Importing required Libraries

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
import plotly.graph_objs as go
from plotly.subplots import make_subplots
from plotly.offline import plot, iplot, init_notebook_mode
init_notebook_mode(connected=True)
```

```
corona_dataset_csv = pd.read_csv('covid19_Confirmed_dataset.csv')
corona_dataset_csv.head(10)
```

```
                Province/State       Country/Region      Lat
Long  \
0                          NaN          Afghanistan  33.0000
65.0000
1                          NaN              Albania  41.1533
20.1683
2                          NaN              Algeria  28.0339
1.6596
3                          NaN              Andorra  42.5063
1.5218
4                          NaN               Angola -11.2027
17.8739
5                          NaN  Antigua and Barbuda  17.0608  -
61.7964
6                          NaN            Argentina -38.4161  -
63.6167
7                          NaN              Armenia  40.0691
45.0382
8  Australian Capital Territory            Australia -35.4735
149.0124
9              New South Wales            Australia -33.8688
151.2093

   1/22/20  1/23/20  1/24/20  1/25/20  1/26/20  1/27/20  ...  4/21/20
\
0        0        0        0        0        0        0  ...     1092

1        0        0        0        0        0        0  ...      609

2        0        0        0        0        0        0  ...     2811

3        0        0        0        0        0        0  ...      717
```

```
4        0        0        0        0        0        0  ...       24

5        0        0        0        0        0        0  ...       23

6        0        0        0        0        0        0  ...     3031

7        0        0        0        0        0        0  ...     1401

8        0        0        0        0        0        0  ...      104

9        0        0        0        0        3        4  ...     2969


   4/22/20  4/23/20  4/24/20  4/25/20  4/26/20  4/27/20  4/28/20
4/29/20  \
0     1176     1279     1351     1463     1531     1703     1828
1939
1      634      663      678      712      726      736      750
766
2     2910     3007     3127     3256     3382     3517     3649
3848
3      723      723      731      738      738      743      743
743
4       25       25       25       25       26       27       27
27
5       24       24       24       24       24       24       24
24
6     3144     3435     3607     3780     3892     4003     4127
4285
7     1473     1523     1596     1677     1746     1808     1867
1932
8      104      104      105      106      106      106      106
106
9     2971     2976     2982     2994     3002     3004     3016
3016

   4/30/20
0     2171
1      773
2     4006
3      745
4       27
5       24
6     4428
7     2066
8      106
9     3025
```

```
[10 rows x 104 columns]
corona_dataset_csv.shape
(266, 104)
corona_dataset_csv.drop(['Lat','Long'],axis=1,inplace=True)
corona_dataset_csv.head(10)
                Province/State       Country/Region  1/22/20  1/23/20
\
0                          NaN          Afghanistan        0        0
1                          NaN              Albania        0        0
2                          NaN              Algeria        0        0
3                          NaN              Andorra        0        0
4                          NaN               Angola        0        0
5                          NaN  Antigua and Barbuda        0        0
6                          NaN            Argentina        0        0
7                          NaN              Armenia        0        0
8  Australian Capital Territory            Australia        0        0
9              New South Wales            Australia        0        0

   1/24/20  1/25/20  1/26/20  1/27/20  1/28/20  1/29/20  ...  4/21/20
\
0        0        0        0        0        0        0  ...     1092
1        0        0        0        0        0        0  ...      609
2        0        0        0        0        0        0  ...     2811
3        0        0        0        0        0        0  ...      717
4        0        0        0        0        0        0  ...       24
5        0        0        0        0        0        0  ...       23
6        0        0        0        0        0        0  ...     3031
```

```
7        0        0        0        0        0        0  ...     1401

8        0        0        0        0        0        0  ...      104

9        0        0        3        4        4        4  ...     2969


   4/22/20  4/23/20  4/24/20  4/25/20  4/26/20  4/27/20  4/28/20
4/29/20  \
0     1176     1279     1351     1463     1531     1703     1828
1939
1      634      663      678      712      726      736      750
766
2     2910     3007     3127     3256     3382     3517     3649
3848
3      723      723      731      738      738      743      743
743
4       25       25       25       25       26       27       27
27
5       24       24       24       24       24       24       24
24
6     3144     3435     3607     3780     3892     4003     4127
4285
7     1473     1523     1596     1677     1746     1808     1867
1932
8      104      104      105      106      106      106      106
106
9     2971     2976     2982     2994     3002     3004     3016
3016

   4/30/20
0     2171
1      773
2     4006
3      745
4       27
5       24
6     4428
7     2066
8      106
9     3025

[10 rows x 102 columns]
```

Aggregating the rows with country

```
corona_dataset_aggregated =
corona_dataset_csv.groupby("Country/Region").sum()
```

```
corona_dataset_aggregated.head(10).sum(axis=1)
```

```
Country/Region
Afghanistan             28462
Albania                 17864
Algeria                 74325
Andorra                 21893
Angola                    649
Antigua and Barbuda       678
Argentina               84105
Armenia                 40610
Australia              224354
Austria                502063
dtype: int64
```

```
corona_dataset_aggregated.shape
```

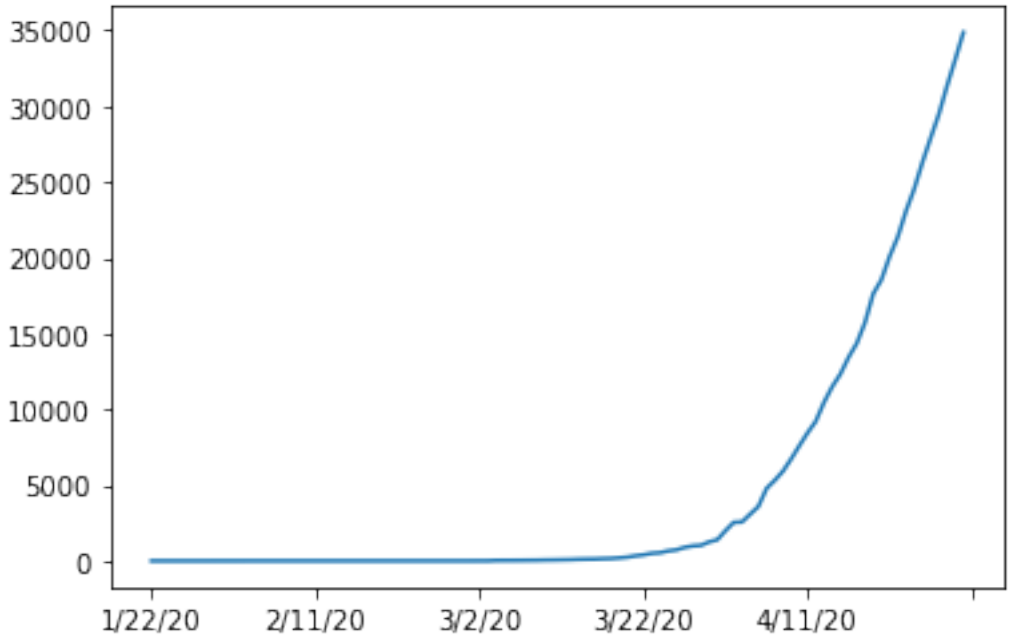
```
(187, 100)
```

```
#from matplotlib.pyplot import figure
#countries=list(corona_dataset_aggregated.index)
#total_cases=corona_dataset_aggregated.sum(axis=1)
#plt.figure(figsize=(100,40),dpi=380)
#plt.xticks(rotation=90,fontsize=25)
#plt.bar(countries,total_cases)
#plt.show()
#figure(num=None, figsize=(8, 6), dpi=80, facecolor='w',
edgecolor='k')
```

Visualizing data related to a country for example India,China,Spain,Italy

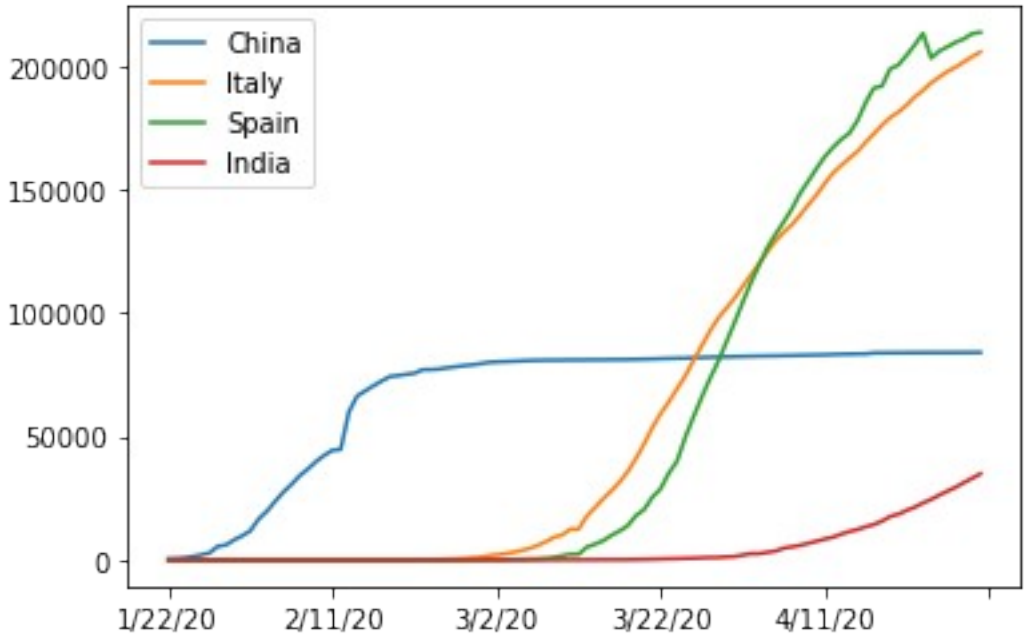
```
corona_dataset_aggregated.loc['India'].plot()
```

```
<AxesSubplot:>
```




```
corona_dataset_aggregated.loc['China'].plot()
corona_dataset_aggregated.loc['Italy'].plot()
corona_dataset_aggregated.loc['Spain'].plot()
corona_dataset_aggregated.loc['India'].plot()
plt.legend()
```

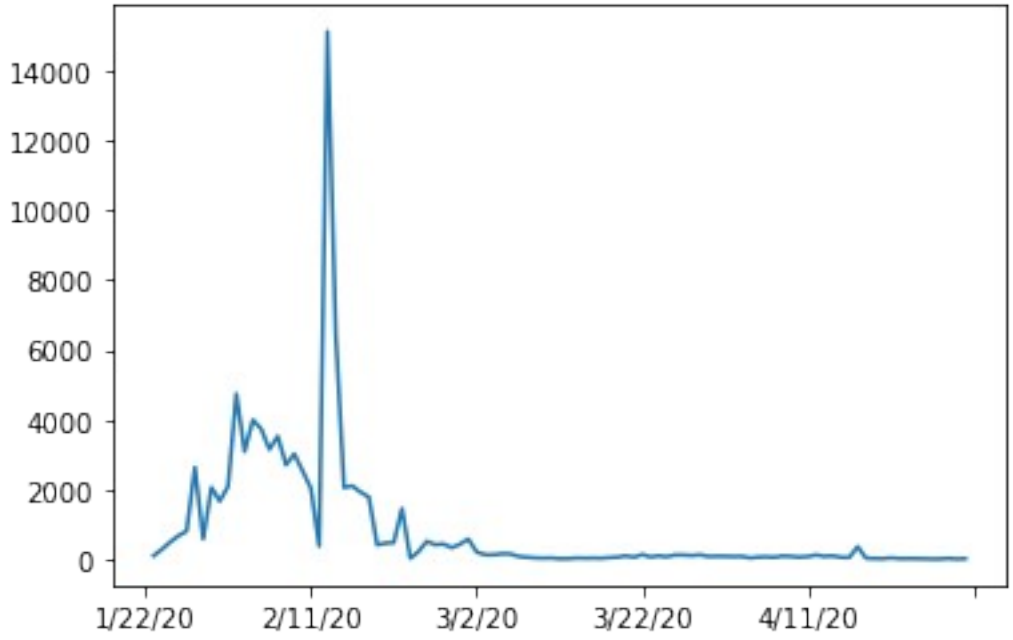
```
<matplotlib.legend.Legend at 0x1cfd9066310>
```



TO GET THE RATE AT WHICH CASES ARE GROWING(DIFFERENTIATING THE CURVE)

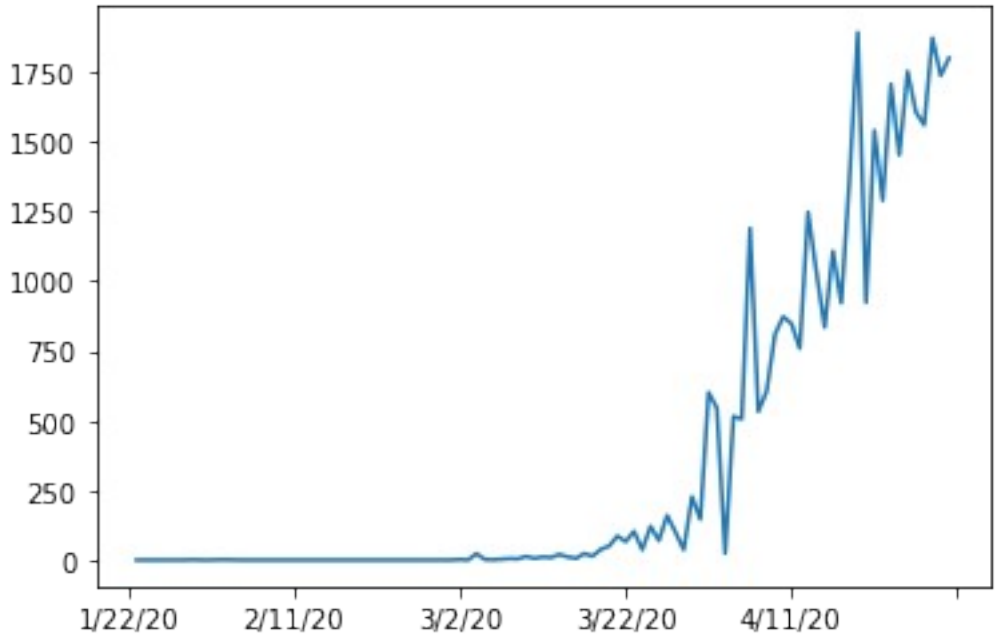
```
corona_dataset_aggregated.loc['China'].diff().plot()
```

```
<AxesSubplot:>
```




```
corona_dataset_aggregated.loc['India'].diff().plot()
```

```
<AxesSubplot:>
```



Find max infection rates for China and India

```
corona_dataset_aggregated.loc['China'].diff().max()
```

```
15136.0
```

```
corona_dataset_aggregated.loc['India'].diff().max()
```

```
1893.0
```

```
corona_dataset_aggregated.loc['India',:]
```

```
1/22/20        0
1/23/20        0
1/24/20        0
1/25/20        0
1/26/20        0
          ...
4/26/20    27890
4/27/20    29451
4/28/20    31324
4/29/20    33062
4/30/20    34863
Name: India, Length: 100, dtype: int64
```

Finding average infection rates

```
corona_dataset_aggregated.loc['China'].diff().mean()
```

```
842.5050505050505
```

```
corona_dataset_aggregated.loc['India'].diff().mean()
```

```
352.1515151515151
```

Find maximum infection rate for all of the countries.

```
countries = list(corona_dataset_aggregated.index)
ave_infection_rates = []
for country in countries :

ave_infection_rates.append(corona_dataset_aggregated.loc[country].diff
().mean())
corona_dataset_aggregated['mean infection rate'] = ave_infection_rates
```

```
corona_dataset_aggregated.head()
```

```
                1/22/20  1/23/20  1/24/20  1/25/20  1/26/20  1/27/20
1/28/20  \
Country/Region

Afghanistan           0        0        0        0        0        0
0
```

```
Albania               0        0        0        0        0        0
0
Algeria               0        0        0        0        0        0
0
Andorra               0        0        0        0        0        0
0
Angola                0        0        0        0        0        0
0

                1/29/20  1/30/20  1/31/20  ...  4/22/20  4/23/20
4/24/20  \
Country/Region                             ...

Afghanistan           0        0        0  ...     1176     1279
1351
Albania               0        0        0  ...      634      663
678
Algeria               0        0        0  ...     2910     3007
3127
Andorra               0        0        0  ...      723      723
731
Angola                0        0        0  ...       25       25
25

                4/25/20  4/26/20  4/27/20  4/28/20  4/29/20
4/30/20  \
Country/Region

Afghanistan        1463     1531     1703     1828     1939     2171

Albania             712      726      736      750      766      773

Algeria            3256     3382     3517     3649     3848     4006

Andorra             738      738      743      743      743      745

Angola               25       26       27       27       27       27


                mean infection rate
Country/Region
Afghanistan                21.929293
Albania                     7.808081
Algeria                    40.464646
Andorra                     7.525253
Angola                      0.272727

[5 rows x 101 columns]
```

Create a new dataframe with only needed column

```
corona_data = pd.DataFrame(corona_dataset_aggregated['mean infection rate'])

corona_data.head(10)
```

```
                     mean infection rate
Country/Region
Afghanistan                    21.929293
Albania                         7.808081
Algeria                        40.464646
Andorra                         7.525253
Angola                          0.272727
Antigua and Barbuda             0.242424
Argentina                      44.727273
Armenia                        20.868687
Australia                      68.343434
Austria                       156.080808
```

Importing the world happiness report

```
world_happiness_report = pd.read_csv("worldwide_happiness_report.csv")
world_happiness_report.head()
```

```
   Overall rank Country or region  Score  GDP per capita  Social
support  \
0             1           Finland  7.769           1.340
1.587
1             2           Denmark  7.600           1.383
1.573
2             3            Norway  7.554           1.488
1.582
3             4           Iceland  7.494           1.380
1.624
4             5       Netherlands  7.488           1.396
1.522

   Healthy life expectancy  Freedom to make life choices
Generosity  \
0                    0.986                         0.596       0.153

1                    0.996                         0.592       0.252

2                    1.028                         0.603       0.271

3                    1.026                         0.591       0.354

4                    0.999                         0.557       0.322
```

```
   Perceptions of corruption
0                      0.393
1                      0.410
2                      0.341
3                      0.118
4                      0.298
```

```
world_happiness_report.dtypes
```

```
Overall rank                      int64
Country or region                object
Score                           float64
GDP per capita                  float64
Social support                  float64
Healthy life expectancy         float64
Freedom to make life choices    float64
Generosity                      float64
Perceptions of corruption       float64
dtype: object
```

```
world_happiness_report.shape
```

```
(156, 9)
```

Dropping useless Columns

```
columns_to_dropped = ['Overall rank','Score','Generosity','Perceptions of corruption']
world_happiness_report.drop(columns_to_dropped,axis=1 , inplace=True)
```

```
world_happiness_report.head()
```

```
  Country or region  GDP per capita  Social support  Healthy life expectancy  \
0           Finland           1.340           1.587                    0.986
1           Denmark           1.383           1.573                    0.996
2            Norway           1.488           1.582                    1.028
3           Iceland           1.380           1.624                    1.026
4       Netherlands           1.396           1.522                    0.999

   Freedom to make life choices
0                         0.596
1                         0.592
2                         0.603
3                         0.591
4                         0.557
```

Changing the indices of the dataframe

```
world_happiness_report.set_index(['Country or region'],inplace=True)
world_happiness_report.head()
```

```
                  GDP per capita  Social support  Healthy life
expectancy  \
Country or region

Finland                    1.340           1.587
0.986
Denmark                    1.383           1.573
0.996
Norway                     1.488           1.582
1.028
Iceland                    1.380           1.624
1.026
Netherlands                1.396           1.522
0.999

                  Freedom to make life choices
Country or region
Finland                                   0.596
Denmark                                   0.592
Norway                                    0.603
Iceland                                   0.591
Netherlands                               0.557
```

Joining the two datasets

```
data = world_happiness_report.join(corona_data,how="inner")
data.head()
```

```
             GDP per capita  Social support  Healthy life
expectancy  \
Finland               1.340           1.587                    0.986

Denmark               1.383           1.573                    0.996

Norway                1.488           1.582                    1.028

Iceland               1.380           1.624                    1.026

Netherlands           1.396           1.522                    0.999


             Freedom to make life choices  mean infection rate
Finland                             0.596            50.454545
Denmark                             0.592            94.505051
Norway                              0.603            78.161616
```

```
Iceland                                0.591           18.151515
Netherlands                            0.557          399.111111
```

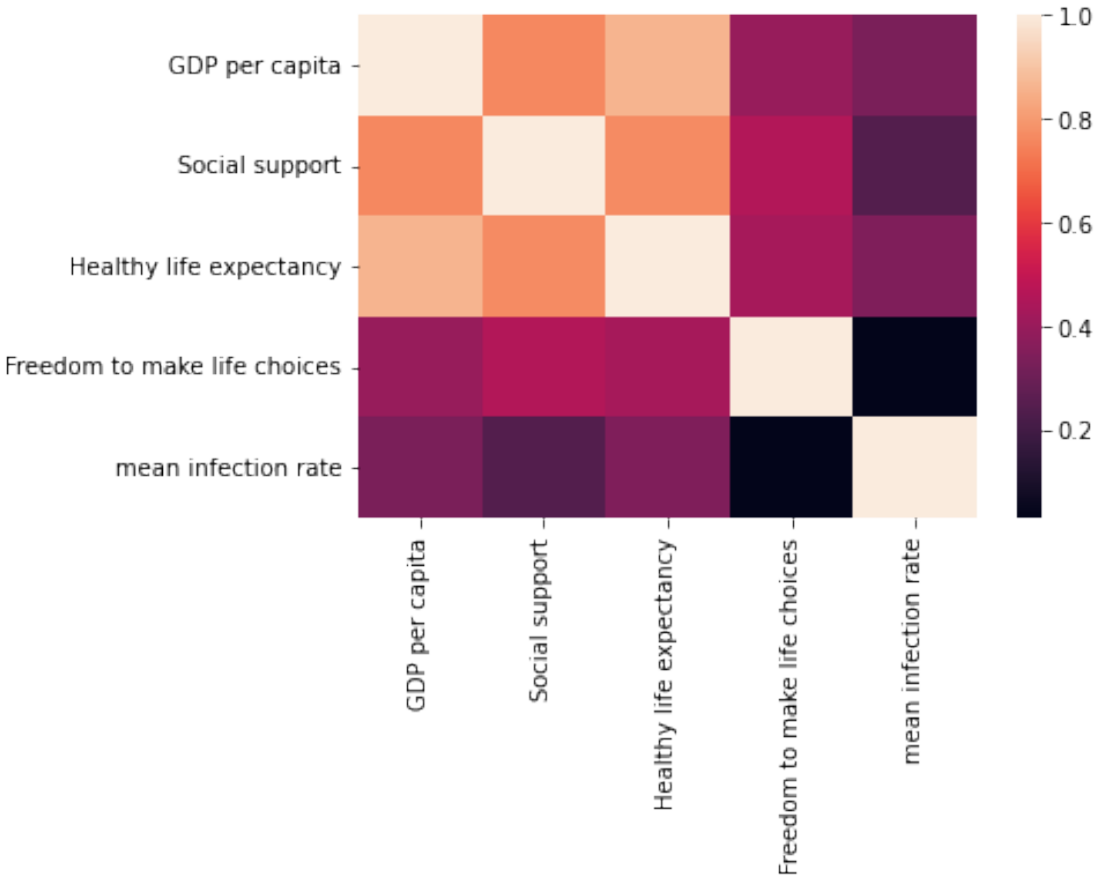
Correlation Matrix

```
data.corr()
# it is representing the correlation between every two columns of our
dataset
```

```
                                GDP per capita  Social support  \
GDP per capita                        1.000000        0.759468
Social support                        0.759468        1.000000
Healthy life expectancy               0.863062        0.765286
Freedom to make life choices          0.394603        0.456246
mean infection rate                   0.329073        0.241618

                                Healthy life expectancy  \
GDP per capita                                 0.863062
Social support                                 0.765286
Healthy life expectancy                        1.000000
Freedom to make life choices                   0.427892
mean infection rate                            0.341890

                                Freedom to make life choices  \
GDP per capita                                      0.394603
Social support                                      0.456246
Healthy life expectancy                             0.427892
Freedom to make life choices                        1.000000
mean infection rate                                 0.029595

                                mean infection rate
GDP per capita                            0.329073
Social support                            0.241618
Healthy life expectancy                   0.341890
Freedom to make life choices              0.029595
mean infection rate                       1.000000
```

```
sns.heatmap(data.corr())
```

```
<AxesSubplot:>
```

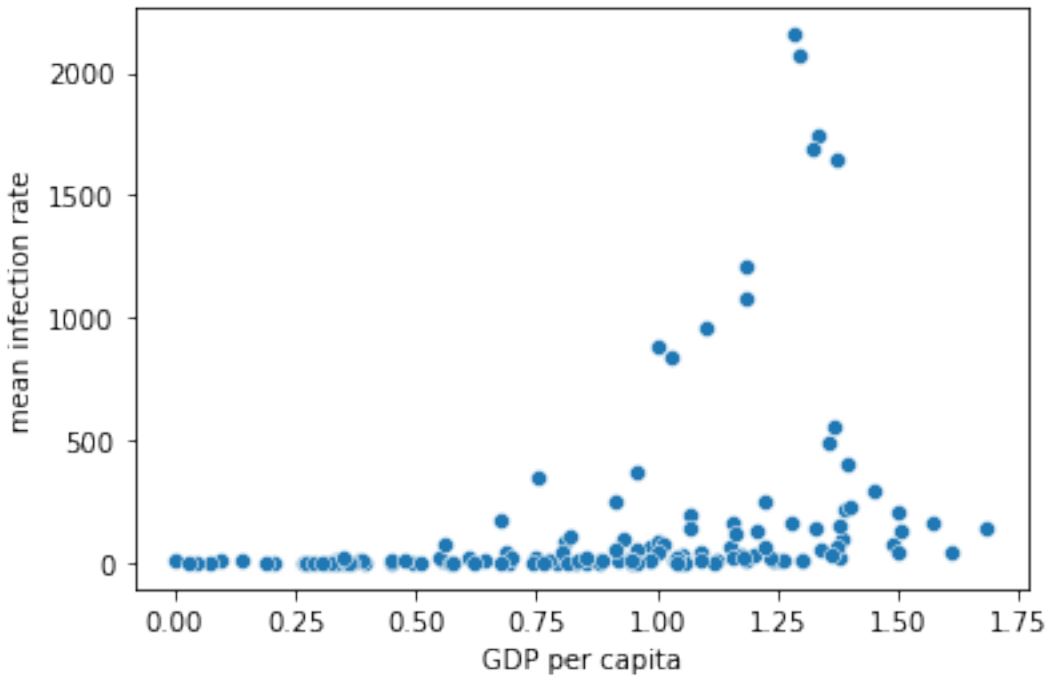


Visualization of the results

Plotting GDP vs maximum Infection rate

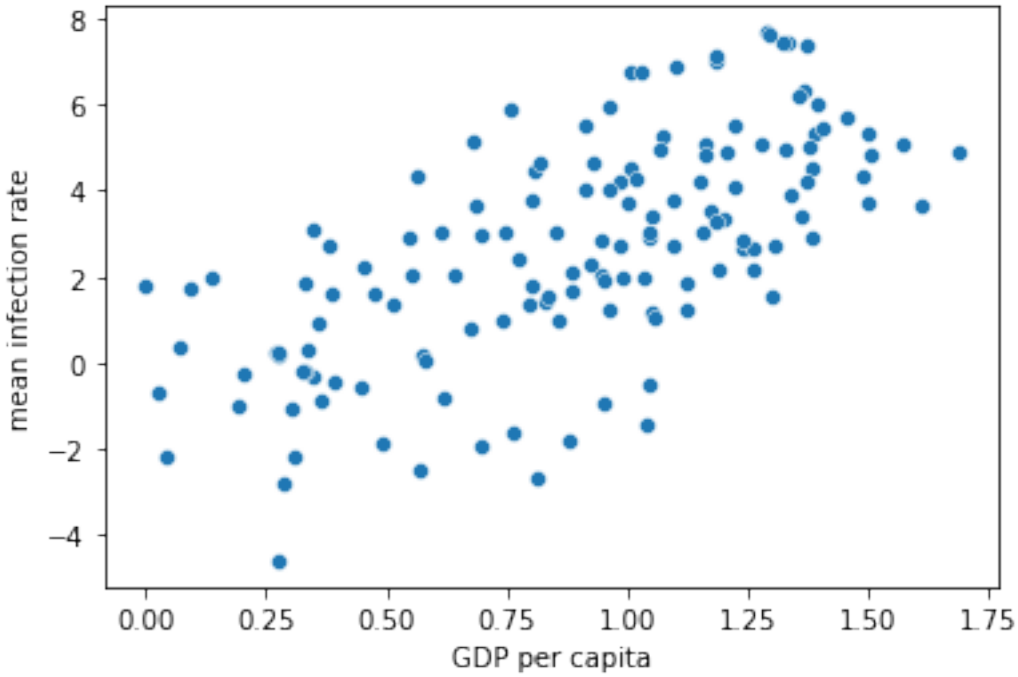
```
x = data['GDP per capita']
y = data['mean infection rate']
sns.scatterplot(x,y)    #VISUALISATION IS DIFFICULT BECAUSE OF
DIFFERENCE Y SCALE AND X-SCALE
```

```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.


<AxesSubplot:xlabel='GDP per capita', ylabel='mean infection rate'>
```




```
x = data['GDP per capita']
y = data['mean infection rate']
sns.scatterplot(x,np.log(y))
```

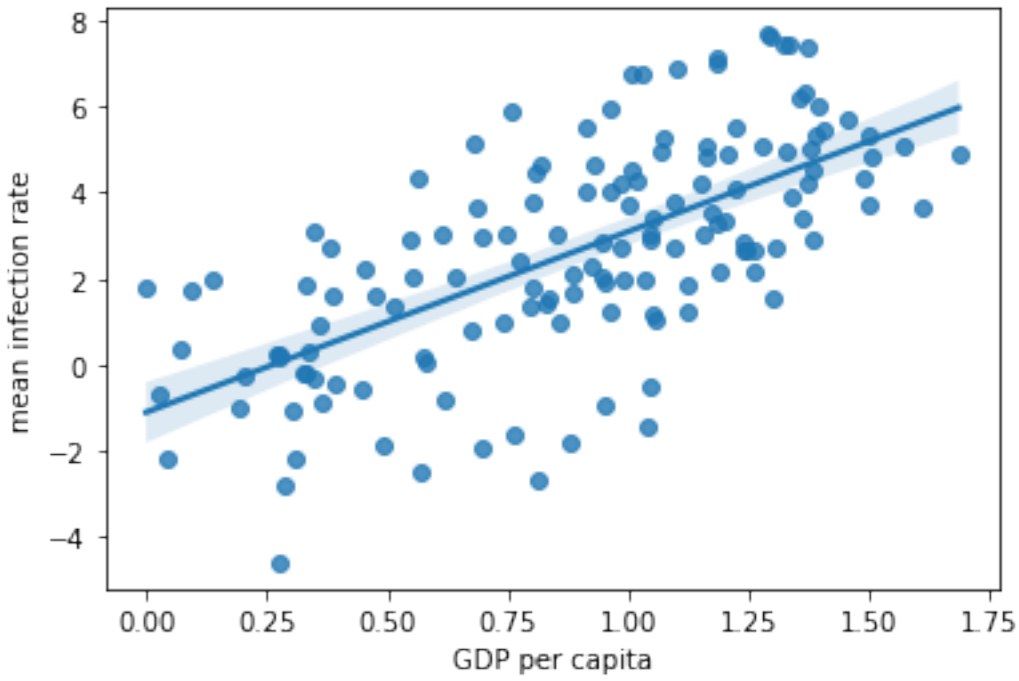
```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.


<AxesSubplot:xlabel='GDP per capita', ylabel='mean infection rate'>
```




```
sns.regplot(x,np.log(y))
```

```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
```

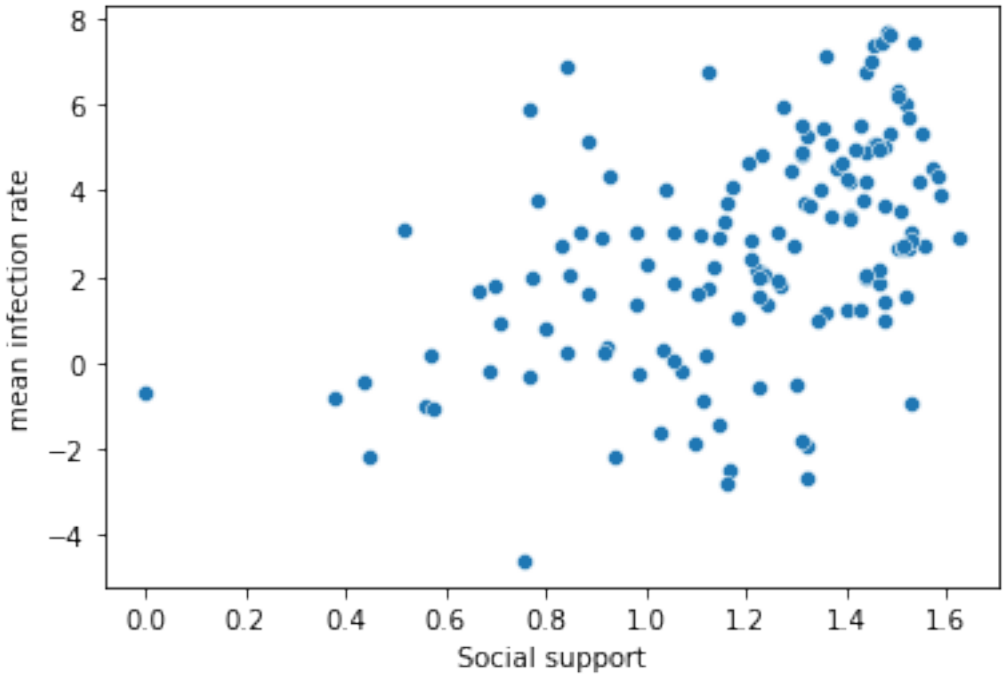
```
<AxesSubplot:xlabel='GDP per capita', ylabel='mean infection rate'>
```



Plotting Social support vs maximum Infection rate

```
x = data['Social support']
y = data['mean infection rate']
sns.scatterplot(x,np.log(y))
```

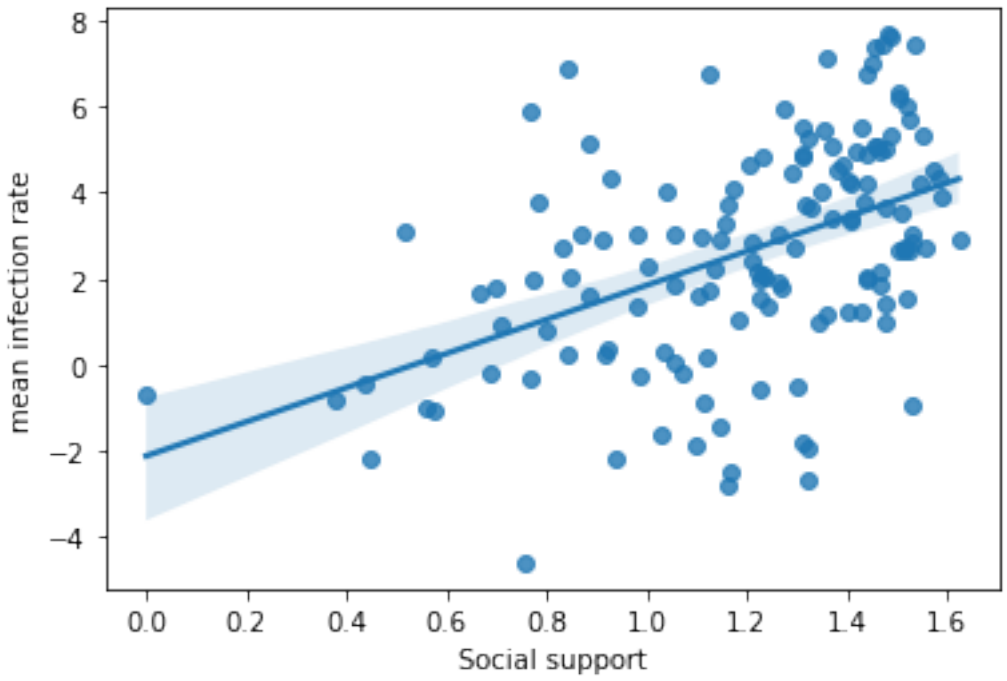
```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.


<AxesSubplot:xlabel='Social support', ylabel='mean infection rate'>
```




```
sns.regplot(x,np.log(y))
```

```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
```

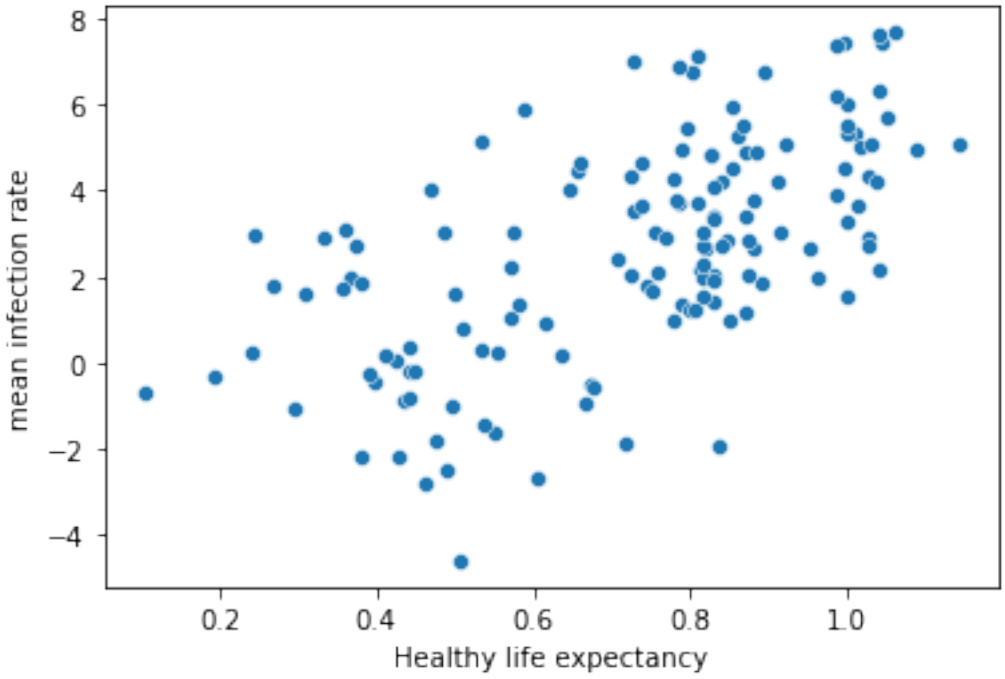
```
<AxesSubplot:xlabel='Social support', ylabel='mean infection rate'>
```



Plotting Healthy life expectancy vs maximum Infection rate

```
x = data['Healthy life expectancy']
y = data['mean infection rate']
sns.scatterplot(x,np.log(y))
```

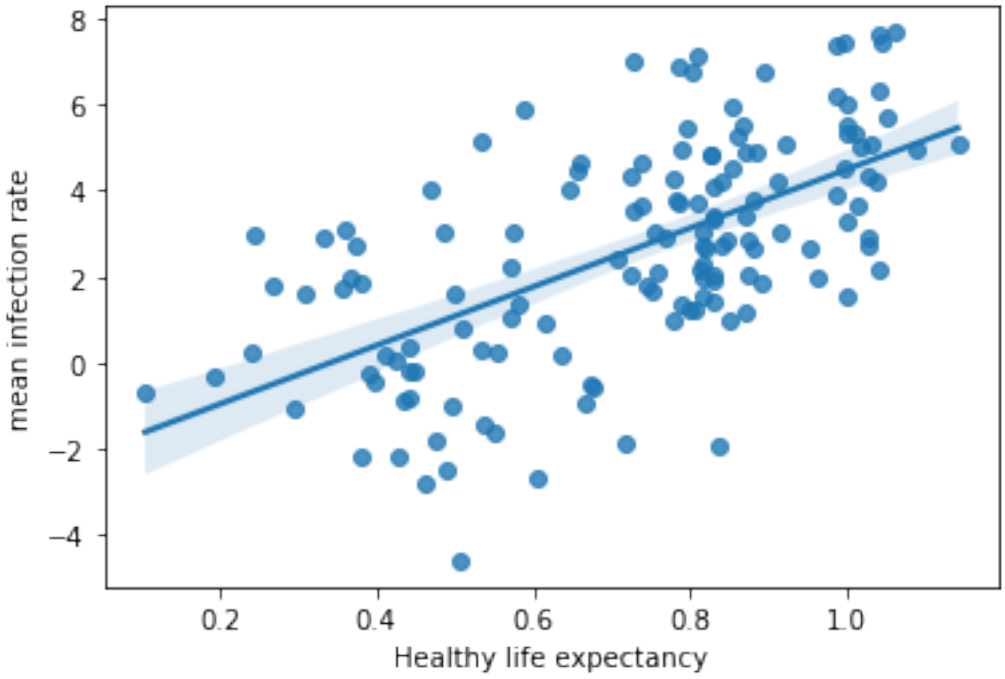
```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.


<AxesSubplot:xlabel='Healthy life expectancy', ylabel='mean infection
rate'>
```




```
sns.regplot(x,np.log(y))
```

```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
```

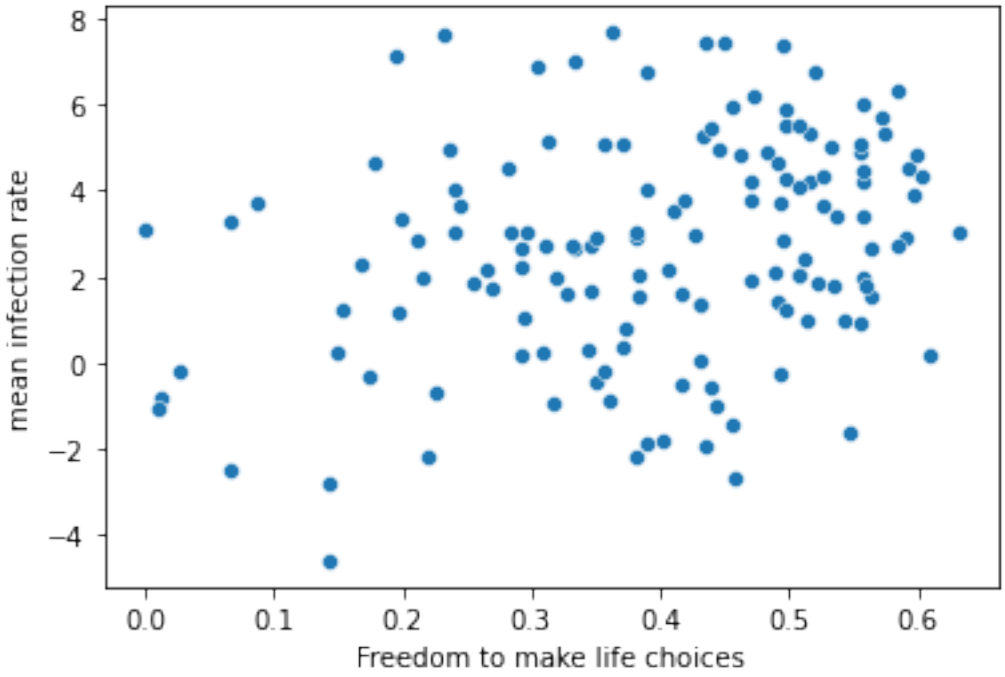
```
<AxesSubplot:xlabel='Healthy life expectancy', ylabel='mean infection
rate'>
```



Plotting Freedom to make life choices vs maximum Infection rate

```
x = data['Freedom to make life choices']
y = data['mean infection rate']
sns.scatterplot(x,np.log(y))
```

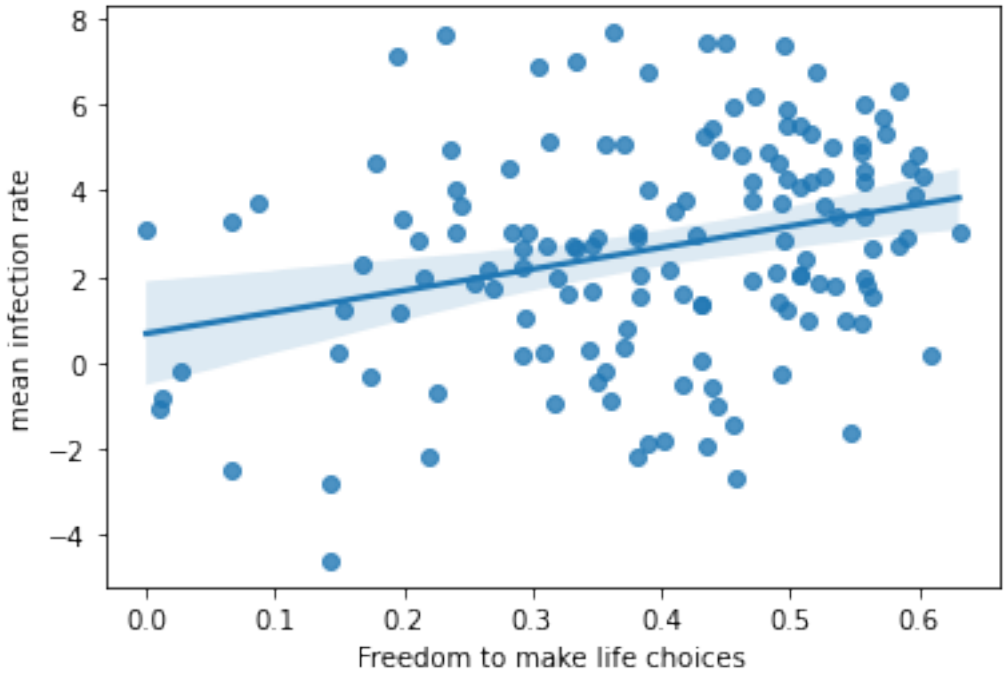
```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.


<AxesSubplot:xlabel='Freedom to make life choices', ylabel='mean
infection rate'>
```




```
sns.regplot(x,np.log(y))
```

```
D:\Users\dell\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning:

Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
```

```
<AxesSubplot:xlabel='Freedom to make life choices', ylabel='mean
infection rate'>
```




```
from covid import Covid

covid = Covid()
covid.get_data()
len(covid.get_data())
```

```
196
```

```
countries = covid.list_countries()

italy_cases = covid.get_status_by_country_id(115)

india_cases = covid.get_status_by_country_name("india")
india_cases
```

```
{'id': '80',
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 'confirmed': 34674643,
 'active': None,
 'deaths': 474479,
 'recovered': None,
 'latitude': 20.593684,
 'longitude': 78.96288,
 'last_update': 1639146106000}
```

```
df=pd.DataFrame(data=covid.get_data())
df.head()
```

```
    id         country  confirmed active  deaths recovered   latitude
\
```

```
0  183              US   49666654   None  794656      None  40.000000

1   80           India   34674643   None  474479      None  20.593684

2   24          Brazil   22177059   None  616457      None -14.235000

3  187  United Kingdom   10722083   None  146592      None  55.000000

4  145          Russia    9782723   None  281571      None  61.524000
```

```
   longitude    last_update
0 -100.00000  1639146106000
1   78.96288  1639146106000
2  -51.92530  1639146106000
3   -3.00000  1639146106000
4  105.31880  1639146106000
```

```
def plot_map(df, col, pal):
    df = df[df[col]>0]
    fig = px.choropleth(df, locations="country", locationmode='country
names',
                  color=col, hover_name="country",
                  title=col, hover_data=[col],
color_continuous_scale=pal)

    fig.show()

plot_map(df, 'confirmed', 'matter')
```


```
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```


```
df.drop(['latitude','longitude','id'],axis=1,inplace=True)
df.head()
```

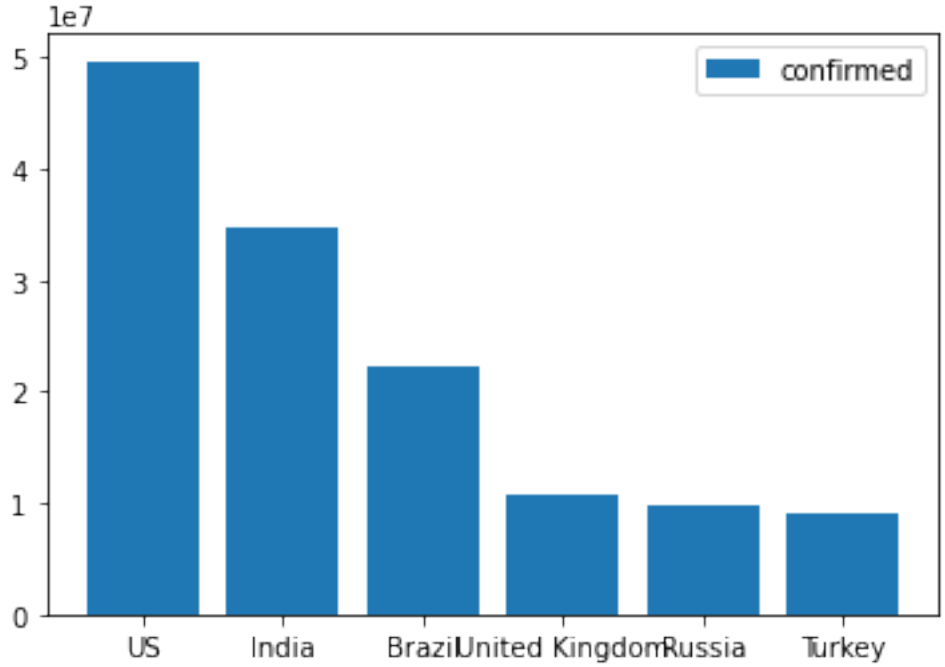
	country	confirmed	active	deaths	recovered	last_update
0	US	49666654	None	794656	None	1639146106000
1	India	34674643	None	474479	None	1639146106000
2	Brazil	22177059	None	616457	None	1639146106000
3	United Kingdom	10722083	None	146592	None	1639146106000
4	Russia	9782723	None	281571	None	1639146106000

```
df.set_index('country',inplace=True)
df.head()
```

```
                confirmed active  deaths recovered    last_update
country
US               49666654   None  794656      None  1639146106000
India            34674643   None  474479      None  1639146106000
Brazil           22177059   None  616457      None  1639146106000
United Kingdom   10722083   None  146592      None  1639146106000
Russia            9782723   None  281571      None  1639146106000
```

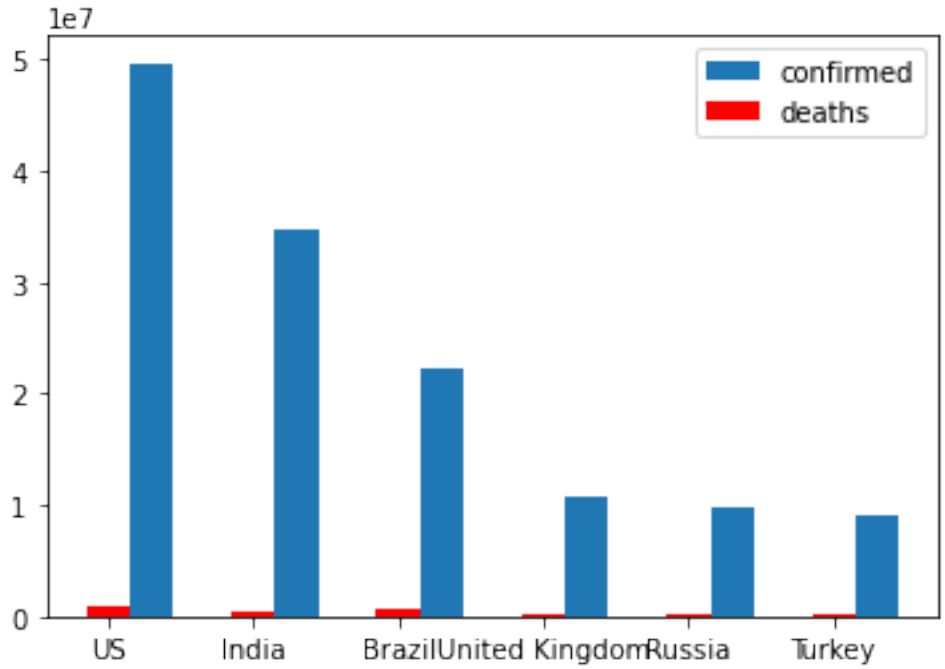
```
countries=df.index[:6]
confirm=df['confirmed'][:6].to_numpy()
plt.bar(countries,confirm,label='confirmed')
plt.legend()
```

```
<matplotlib.legend.Legend at 0x1cfdba9dee0>
```




```
countries=df.index[:6]
confirm=df['confirmed'][:6].to_numpy()
total_deaths=df['deaths'][:6].to_numpy()

xpos=np.arange(6)

plt.bar(xpos+0.3,confirm,label='confirmed',width=0.3)
plt.bar(xpos,total_deaths,label='deaths',width=0.3,color='red')
plt.xticks(xpos,countries)
plt.legend()
```

```
<matplotlib.legend.Legend at 0x1cfdbb19df0>
```




```
final=df.join(corona_data,how='inner')
len(final)
```

```
186
```

```
final.head()
```

```
                confirmed active  deaths recovered    last_update  \
US               49666654   None  794656      None  1639146106000
India            34674643   None  474479      None  1639146106000
Brazil           22177059   None  616457      None  1639146106000
United Kingdom   10722083   None  146592      None  1639146106000
Russia            9782723   None  281571      None  1639146106000

                mean infection rate
US                     10802.252525
India                    352.151515
Brazil                   880.676768
United Kingdom          1742.232323
Russia                  1075.737374
```

Joining Data from covid library and World Happiness Index

```
data1 = world_happiness_report.join(df,how="inner")
```

```
data1.head(10)
```

```
             GDP per capita  Social support  Healthy life
expectancy  \
```

Finland	1.340	1.587	0.986
Denmark	1.383	1.573	0.996
Norway	1.488	1.582	1.028
Iceland	1.380	1.624	1.026
Netherlands	1.396	1.522	0.999
Switzerland	1.452	1.526	1.052
Sweden	1.387	1.487	1.009
New Zealand	1.303	1.557	1.026
Canada	1.365	1.505	1.039
Austria	1.376	1.475	1.016

	Freedom to make life choices	confirmed	active	deaths	recovered
Finland	0.596	201051	None	1421	None
Denmark	0.592	542181	None	2996	None
Norway	0.603	305368	None	1135	None
Iceland	0.591	19159	None	35	None
Netherlands	0.557	2870459	None	20372	None
Switzerland	0.572	1111923	None	11739	None
Sweden	0.574	1226055	None	15185	None
New Zealand	0.585	12623	None	44	None
Canada	0.584	1831341	None	29930	None
Austria	0.532	1221095	None	13076	None

	last_update
Finland	1639146106000
Denmark	1639146106000
Norway	1639146106000
Iceland	1639146106000

```
Netherlands  1639146106000
Switzerland  1639146106000
Sweden       1639146106000
New Zealand  1639146106000
Canada       1639146106000
Austria      1639146106000
```

Scaling data

```
data1.drop(['active','recovered','last_update'],axis=1 ,inplace =
True)
data1.head()
```

```
             GDP per capita  Social support  Healthy life
expectancy  \
Finland               1.340           1.587                     0.986

Denmark               1.383           1.573                     0.996

Norway                1.488           1.582                     1.028

Iceland               1.380           1.624                     1.026

Netherlands           1.396           1.522                     0.999


             Freedom to make life choices  confirmed  deaths
Finland                             0.596     201051    1421
Denmark                             0.592     542181    2996
Norway                              0.603     305368    1135
Iceland                             0.591      19159      35
Netherlands                         0.557    2870459   20372
```

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
scaled = scaler.fit_transform(data1)
```

```
from pandas import DataFrame
datax = DataFrame(scaled)
datax.head()
```

```
          0         1         2         3         4         5
0  0.795724  0.977217  0.850386  0.944532  0.005722  0.002300
1  0.821259  0.968596  0.860039  0.938193  0.015561  0.004855
2  0.883610  0.974138  0.890927  0.955626  0.008731  0.001836
3  0.819477  1.000000  0.888996  0.936609  0.000476  0.000052
4  0.828979  0.937192  0.862934  0.882726  0.082713  0.033042
```

Performing linear regression

```
from sklearn.linear_model import LinearRegression
regression_model = LinearRegression()

x = datax.iloc[:, -6].values #GDP
y = datax.iloc[:, -1].values #deaths
x= x.reshape(-1,1)
regression_model.fit(x,y) #GDP vs Deaths

LinearRegression()

y_predicted = regression_model.predict(x)

from sklearn.metrics import mean_squared_error ,r2_score
mse = mean_squared_error(y,y_predicted)

mse

0.015631230121152265

rmse = np.sqrt(mean_squared_error(y,y_predicted))
r2 = r2_score(y,y_predicted)

rmse

0.12502491800098198

r2

0.021593705847284927
```

GDP alone cannot explain variance of deaths

Gradient descent approach

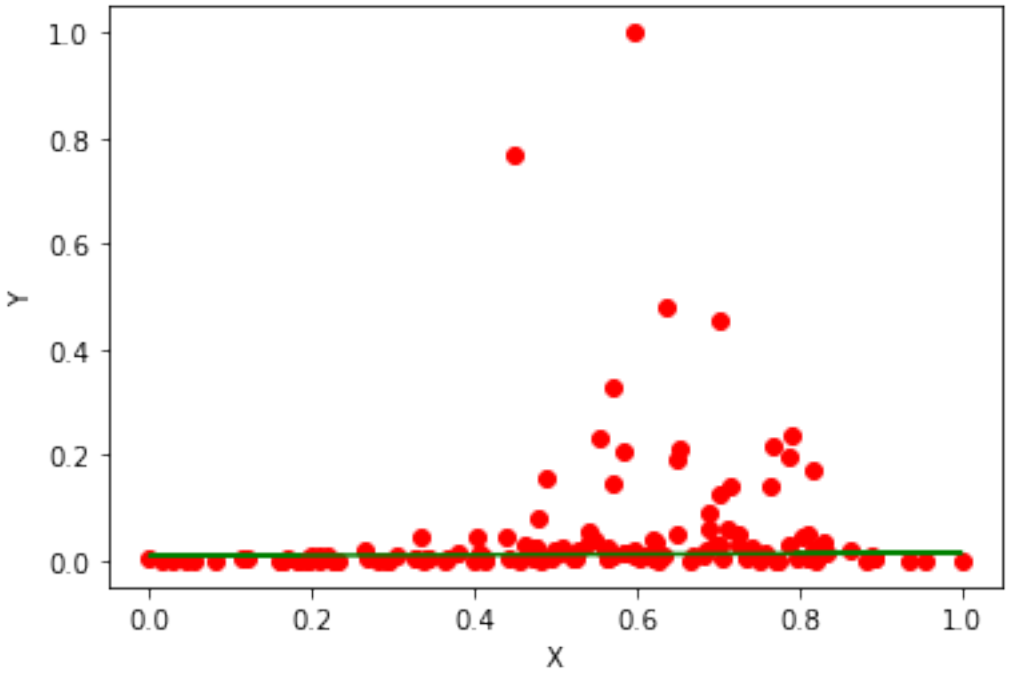
```
# Gradient descent_Build the model
m = 0
c = 0
L = 0.00001
epochs = 10000 #the number of iterations to perform gradiation
X = datax.iloc[:, -6].values #attributes to determine dependant
variable/ Class
Y = datax.iloc[:, -1].values #dependant variable/ Class
n = float(len(X))
n

144.0

for i in range(epochs):
    Y_pred = m*X + c #The current predicted value of Y
    D_m = (-2/n) * sum(X* (Y - Y_pred)) # Derivative wrt m
    D_c = (-2/n) * sum(Y - Y_pred) # Derivative of c
```

```
    m = m - L* D_m # Update m
    c = c - L*D_c # Update c
print (m,c)
```

```
0.005452208077273036 0.008711837822156551
```

```
Y_pred = m*X + c
plt.scatter(X,Y,color = "red")
plt.plot(X,Y_pred,color = "green")
plt.xlabel("X")
plt.ylabel("Y")
```

```
Text(0, 0.5, 'Y')
```



Outliers of the Data Frame

Social support index vs Deaths due to covid

```
x = datax.iloc[:, -5].values #attributes to determine dependant variable/ Class
y = datax.iloc[:, -1].values #dependant variable/ Class
x= x.reshape(-1,1)
regression_model.fit(x,y)
```

```
LinearRegression()
```

```
y_predicted = regression_model.predict(x)
```

```
mse = mean_squared_error(y,y_predicted)
mse
```

```
0.015785897837850917
```

```
rmse = np.sqrt(mean_squared_error(y,y_predicted))
r2 = r2_score(y,y_predicted)
r2
```

```
0.011912582458575072
```

Healthy Life Expectancy Vs Deaths due to covid

```
x = datax.iloc[:, -4].values #attributes to determine dependant variable/ Class
y = datax.iloc[:, -1].values #dependant variable/ Class
x= x.reshape(-1,1)
regression_model.fit(x,y)
y_predicted = regression_model.predict(x)
mse = mean_squared_error(y,y_predicted)
mse
```

```
0.0156979693574256
```

```
rmse = np.sqrt(mean_squared_error(y,y_predicted))
r2 = r2_score(y,y_predicted)
r2
```

```
0.017416293811848615
```

Vaccinations

```
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
```

```
df = pd.read_csv('country_vaccinations.csv')
df.head()
```

```
       country iso_code        date  total_vaccinations
people_vaccinated  \
0  Afghanistan      AFG  2021-02-22                 0.0
0.0
1  Afghanistan      AFG  2021-02-23                 NaN
```

```
NaN
2  Afghanistan      AFG  2021-02-24                NaN
NaN
3  Afghanistan      AFG  2021-02-25                NaN
NaN
4  Afghanistan      AFG  2021-02-26                NaN
NaN

   people_fully_vaccinated  daily_vaccinations_raw  daily_vaccinations
\
0                      NaN                     NaN                 NaN

1                      NaN                     NaN              1367.0

2                      NaN                     NaN              1367.0

3                      NaN                     NaN              1367.0

4                      NaN                     NaN              1367.0


   total_vaccinations_per_hundred  people_vaccinated_per_hundred  \
0                             0.0                            0.0
1                             NaN                            NaN
2                             NaN                            NaN
3                             NaN                            NaN
4                             NaN                            NaN

   people_fully_vaccinated_per_hundred  daily_vaccinations_per_million
\
0                                  NaN                             NaN

1                                  NaN                            34.0

2                                  NaN                            34.0

3                                  NaN                            34.0

4                                  NaN                            34.0


                                        vaccines  \
0  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
1  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
2  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
3  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
4  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...

                source_name  \
```

```
0  World Health Organization
1  World Health Organization
2  World Health Organization
3  World Health Organization
4  World Health Organization
```

```
                                        source_website
0  https://reliefweb.int/sites/reliefweb.int/file...
1  https://reliefweb.int/sites/reliefweb.int/file...
2  https://reliefweb.int/sites/reliefweb.int/file...
3  https://reliefweb.int/sites/reliefweb.int/file...
4  https://reliefweb.int/sites/reliefweb.int/file...
```

```
df.isnull().sum()
```

```
country                                   0
iso_code                                  0
date                                      0
total_vaccinations                    25685
people_vaccinated                     27190
people_fully_vaccinated               30037
daily_vaccinations_raw                31124
daily_vaccinations                      253
total_vaccinations_per_hundred        25685
people_vaccinated_per_hundred         27190
people_fully_vaccinated_per_hundred   30037
daily_vaccinations_per_million          253
vaccines                                  0
source_name                               0
source_website                            0
dtype: int64
```

```
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
```

```
          0   1   2
0      2021  02  22
```

```
1      2021  02  23
2      2021  02  24
3      2021  02  25
4      2021  02  26
...     ...  ..  ..
55819  2021  11  01
55820  2021  11  02
55821  2021  11  03
55822  2021  11  04
55823  2021  11  05

[55824 rows x 3 columns]
```

```
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()
```

```
       country iso_code       date  total_vaccinations
people_vaccinated  \
0  Afghanistan      AFG 2021-02-22                   0
0
1  Afghanistan      AFG 2021-02-23                   0
0
2  Afghanistan      AFG 2021-02-24                   0
0
3  Afghanistan      AFG 2021-02-25                   0
0
4  Afghanistan      AFG 2021-02-26                   0
0

   people_fully_vaccinated  daily_vaccinations_raw  daily_vaccinations
\
0                        0                       0                   0

1                        0                       0                1367

2                        0                       0                1367

3                        0                       0                1367

4                        0                       0                1367


   total_vaccinations_per_hundred  people_vaccinated_per_hundred  \
0                               0                              0
```

```
1                                  0                                  0
2                                  0                                  0
3                                  0                                  0
4                                  0                                  0

   people_fully_vaccinated_per_hundred  daily_vaccinations_per_million
\
0                                    0                                0

1                                    0                               34

2                                    0                               34

3                                    0                               34

4                                    0                               34


                                             vaccines  \
0  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
1  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
2  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
3  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
4  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...

                source_name  \
0  World Health Organization
1  World Health Organization
2  World Health Organization
3  World Health Organization
4  World Health Organization

                                      source_website  year  month  day

0  https://reliefweb.int/sites/reliefweb.int/file...  2021      2   22

1  https://reliefweb.int/sites/reliefweb.int/file...  2021      2   23

2  https://reliefweb.int/sites/reliefweb.int/file...  2021      2   24

3  https://reliefweb.int/sites/reliefweb.int/file...  2021      2   25

4  https://reliefweb.int/sites/reliefweb.int/file...  2021      2   26

df.describe()

       total_vaccinations  people_vaccinated  people_fully_vaccinated
\
count        5.582400e+04       5.582400e+04             5.582400e+04
```

```
mean         9.954941e+06       5.624392e+06             3.438866e+06

std          1.057154e+08       3.158674e+07             1.941963e+07

min         -2.147484e+09       0.000000e+00             0.000000e+00

25%          0.000000e+00       0.000000e+00             0.000000e+00

50%          3.108000e+04       4.969000e+03             0.000000e+00

75%          2.477739e+06       1.369812e+06             6.764480e+05

max          2.142580e+09       1.100842e+09             1.070386e+09


       daily_vaccinations_raw  daily_vaccinations  \
count            5.582400e+04        5.582400e+04
mean             1.134868e+05        1.297107e+05
std              8.412834e+05        8.228933e+05
min              0.000000e+00        0.000000e+00
25%              0.000000e+00        9.220000e+02
50%              0.000000e+00        7.007000e+03
75%              1.709025e+04        4.154275e+04
max              2.474100e+07        2.242429e+07

       total_vaccinations_per_hundred
people_vaccinated_per_hundred  \
count                    55824.000000                   55824.000000

mean                        28.357785                      15.636644

std                         45.498547                      24.255363

min                          0.000000                       0.000000

25%                          0.000000                       0.000000

50%                          0.000000                       0.000000

75%                         42.000000                      26.000000

max                        269.000000                     120.000000


       people_fully_vaccinated_per_hundred
daily_vaccinations_per_million  \
count                         55824.000000
```

```
55824.000000
mean                              11.008222
3480.269669
std                               20.232838
4241.817117
min                                0.000000
0.000000
25%                                0.000000
586.000000
50%                                0.000000
2205.000000
75%                               12.000000
5095.000000
max                              118.000000
117497.000000

               year         month           day
count  55824.000000  55824.000000  55824.000000
mean    2020.993730      6.266946     15.846106
std        0.078934      2.637807      8.869602
min     2020.000000      1.000000      1.000000
25%     2021.000000      4.000000      8.000000
50%     2021.000000      6.000000     16.000000
75%     2021.000000      8.000000     24.000000
max     2021.000000     12.000000     31.000000

df.country.unique()

array(['Afghanistan', 'Albania', 'Algeria', 'Andorra', 'Angola',
       'Anguilla', 'Antigua and Barbuda', 'Argentina', 'Armenia',
'Aruba',
       'Australia', 'Austria', 'Azerbaijan', 'Bahamas', 'Bahrain',
       'Bangladesh', 'Barbados', 'Belarus', 'Belgium', 'Belize',
'Benin',
       'Bermuda', 'Bhutan', 'Bolivia', 'Bonaire Sint Eustatius and
Saba',
       'Bosnia and Herzegovina', 'Botswana', 'Brazil',
       'British Virgin Islands', 'Brunei', 'Bulgaria', 'Burkina Faso',
       'Burundi', 'Cambodia', 'Cameroon', 'Canada', 'Cape Verde',
       'Cayman Islands', 'Central African Republic', 'Chad', 'Chile',
       'China', 'Colombia', 'Comoros', 'Congo', 'Cook Islands',
       'Costa Rica', "Cote d'Ivoire", 'Croatia', 'Cuba', 'Curacao',
       'Cyprus', 'Czechia', 'Democratic Republic of Congo', 'Denmark',
       'Djibouti', 'Dominica', 'Dominican Republic', 'Ecuador',
'Egypt',
       'El Salvador', 'England', 'Equatorial Guinea', 'Estonia',
       'Eswatini', 'Ethiopia', 'Faeroe Islands', 'Falkland Islands',
       'Fiji', 'Finland', 'France', 'French Polynesia', 'Gabon',
'Gambia',
       'Georgia', 'Germany', 'Ghana', 'Gibraltar', 'Greece',
```

```
'Greenland',
       'Grenada', 'Guatemala', 'Guernsey', 'Guinea', 'Guinea-Bissau',
       'Guyana', 'Haiti', 'Honduras', 'Hong Kong', 'Hungary',
'Iceland',
       'India', 'Indonesia', 'Iran', 'Iraq', 'Ireland', 'Isle of Man',
       'Israel', 'Italy', 'Jamaica', 'Japan', 'Jersey', 'Jordan',
       'Kazakhstan', 'Kenya', 'Kiribati', 'Kosovo', 'Kuwait',
       'Kyrgyzstan', 'Laos', 'Latvia', 'Lebanon', 'Lesotho',
'Liberia',
       'Libya', 'Liechtenstein', 'Lithuania', 'Luxembourg', 'Macao',
       'Madagascar', 'Malawi', 'Malaysia', 'Maldives', 'Mali',
'Malta',
       'Mauritania', 'Mauritius', 'Mexico', 'Moldova', 'Monaco',
       'Mongolia', 'Montenegro', 'Montserrat', 'Morocco',
'Mozambique',
       'Myanmar', 'Namibia', 'Nauru', 'Nepal', 'Netherlands',
       'New Caledonia', 'New Zealand', 'Nicaragua', 'Niger',
'Nigeria',
       'Niue', 'North Macedonia', 'Northern Cyprus', 'Northern
Ireland',
       'Norway', 'Oman', 'Pakistan', 'Palestine', 'Panama',
       'Papua New Guinea', 'Paraguay', 'Peru', 'Philippines',
'Pitcairn',
       'Poland', 'Portugal', 'Qatar', 'Romania', 'Russia', 'Rwanda',
       'Saint Helena', 'Saint Kitts and Nevis', 'Saint Lucia',
       'Saint Vincent and the Grenadines', 'Samoa', 'San Marino',
       'Sao Tome and Principe', 'Saudi Arabia', 'Scotland', 'Senegal',
       'Serbia', 'Seychelles', 'Sierra Leone', 'Singapore',
       'Sint Maarten (Dutch part)', 'Slovakia', 'Slovenia',
       'Solomon Islands', 'Somalia', 'South Africa', 'South Korea',
       'South Sudan', 'Spain', 'Sri Lanka', 'Sudan', 'Suriname',
'Sweden',
       'Switzerland', 'Syria', 'Taiwan', 'Tajikistan', 'Tanzania',
       'Thailand', 'Timor', 'Togo', 'Tokelau', 'Tonga',
       'Trinidad and Tobago', 'Tunisia', 'Turkey', 'Turkmenistan',
       'Turks and Caicos Islands', 'Tuvalu', 'Uganda', 'Ukraine',
       'United Arab Emirates', 'United Kingdom', 'United States',
       'Uruguay', 'Uzbekistan', 'Vanuatu', 'Venezuela', 'Vietnam',
       'Wales', 'Wallis and Futuna', 'Yemen', 'Zambia', 'Zimbabwe'],
      dtype=object)
```

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

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()
```


```
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
```

```
C:\Users\dell\AppData\Local\Temp/ipykernel_8784/469794026.py:6:
RuntimeWarning:

overflow encountered in long_scalars
```

	total_vaccinted_till_date
India	1070252854
United States	426856166
Brazil	277092585
Indonesia	196518393

```
Japan                           189787850
...                                   ...
Niue                               2484
Tokelau                            1966
Burundi                             610
Pitcairn                             43
China                         -2007914084

[223 rows x 1 columns]
```

```
datar = country_wise_total_vaccinated_df.join(data1,how="inner")

datar.head(10)
```

	total_vaccinted_till_date	GDP per capita	Social support	Healthy life expectancy	Freedom to make life choices
India	1070252854	0.755	0.765	0.588	0.498
Brazil	277092585	1.004	1.439	0.802	0.390
Indonesia	196518393	0.931	1.203	0.660	0.491
Japan	189787850	1.327	1.419	1.088	0.445
Mexico	125372969	1.070	1.323		
Turkey	117406602	1.183	1.360		
Germany	112306162	1.373	1.454		
Pakistan	107371250	0.677	0.886		
Russia	105282120	1.183	1.452		
United Kingdom	102153121	1.333	1.538		

```
Mexico                          0.861                          0.433

Turkey                          0.808                          0.195

Germany                         0.987                          0.495

Pakistan                        0.535                          0.313

Russia                          0.726                          0.334

United Kingdom                  0.996                          0.450
```

```
                confirmed  deaths
India            34674643  474479
Brazil           22177059  616457
Indonesia         4258560  143918
Japan             1727654   18367
Mexico            3911714  296188
Turkey            8986377   78602
Germany           6427417  105000
Pakistan          1288366   28812
Russia            9782723  281571
United Kingdom   10722083  146592
```

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
scaled = scaler.fit_transform(datar)
```

```
from pandas import DataFrame
data_scaled = DataFrame(scaled)
data_scaled.head()
```

```
          0         1         2         3         4         5
6
0  1.000000  0.448337  0.471059  0.466216  0.789223  1.000000
0.769686
1  0.742327  0.596200  0.886084  0.672780  0.618067  0.639548
1.000000
2  0.716151  0.552850  0.740764  0.535714  0.778130  0.122748
0.233456
3  0.713965  0.788005  0.873768  0.948842  0.705230  0.049752
0.029790
4  0.693038  0.635392  0.814655  0.729730  0.686212  0.112744
0.480466
```

```
from sklearn.linear_model import LinearRegression
regression_model = LinearRegression()
from sklearn.metrics import mean_squared_error ,r2_score
```

```
x = data_scaled.iloc[:, -7].values #attributes to determine dependant
variable/ Class
y = data_scaled.iloc[:, -1].values #dependant variable/ Class
x=x.reshape(-1,1)
regression_model.fit(x,y)
y_predicted = regression_model.predict(x)
mse = mean_squared_error(y,y_predicted)
mse
```

```
0.013823870773761234
```

```
rmse = np.sqrt(mean_squared_error(y,y_predicted))
r2 = r2_score(y,y_predicted)
r2
```

```
0.1449725320537083
```

```
x = data_scaled.iloc[:, -7].values #attributes to determine dependant
variable/ Class
y = data_scaled.iloc[:, -2].values #dependant variable/ Class
x=x.reshape(-1,1)
regression_model.fit(x,y)
y_predicted = regression_model.predict(x)
mse = mean_squared_error(y,y_predicted)
mse
```

```
0.009501470187026878
```

```
rmse = np.sqrt(mean_squared_error(y,y_predicted))
r2 = r2_score(y,y_predicted)
r2
```

```
0.22022315976696827
```

Multinomial regression

Performing multinomial regreesion on (Vaccination,GDP) vs Deaths due to Covid

```
data_scaled
```

```
            0         1         2         3         4         5
6
0    1.000000  0.448337  0.471059  0.466216  0.789223  1.000000
0.769686
1    0.742327  0.596200  0.886084  0.672780  0.618067  0.639548
1.000000
2    0.716151  0.552850  0.740764  0.535714  0.778130  0.122748
0.233456
3    0.713965  0.788005  0.873768  0.948842  0.705230  0.049752
```

```
0.029790
4    0.693038  0.635392  0.814655  0.729730  0.686212  0.112744
0.480466
..        ...       ...       ...       ...       ...       ...
...
137  0.652380  0.207838  0.471675  0.083977  0.275753  0.000088
0.000289
138  0.652353  0.181710  0.354064  0.183398  0.015848  0.000294
0.000211
139  0.652349  0.191805  0.423645  0.332046  0.041204  0.000666
0.001225
140  0.652309  0.027316  0.275246  0.265444  0.348653  0.000518
0.000057
141  0.000000  0.611045  0.692734  0.760618  0.825674  0.003156
0.007861

[142 rows x 7 columns]
```

```
from sklearn import linear_model
import statsmodels.api as sm
from sklearn.metrics import r2_score
X = data_scaled[[0,1]] # here we have 2 variables for multiple
regression. If you just want to use one variable for simple linear
regression, then use X = df['Interest_Rate'] for
example.Alternatively, you may add additional variables within the
brackets
Y = data_scaled[6]

# with sklearn
regr = linear_model.LinearRegression()
regr.fit(X, Y)

print('Intercept: \n', regr.intercept_)
print('Coefficients: \n', regr.coef_)
print('R sqaure: \n')
regr.score(X, Y)
```

```
Intercept:
 -0.4866183114101143
Coefficients:
 [0.75670296 0.07414227]
R sqaure:


0.16382754007909928
```

Performing multinomial regreesion on (Vaccination,GDP) vs Deaths due to Covid using stastical models

```
# with statsmodels
X = sm.add_constant(X) # adding a constant
```

```
model = sm.OLS(Y, X).fit()
predictions = model.predict(X)

print_model = model.summary()
print(print_model)
```

```
D:\Users\dell\anaconda3\lib\site-packages\statsmodels\tsa\
tsatools.py:142: FutureWarning:

In a future version of pandas all arguments of concat except for the
argument 'objs' will be keyword-only
```

```
                            OLS Regression Results

==============================================================================
========
Dep. Variable:                      6   R-squared:
0.164
Model:                            OLS   Adj. R-squared:
0.152
Method:                 Least Squares   F-statistic:
13.62
Date:                Fri, 10 Dec 2021   Prob (F-statistic):
3.98e-06
Time:                        20:38:27   Log-Likelihood:
104.07
No. Observations:                 142   AIC:
-202.1
Df Residuals:                     139   BIC:
-193.3
Df Model:                           2

Covariance Type:            nonrobust

==============================================================================
========
                 coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
--------
const         -0.4866      0.104     -4.660      0.000      -0.693
-0.280
0              0.7567      0.155      4.885      0.000       0.450
1.063
1              0.0741      0.042      1.770      0.079      -0.009
0.157
==============================================================================
========
```

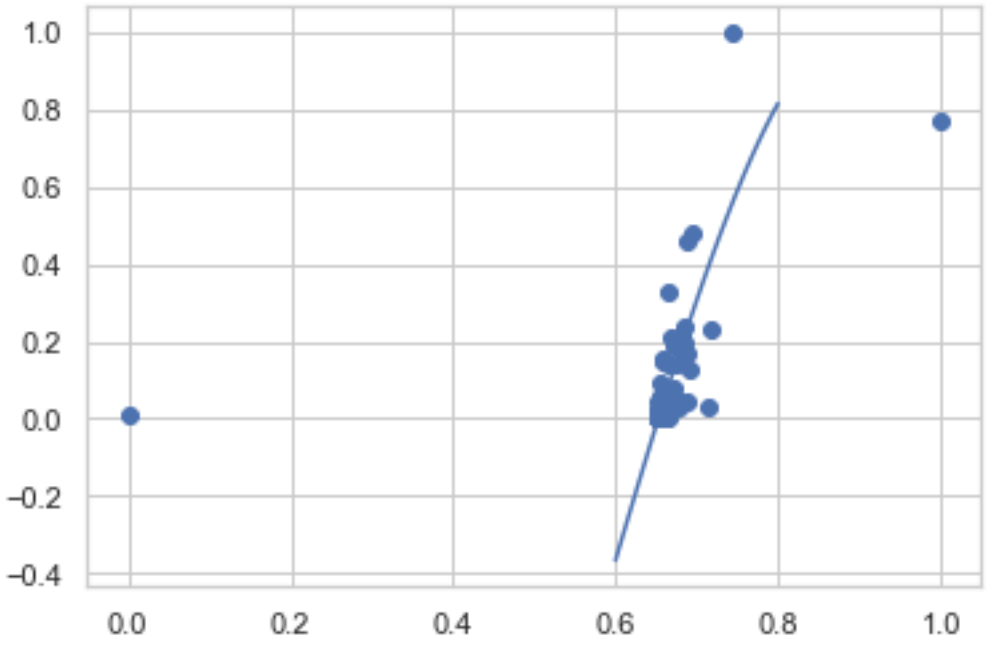
```
Omnibus:                      168.792   Durbin-Watson:
1.099
Prob(Omnibus):                  0.000   Jarque-Bera (JB):
4361.505
Skew:                           4.557   Prob(JB):
0.00
Kurtosis:                      28.575   Cond. No.
24.7
================================================================================
========

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is
correctly specified.
```

Polonomial Regression

```
X = data_scaled[0] # Vaccinated list of different countries
Y =data_scaled[6] # Covid Confirmed cases
```

Polynomial regression (Vaccinations vs Confirmed cases)

```
import numpy as np
mymodel = np.poly1d(np.polyfit(X, Y, 3))
myline = np.linspace(0.6, 0.8, 100)

plt.scatter(X, Y)
plt.plot(myline, mymodel(myline))
plt.show()
```



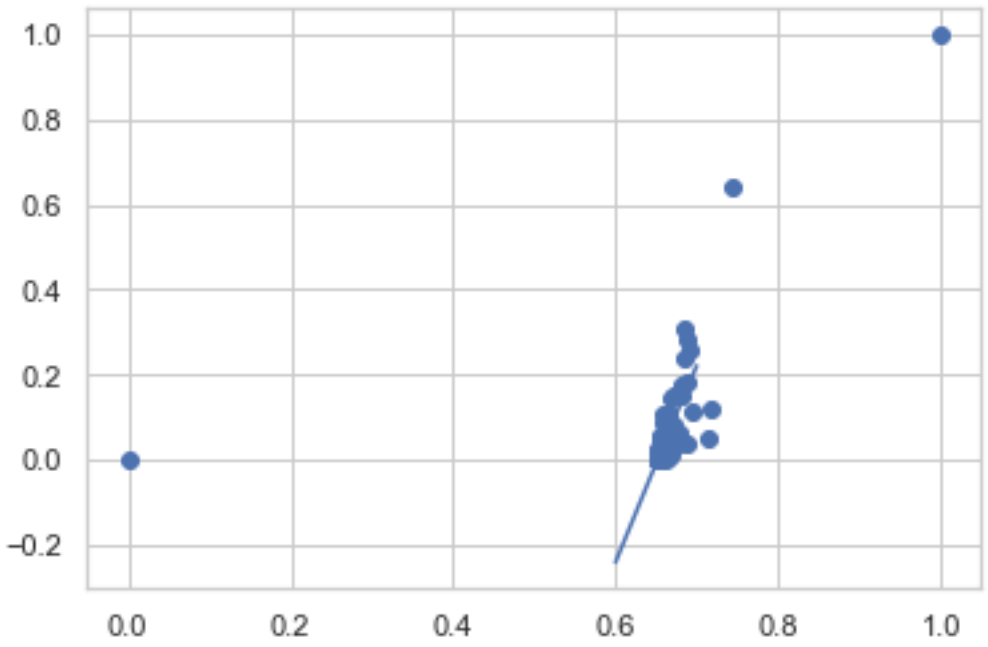
Rsquare value of Vaccinations vs Confirmed cases

```
print(r2_score(Y, mymodel(X)))
```

```
0.6847344781455831
```

Polynomial regression (Vaccinations vs Deaths)

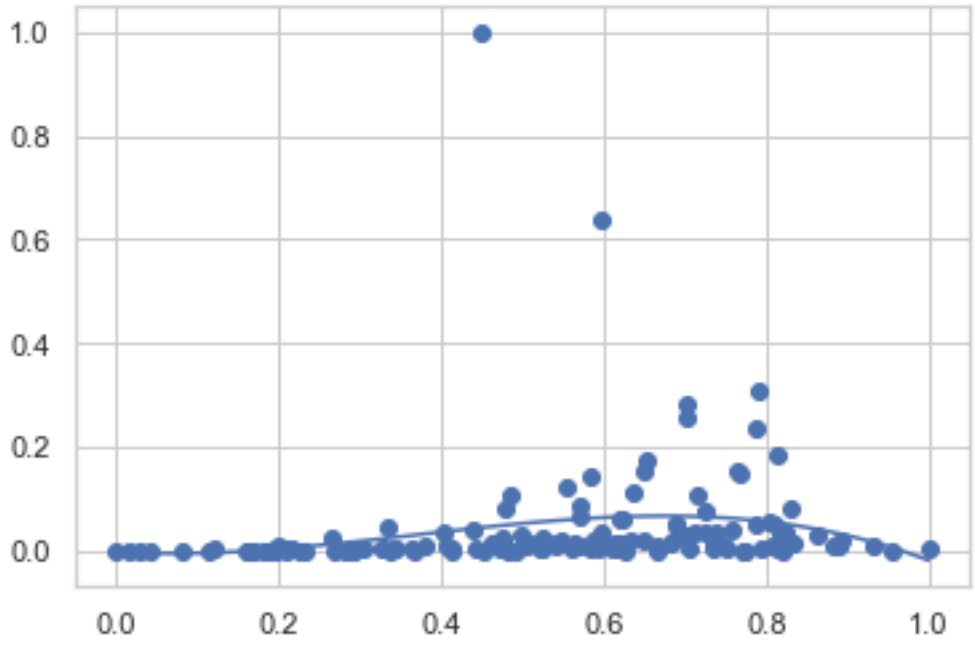
```
X = data_scaled[0] #Vaccinated list
Y =data_scaled[5] # Deaths  due to covid

import numpy as np
mymodel = np.poly1d(np.polyfit(X, Y, 3))
myline = np.linspace(0.6, 0.7, 100)

plt.scatter(X, Y)
plt.plot(myline, mymodel(myline))
plt.show()
print("R2 value of Vaccinations vs Deaths:")
print(r2_score(Y, mymodel(X)))
```




```
R2 value of Vaccinations vs Deaths:
0.8397867607203168
```

Polynomial Regression (GDP vs Deaths)

```
X = data_scaled[1]
Y =data_scaled[5]

import numpy as np
mymodel = np.poly1d(np.polyfit(X, Y, 3))
myline = np.linspace(0, 1, 100)

plt.scatter(X, Y)
plt.plot(myline, mymodel(myline))
plt.show()
print("R2 value of Gdp vs Deaths:")
print(r2_score(Y, mymodel(X)))
```




```
R2 value of Gdp vs Deaths:
0.049696032274289315
```