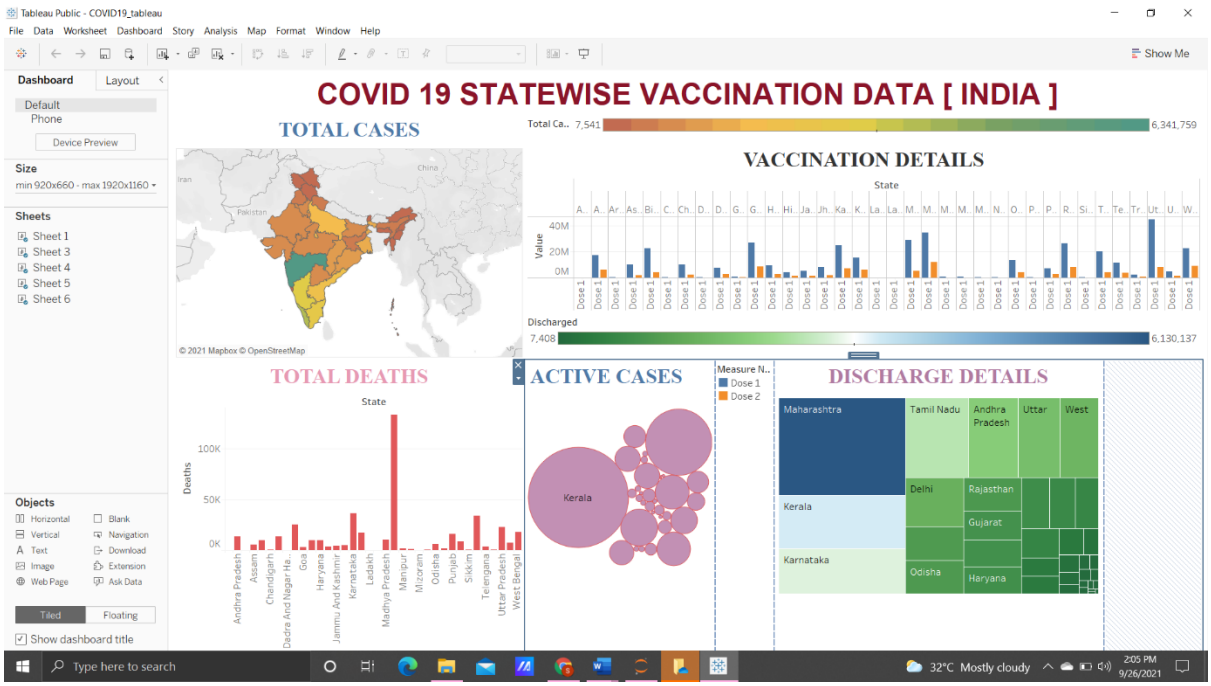
```
barplot(vaccination,main='active cases compared to total
cases',xlab='totalcases',ylab='active')


# discharged static  using histogram
hist(d$Discharged,col='steelblue',main='discharged
patients',xlab='discharged')


# plotting active cases vs the total cases:
print(plot(Active~Total.Cases,data=d))


# linear regression:
lr=lm(Active~Total.Cases,data=d)
print(lr)

summary(lr)

par(mfrow=c(1,1))
plot(lr)


i<-ggplot(d,aes(x=Active,y=Total.Cases))+geom_point()
print(i)

i<-i+geom_smooth(method="lm",col="blue")
print(i)
```

2.3 Excel

A dashboard is a visual representation of key metrics that allow you to quickly view and analyze your data in one place. Dashboards not only provide consolidated data views, but a self-service business intelligence opportunity, where users are able to filter the data to display just what's important to them.



2.4 Tableau



2.5 SAS

Exploratory Data Analysis in SAS

```
data vaccination_data_latest;
infile 'vaccination_data_latest.csv' dlm=',' firstobs=2 dsd;
input State$ TotalCase Active Discharged Deaths Totalvaccinationdoses
Dose1 Dose2;
run;
proc print data=vaccination_data_latest;
run;

/* To check is there any missing values present in table*/
proc means data=vaccination_data_latest nmiss;
run;

/* To check the summary  of the data*/
proc summary data=vaccination_data_latest print n mean median
mode stddev min max;
var TotalCase Active Discharged Deaths Totalvaccinationdoses Dose1
Dose2  ;
run;

/* To check the correlation between columns */
proc corr data=vaccination_data_latest;
run;

/* To find information of data */
proc contents data=vaccination_data_latest ;
run;
```

```
/* To compare the Median and Maximum values of both dose 1 and dose 2 */


proc means data=vaccination_data_latest(where=(Outcome=1)) print median  max ;

var TotalCase Active Discharged Deaths Totalvaccinationdoses Dose1 Dose2 ;

title "vaccination_data_latest";

proc means data=vaccination_data_latest(where=(Outcome=0)) print median  max;

var TotalCase Active Discharged Deaths Totalvaccinationdoses Dose1 Dose2 ;

title "vaccination_data_latest";

run;

/*.............*/



/* Create a sql for storing vaccination details */

proc sql;

create table vaccinationdetails as

select * from vaccination_data_latest;

quit;

proc print data= vaccinationdetails;

run;


/*Select total vaccination details of State   */

proc sql;

select State,Totalvaccinationdoses
```

```
from vaccination_data_latest
;
quit;

/* Maximum number of Totalvaccinationdoses display */
proc sql;
select State,Totalvaccinationdoses from vaccination_data_latest order
by Totalvaccinationdoses desc
;
quit;

/* Maximum number of Totalvaccinationdoses display */
proc sql;
select State,Totalvaccinationdoses from vaccination_data_latest order
by Totalvaccinationdoses desc
;
quit;

/* Maximum number of Totalcases display */
proc sql;
select State,TotalCase from vaccination_data_latest order by TotalCase
desc
;
quit;

/* Visualization */
```

```
/* Histogram */
title "Histogram of vaccination data";
proc sgplot data=vaccination_data_latest;
histogram Totalvaccinationdoses/group=TotalCase transparency=0.5
scale=count;
density Totalvaccinationdoses /type=normal group=TotalCase;
keylegend /location=inside position =topright across=1;
run;


/* Histogram */
title "Histogram of vaccination data";
proc sgplot data=vaccination_data_latest;
histogram Dose1/group=TotalCase transparency=0.5 scale=count;
density Dose1/type=normal group=TotalCase;
keylegend /location=inside position =topright across=1;
run;

/* Histogram */
title "Histogram of vaccination data";
proc sgplot data=vaccination_data_latest;
histogram Dose2/group=TotalCase transparency=0.5 scale=count;
density Dose2/type=normal group=TotalCase;
keylegend /location=inside position =topright across=1;
run;

proc sgplot data=vaccination_data_latest;
scatter x=Totalvaccinationdoses y=TotalCase;
```

```
ellipse x = Active y = Deaths;
        title 'Scatter plot';

/* Hbar */
proc sgplot  data=vaccination_data_latest;
    hbar TotalCase/response=Dose1 stat=mean
    datalabel datalabelattrs=(weight=bold) fillattrs=(color=cadetblue);
    title 'Dose 1 vaccination';
run;
```

EduBridge

CONCLUSION

- Highest Dose 1 vaccinated state in India in 202 is Uttar Pradesh
- Lowest Dose 1 vaccinated state in India in 202 is Lakshadweep

- Highest total cases in 2020 in India is in Maharashtra State
- Highest discharged persons in 2020 in India is in Maharashtra State

- Highest active cases is found in 2020 in India is in Kerala
- Highest Deaths in India in 2020 is in Madhya Pradesh