9pc2jz2rf

March 4, 2023

1 Mini Project 2

[28]:
```
#Importing libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from scipy.optimize import curve_fit
```

[29]:
```
csv_data_path="United_States_COVID-19_Cases_and_Deaths_by_State_over_Time.csv"
```

[30]:
```
#Importing and reading the data
covid19=pd.read_csv(csv_data_path)
df=pd.DataFrame(covid19)
```

[31]:
```
df
```

[31]:

	submission_date	state	tot_cases	conf_cases	prob_cases	new_case	\
0	01/14/2022	KS	621,273	470,516	150,757	19,414	
1	01/02/2022	AS	11	NaN	NaN	0	
2	02/04/2020	AR	0	NaN	NaN	0	
3	12/06/2021	MP	1,104	1,104	0	0	
4	05/09/2021	PW	0	NaN	NaN	0	
…	…	…	…	…	…	…	
50356	05/28/2020	IA	18,585	NaN	NaN	228	
50357	06/07/2020	SD	5,438	NaN	NaN	71	
50358	04/30/2021	SD	122,660	NaN	NaN	128	
50359	04/06/2020	NM	686	NaN	NaN	62	
50360	03/13/2021	IA	342,495	NaN	NaN	425	

	pnew_case	tot_death	conf_death	prob_death	new_death	pnew_death	\
0	6,964	7,162	NaN	NaN	21	4	
1	0	0	NaN	NaN	0	0	
2	NaN	0	NaN	NaN	0	NaN	
3	0	5	5	0	2	0	
4	0	0	NaN	NaN	0	0	
…	…	…	…	…	…	…	
50356	0	506	NaN	NaN	14	0	

```
50357         0        65         64          1         0          1
50358        17     1,967      1,601        366         5          1
50359         0        12        NaN        NaN         0          0
50360        77     5,633        NaN        NaN         3          3

                    created_at consent_cases consent_deaths
0       01/15/2022 02:59:30 PM         Agree            NaN
1       01/03/2022 03:18:16 PM           NaN            NaN
2       03/26/2020 04:22:39 PM     Not agree      Not agree
3       12/08/2021 12:00:00 AM         Agree          Agree
4       05/10/2021 02:15:36 PM           NaN            NaN
…                          …           …              …
50356   05/29/2020 02:19:55 PM     Not agree      Not agree
50357   06/08/2020 02:55:08 PM           NaN          Agree
50358   05/01/2021 01:43:22 PM           NaN          Agree
50359   04/08/2020 12:00:00 AM           NaN      Not agree
50360   03/14/2021 01:53:25 PM     Not agree      Not agree

[50361 rows x 15 columns]
```

[32]:
```
#tells about rows and columns
df.shape
```

[32]:
```
(50361, 15)
```

[33]:
```
#tells information about the dataframe
df.info
```

[33]:
```
<bound method DataFrame.info of       submission_date state tot_cases conf_cases
prob_cases new_case  \
0          01/14/2022    KS   621,273    470,516    150,757   19,414
1          01/02/2022    AS        11        NaN        NaN        0
2          02/04/2020    AR         0        NaN        NaN        0
3          12/06/2021    MP     1,104      1,104          0        0
4          05/09/2021    PW         0        NaN        NaN        0
…                 …   …       …         …         …      …
50356      05/28/2020    IA    18,585        NaN        NaN      228
50357      06/07/2020    SD     5,438        NaN        NaN       71
50358      04/30/2021    SD   122,660        NaN        NaN      128
50359      04/06/2020    NM       686        NaN        NaN       62
50360      03/13/2021    IA   342,495        NaN        NaN      425

      pnew_case tot_death conf_death prob_death new_death pnew_death  \
0         6,964     7,162        NaN        NaN        21          4
1             0         0        NaN        NaN         0          0
2           NaN         0        NaN        NaN         0        NaN
3             0         5          5          0         2          0
```

```
4             0         0        NaN        NaN         0          0
…           …       …        …          …          …        …
50356         0       506        NaN        NaN        14          0
50357         0        65         64          1         0          1
50358        17     1,967      1,601        366         5          1
50359         0        12        NaN        NaN         0          0
50360        77     5,633        NaN        NaN         3          3

                   created_at consent_cases consent_deaths
0      01/15/2022 02:59:30 PM         Agree            NaN
1      01/03/2022 03:18:16 PM           NaN            NaN
2      03/26/2020 04:22:39 PM     Not agree      Not agree
3      12/08/2021 12:00:00 AM         Agree          Agree
4      05/10/2021 02:15:36 PM           NaN            NaN
…                        …           …             …
50356  05/29/2020 02:19:55 PM     Not agree      Not agree
50357  06/08/2020 02:55:08 PM           NaN          Agree
50358  05/01/2021 01:43:22 PM           NaN          Agree
50359  04/08/2020 12:00:00 AM           NaN      Not agree
50360  03/14/2021 01:53:25 PM     Not agree      Not agree

[50361 rows x 15 columns]>
```

[34]:
```
df.head()
```

[34]:
```
  submission_date state tot_cases conf_cases prob_cases new_case pnew_case  \
0      01/14/2022    KS   621,273    470,516    150,757   19,414     6,964
1      01/02/2022    AS        11        NaN        NaN        0         0
2      02/04/2020    AR         0        NaN        NaN        0       NaN
3      12/06/2021    MP     1,104      1,104          0        0         0
4      05/09/2021    PW         0        NaN        NaN        0         0

  tot_death conf_death prob_death new_death pnew_death  \
0     7,162        NaN        NaN        21          4
1         0        NaN        NaN         0          0
2         0        NaN        NaN         0        NaN
3         5          5          0         2          0
4         0        NaN        NaN         0          0

               created_at consent_cases consent_deaths
0  01/15/2022 02:59:30 PM         Agree            NaN
1  01/03/2022 03:18:16 PM           NaN            NaN
2  03/26/2020 04:22:39 PM     Not agree      Not agree
3  12/08/2021 12:00:00 AM         Agree          Agree
4  05/10/2021 02:15:36 PM           NaN            NaN
```

[35]:
```
df.describe()
```

[35]:
```
       submission_date  state tot_cases conf_cases prob_cases new_case  \
count            50361  50361     50361      27885      27813    50361
unique             860     60     37784      22898      16503     7568
top         01/14/2022     AL         0          0          0        0
freq                60    860      3971        766       6400     9929

       pnew_case tot_death conf_death prob_death new_death pnew_death  \
count      46659     50361      27448      27448     50361      46691
unique      2964     16880      12621       3872       505        320
top            0         0          0          0         0          0
freq       21637      6426       2057       7185     18040      33153

                    created_at consent_cases consent_deaths
count                    50361         41966          42810
unique                    1913             2              2
top     03/26/2020 04:22:39 PM         Agree          Agree
freq                      2888         30030          29468
```

[36]:
```
df.isnull().sum()
```

[36]:
```
submission_date        0
state                  0
tot_cases              0
conf_cases         22476
prob_cases         22548
new_case               0
pnew_case           3702
tot_death              0
conf_death         22913
prob_death         22913
new_death              0
pnew_death          3670
created_at             0
consent_cases       8395
consent_deaths      7551
dtype: int64
```

[37]:
```
df_CA=df[df['state']=='CA']                    #initialize a sub-dataframefor␣
 ↪storing values of california
```

[38]:
```
df_CA
```

[38]:
```
       submission_date state  tot_cases conf_cases prob_cases new_case  \
10539       12/12/2021    CA  5,133,238  4,867,604    265,634        0
10541       02/28/2022    CA  8,960,997  8,381,196    579,801   19,492
10564       09/15/2021    CA  4,574,136  4,380,566    193,570    7,760
10676       06/11/2021    CA  3,694,498  3,694,498          0    1,136
```

```
10683      06/08/2021    CA  3,691,660  3,691,660          0      792
…                …   …       …          …          …      …
34707      12/24/2021    CA  5,264,182  4,990,016    274,166   20,401
34719      01/28/2022    CA  8,213,786  7,706,395    507,391   76,729
34765      10/09/2020    CA    838,606    838,606          0    3,806
34778      08/29/2020    CA    693,839    693,839          0    4,981
34805      01/07/2022    CA  5,947,810  5,634,357    313,453  103,606

      pnew_case tot_death conf_death prob_death new_death pnew_death  \
10539         0    74,509        NaN        NaN         0          0
10541         0    84,700        NaN        NaN       708          0
10564         0    67,001     67,001          0       188          0
10676         0    62,593     62,593          0        55          0
10683         0    62,479     62,479          0         6          0
…         …       …          …          …       …        …
34707         0    75,461        NaN        NaN        78          0
34719         0    78,825        NaN        NaN       254          0
34765         0    16,298     16,298          0        73          0
34778         0    12,569     12,569          0       108          0
34805         0    76,341        NaN        NaN       287          0

                  created_at consent_cases consent_deaths
10539  12/13/2021 03:27:15 PM         Agree      Not agree
10541  03/01/2022 03:28:54 PM         Agree      Not agree
10564  09/17/2021 12:00:00 AM         Agree          Agree
10676  06/13/2021 12:00:00 AM         Agree          Agree
10683  06/10/2021 12:00:00 AM         Agree          Agree
…                        …           …            …
34707  12/25/2021 02:11:33 PM         Agree      Not agree
34719  01/29/2022 02:30:49 PM         Agree      Not agree
34765  10/11/2020 12:00:00 AM         Agree          Agree
34778  08/31/2020 12:00:00 AM         Agree          Agree
34805  01/08/2022 02:31:47 PM         Agree      Not agree

[839 rows x 15 columns]
```

[39]:
```
df_CA.shape
```

[39]:
```
(839, 15)
```

[40]:
```
df_CA.describe()
```

[40]:
```
       submission_date state tot_cases conf_cases prob_cases new_case  \
count              839   839       839        839        839      839
unique             839     1       719        719         41      694
top         12/12/2021    CA         0          0          0        0
freq                 1   839        11         11        533      121
```

```
       pnew_case tot_death conf_death prob_death new_death pnew_death  \
count        839       839        634        634       839        839
unique        40       689        574          1       288          1
top            0         0          0          0         0          0
freq         800        43         31        634       149        839

                     created_at consent_cases consent_deaths
count                       839           839            839
unique                      835             1              2
top     03/07/2022 05:06:37 PM         Agree          Agree
freq                          5           839            634
```

[41]:
```
df_CA.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 839 entries, 10539 to 34805
Data columns (total 15 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   submission_date  839 non-null    object
 1   state            839 non-null    object
 2   tot_cases        839 non-null    object
 3   conf_cases       839 non-null    object
 4   prob_cases       839 non-null    object
 5   new_case         839 non-null    object
 6   pnew_case        839 non-null    object
 7   tot_death        839 non-null    object
 8   conf_death       634 non-null    object
 9   prob_death       634 non-null    object
 10  new_death        839 non-null    object
 11  pnew_death       839 non-null    object
 12  created_at       839 non-null    object
 13  consent_cases    839 non-null    object
 14  consent_deaths   839 non-null    object
dtypes: object(15)
memory usage: 104.9+ KB
```

[42]:
```
tot_cases=np.array(df_CA['tot_cases'])                    #creating array
```

[43]:
```
tot_cases
```

[43]:
```
array(['5,133,238', '8,960,997', '4,574,136', '3,694,498', '3,691,660',
       '9,084,834', '739,527', '4,885,289', '4,653,610', '586,056',
       '122,901', '9,105,181', '5,041,193', '5,084,927', '1,389,707',
       '9,140,562', '26,182', '3,553,307', '12,026', '4,429,964',
       '2,781,039', '538,416', '4,276,720', '3,484,963', '10,566',
```

'3,656,967', '23,253', '3,555,915', '9,115,022', '3,677,235', '6',
'3,661,675', '8,775,930', '944,576', '4,653,610', '7,570,538',
'3,465,726', '4,676,579', '247', '722,283', '5,844,204',
'4,826,113', '904,198', '4,554,525', '3,559,193', '5,264,182',
'5,204,695', '3,428,518', '760,013', '4,749,201', '1,286,557',
'514,901', '4,972,469', '1,854,456', '3,659,641', '9,155,320',
'8,867,026', '312,344', '3,294,447', '6', '165,416', '4,515,931',
'4,355,018', '485,502', '8,545,237', '3,085,040', '133',
'8,941,505', '4,466,363', '991,609', '3,688,893', '4,497,019',
'4,382,003', '6', '8,987,031', '48,917', '774,135', '4,997,390',
'43,464', '5,152,143', '8,867,026', '3,801', '5,371,564',
'4,148,188', '4,705,915', '1,102,033', '926,534', '3,689,994',
'9,105,181', '3,541,928', '2,942,475', '222,917', '500,130',
'9,247,030', '9,115,022', '529,980', '5,477,529', '88',
'2,973,174', '288', '74,936', '4,201,675', '375,363', '5,014,428',
'4,489,496', '0', '9,002,023', '8,155', '3,664,909', '3,602,827',
'98,980', '4,248,391', '3,634,778', '3,969,141', '4,211,423',
'18,309', '0', '0', '5,009,101', '5,049,583', '766,201', '27,528',
'966,500', '3,702,882', '638,831', '807,425', '874,077',
'4,826,113', '4,162,287', '621,562', '96,733', '4,646,334',
'9,191', '3,169,914', '9,074,163', '493,588', '64,561', '1,468',
'248,235', '8,016,654', '7,570,538', '5,084,927', '4,855,054',
'509,162', '732,144', '3,391,036', '183,073', '757,778', '21',
'8,999,665', '4,960,026', '3,532,496', '76,793', '1,733',
'3,488,467', '9,115,022', '9,177,609', '3,441,946', '9,177,609',
'9,140,562', '3,918,247', '1,551,766', '8,775,930', '3,704,005',
'4,749,201', '9,045,132', '3,412,057', '3,573,074', '519,427',
'2,345,909', '139,281', '5,029,772', '6,502,320', '912,904',
'4,826,113', '3,693,362', '232,657', '1,224', '813,687',
'4,137,738', '5,053,778', '3,450,058', '9,082,073', '3,878,207',
'101,697', '52,197', '4,588,021', '4,291,284', '3,611,349',
'4,107,763', '1,998,115', '4,850,676', '2,155,976', '1,892,348',
'206,433', '0', '8,962,457', '877,784', '3,714,051', '2,482,226',
'3,371,556', '8,867,026', '5,057,974', '3,892,784', '9,140,562',
'94,558', '117,687', '475,305', '6,789,403', '4,787,698',
'593,141', '977,218', '336,447', '3,683,309', '21,794',
'3,547,278', '9,031,767', '3,640,226', '3,706,846', '3,530,055',
'4,263,107', '1,029,235', '892,810', '4,081,576', '445,400',
'1,485,703', '4,687,825', '712,052', '5,947,810', '4,504,293',
'254,745', '4,176,766', '3,528,795', '5,766,356', '472',
'8,843,229', '3,663,539', '3,685,455', '3,670,469', '384,692',
'3,889,528', '4,915,947', '3,520,333', '3,335,926', '13',
'850,028', '699,909', '4,984,465', '826,784', '5,178,422',
'9,074,163', '9,019,412', '103,886', '3,362,981', '2,816,969',
'675', '4,892,387', '86,197', '1,264,539', '998,502', '3,616,779',
'6', '4,929,176', '19,472', '3,701,926', '9,019,412', '898,029',
'17', '3,687,736', '58,815', '3,136,158', '3,608,898', '3,904,150',

'8,213,786', '668,615', '823,729', '1,144,049', '4,643',
'3,460,326', '7,109,212', '30,333', '3,622,427', '1,008,377', '33',
'2,452,334', '8,914,094', '3,526,335', '5,126,986', '9,140,562',
'794,040', '8,213,786', '940,010', '90,631', '1,245,951',
'4,724,913', '8,941,505', '1,019,345', '3,674,044', '14,336',
'3,562,191', '5,947,810', '195,571', '271,684', '3,700,750',
'4,781,510', '3,697,927', '3,682,099', '3,535,534', '3,258,706',
'4,067,174', '4,826,113', '1,807,982', '88,444', '4,742,491', '21',
'4,323,858', '329,162', '3,696,472', '34', '2,859,624',
'4,937,188', '4,728,665', '8,867,026', '8', '867,317', '20,615',
'0', '717,177', '9,019,412', '3,895,877', '3,516,862', '5,171,129',
'3,880,618', '3,346,340', '3,281,271', '790,640', '688,858',
'3,549,101', '735,235', '9,074,163', '9,115,022', '1,764,374',
'9,095,256', '3,643,992', '1,125,699', '3,629,624', '8,981,277',
'1,964,076', '4,094,492', '704,085', '5,084,927', '4,705,915',
'3,699,455', '66,680', '3,497,578', '1,110,370', '4,820,020',
'554,160', '3,939,217', '9,045,132', '3,666,591', '9,040,591',
'3,667,550', '4,054,132', '9,095,256', '831,225', '1,723,362',
'8,582,249', '6', '934,672', '3,654,545', '113,006', '3,435,186',
'1,006', '3,712,152', '828,461', '4,705,915', '9,095,256',
'916,918', '5,178,422', '8,929,768', '200,461', '4,892,387',
'524,722', '8,752,983', '3,674,662', '28,963', '198', '4,301,558',
'392', '8', '3,493,126', '3,713,944', '3,976,872', '3,880,618',
'54,937', '1,311,625', '601,075', '3,690,868', '3,399,878', '33',
'3,947,201', '1,212,968', '3,620,301', '3,675,817', '0',
'3,695,530', '4,538,638', '4,749,201', '951,094', '460,550',
'7,929,436', '81,795', '1,420,558', '1,617,370', '7', '4,622,180',
'9,177,609', '8,742,232', '2,621,277', '3,153,186', '169,309',
'115,310', '9,007,008', '8,816,088', '3,684,388', '3,583,830',
'4,190,238', '3,904,150', '24,424', '956,957', '5,033,935',
'3,648,276', '37,369', '3,626,656', '870,791', '3,513,678', '0',
'4,653,610', '3,270,770', '3,686,689', '3,922,970', '3,406,365',
'128,812', '2,187,221', '3,479,078', '3,646,729', '6,256,630',
'9,105,181', '31', '727,239', '153,560', '3,538,821', '1,366,435',
'858,401', '4,937,188', '5,477,529', '3,705,427', '4,892,387',
'3,947,201', '846,579', '92,710', '3,614,112', '9,247,030',
'3,685,916', '5,133,238', '5,113,467', '6,789,403', '41,137',
'260,155', '4,770,213', '2,122,806', '750,298', '632,667',
'106,878', '5,212,461', '3,708,861', '3,564,468', '4,597,564',
'5,477,529', '3,713,944', '6,932', '5,001,302', '4,004,855',
'852,406', '3,710,454', '304,297', '9,221,030', '4,766,122',
'9,081,332', '53', '289,468', '3,381,615', '3,224,374',
'3,697,299', '707,797', '3,354,591', '0', '453,659', '3,880,618',
'855,072', '9,247,030', '3,308,468', '4,992,875', '8,907,611',
'545,787', '8,655,610', '0', '781,694', '4,480,630', '3,624,838',
'3,642,480', '2,518,611', '173,824', '510', '7,185,586', '320,804',
'3,186,610', '10,701', '145,643', '1,087,714', '296,499',

'8,941,505', '5,157,619', '8', '2,409,703', '151,452', '62,512',
'4,698,046', '4,681,332', '240,195', '5,350,816', '4,311,959',
'3,631,740', '157', '574,411', '6,670,139', '1,183,320',
'3,671,655', '842,776', '3,590,758', '2,218,142', '3,904,150',
'784,324', '73,164', '46,500', '1,955', '141,983', '3,685,032',
'930,628', '161,099', '1,671,081', '119,807', '4,911,738',
'5,133,238', '3,455,361', '650,336', '8,582,249', '9,045,132',
'679,099', '3,006', '16,957', '3,668,842', '3,704,640',
'5,421,162', '413,576', '886,865', '9,274,208', '6,400,010',
'9,071,134', '4,808,543', '810,625', '3,475,562', '1,341,700',
'3,983,721', '3,655,922', '9,198,997', '148,855', '3,577,951',
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'2,391,261', '277,774', '131,319', '9,177,609', '4,406,577',

```
       '30,978', '3', '3,507,266', '3,721,006', '2,710,801', '3,710,544',
       '2,231,552', '39,254', '3,523,563', '4,615,987', '3,039,044',
       '400,769', '3,470,877', '5,077,315', '65,981', '3,582,463',
       '60,614', '4,606,949', '9,221,030', '4,445,303', '9,133,996',
       '1,072,272', '50,442', '8,854,449', '190,222', '9,061,143',
       '3,713,944', '762,963', '4,396,971', '15', '2,747,288',
       '8,830,785', '9,221,030', '9,031,040', '1,047,789', '922,005',
       '4,963,742', '9,155,320', '8', '5,045,388', '9,115,022',
       '3,712,795', '43', '5,014,428', '2,900,246', '5,223,364', '67,939',
       '737,911', '2,072,665', '3,504,652', '6', '4,457,045', '3,638,132',
       '133,489', '754,923', '971,851', '1,585,044', '34', '25',
       '613,689', '3,604,395', '3,627,885', '5,264,182', '8,213,786',
       '838,606', '693,839', '5,947,810'], dtype=object)
```

[44]:
```
days=np.linspace(0,len(tot_cases))                    #array containing the␣
 ↪day from first recording
```

[45]:
```
days
```

[45]:
```
array([  0.        ,  17.12244898,  34.24489796,  51.36734694,
        68.48979592,  85.6122449 , 102.73469388, 119.85714286,
       136.97959184, 154.10204082, 171.2244898 , 188.34693878,
       205.46938776, 222.59183673, 239.71428571, 256.83673469,
       273.95918367, 291.08163265, 308.20408163, 325.32653061,
       342.44897959, 359.57142857, 376.69387755, 393.81632653,
       410.93877551, 428.06122449, 445.18367347, 462.30612245,
       479.42857143, 496.55102041, 513.67346939, 530.79591837,
       547.91836735, 565.04081633, 582.16326531, 599.28571429,
       616.40816327, 633.53061224, 650.65306122, 667.7755102 ,
       684.89795918, 702.02040816, 719.14285714, 736.26530612,
       753.3877551 , 770.51020408, 787.63265306, 804.75510204,
       821.87755102, 839.        ])
```

[46]:
```
len(days)
```

[46]:
```
50
```

[47]:
```
d={
    "days":pd.Series(days,index=None),
    "tot_cases":pd.Series(tot_cases,index=None)
}
```

[48]:
```
d
```

[48]:
```
{'days': 0       0.000000
 1      17.122449
 2      34.244898
```

3	51.367347
4	68.489796
5	85.612245
6	102.734694
7	119.857143
8	136.979592
9	154.102041
10	171.224490
11	188.346939
12	205.469388
13	222.591837
14	239.714286
15	256.836735
16	273.959184
17	291.081633
18	308.204082
19	325.326531
20	342.448980
21	359.571429
22	376.693878
23	393.816327
24	410.938776
25	428.061224
26	445.183673
27	462.306122
28	479.428571
29	496.551020
30	513.673469
31	530.795918
32	547.918367
33	565.040816
34	582.163265
35	599.285714
36	616.408163
37	633.530612
38	650.653061
39	667.775510
40	684.897959
41	702.020408
42	719.142857
43	736.265306
44	753.387755
45	770.510204
46	787.632653
47	804.755102
48	821.877551
49	839.000000

```
dtype: float64,
'tot_cases': 0      5,133,238
1      8,960,997
2      4,574,136
3      3,694,498
4      3,691,660
         …
834    5,264,182
835    8,213,786
836      838,606
837      693,839
838    5,947,810
Length: 839, dtype: object}
```

[49]:
```
df2=pd.DataFrame(d)
df2
```

[49]:

	days	tot_cases
0	0.000000	5,133,238
1	17.122449	8,960,997
2	34.244898	4,574,136
3	51.367347	3,694,498
4	68.489796	3,691,660
..	…	…
834	NaN	5,264,182
835	NaN	8,213,786
836	NaN	838,606
837	NaN	693,839
838	NaN	5,947,810

[839 rows x 2 columns]

[50]:
```
df2["tot_cases"]=df2["tot_cases"].str.replace(',',"").astype(float)
```

[51]:
```
df2["tot_cases"]
```

[51]:
```
0      5133238.0
1      8960997.0
2      4574136.0
3      3694498.0
4      3691660.0
         …
834    5264182.0
835    8213786.0
836     838606.0
837     693839.0
838    5947810.0
```

```
Name: tot_cases, Length: 839, dtype: float64
```

[52]:
```
df2["days"][:200]
```

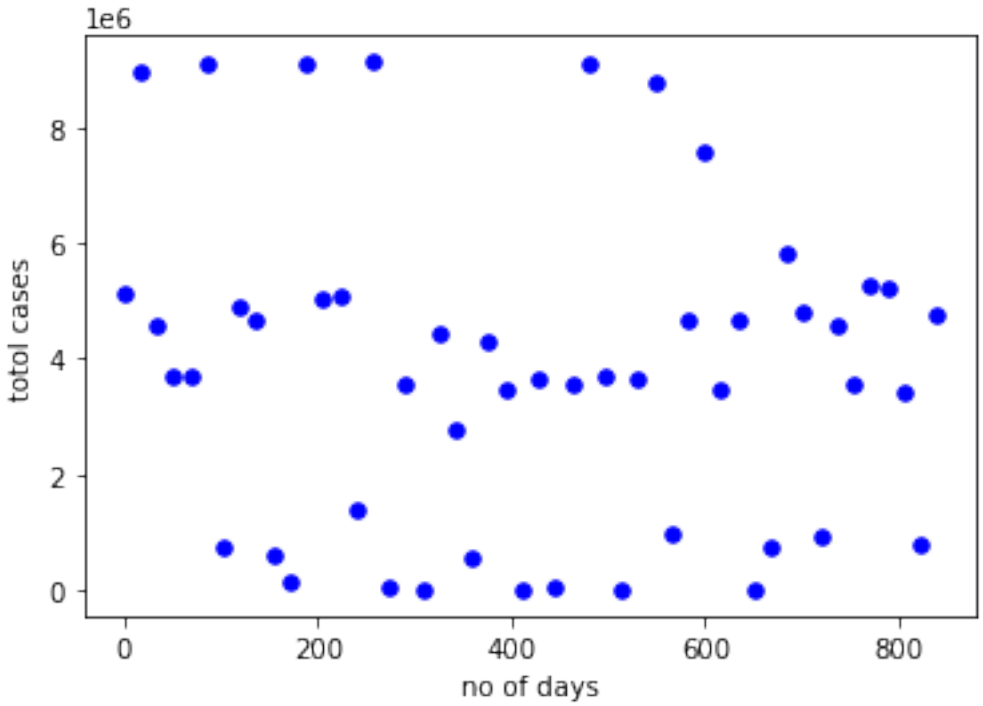
[52]:
```
0       0.000000
1      17.122449
2      34.244898
3      51.367347
4      68.489796
         …
195          NaN
196          NaN
197          NaN
198          NaN
199          NaN
Name: days, Length: 200, dtype: float64
```

[53]:
```
#Defining the fitting function
def exp_fit(x,a,b,c):
    y=a*np.exp(b*x)+c
    return y
```

[56]:
```
fit=curve_fit(exp_fit,df2['days'][:50],df2["tot_cases"][:50],p0=[0.005,0.03,5])
fit_eq=fit[0][0]*np.exp(fit[0][1]*df2["days"][:50]+fit[0][2])
```

[58]:
```
#Plotting
fig=plt.figure()
ax=fig.subplots()
ax.scatter(df2["days"][:50],df2["tot_cases"][:50],color="b",s=30)
ax.plot(df2["days"][:50],fit_eq,color="r",alpha=1)
ax.set_ylabel("totol cases")
ax.set_xlabel("no of days")
```

[58]:
```
Text(0.5, 0, 'no of days')
```



APPLYING AN RANDOM EXPONENTIAL DISTRIBUTION FIT TO A HISTOGRAM

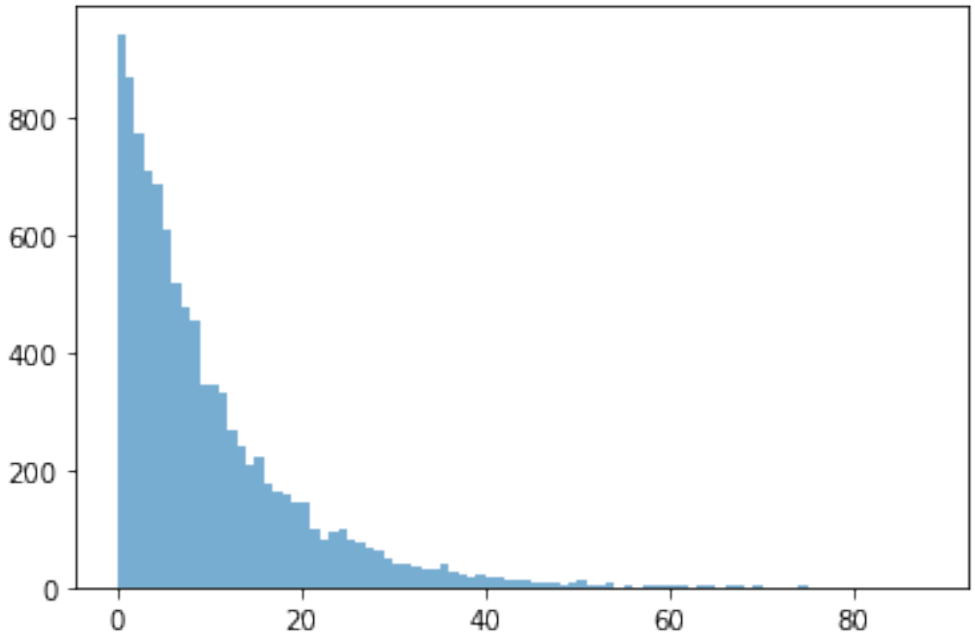
[42]:
```
def exp_fit(x,a,b):
    y=a*np.exp(-b*x)
    return y
```

[43]:
```
data=np.random.exponential(5,size=10000)
hist=np.histogram(data,bins="auto")[0]
x=np.arange(0,len(hist),1)
```

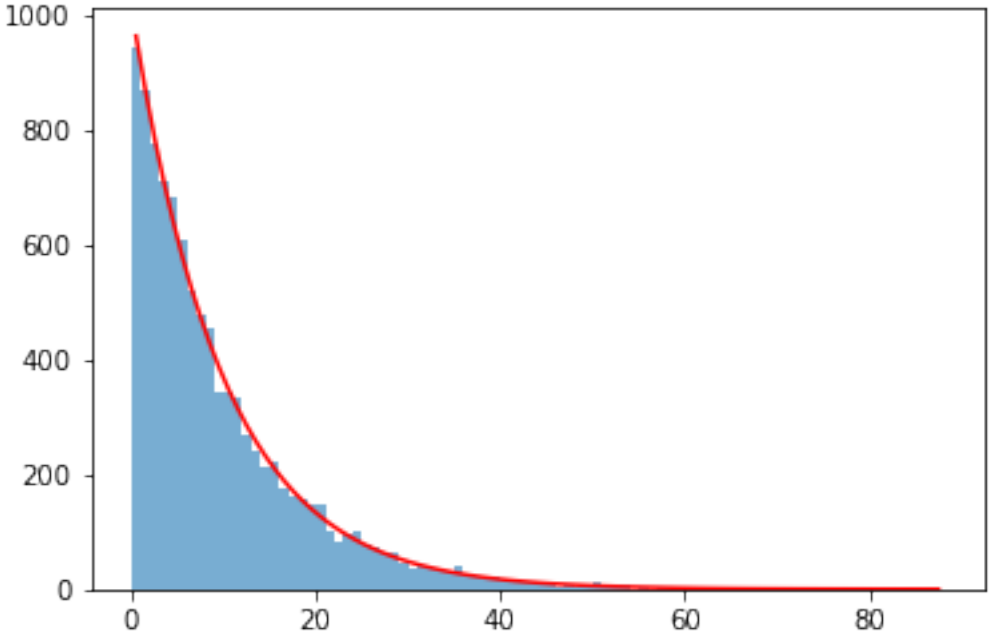
[44]:
```
x_fit=x+x[1]/2
fit=curve_fit(exp_fit,x_fit,hist)
fit_eq=fit[0][0]*np.exp(-fit[0][1]*x_fit)
```

```
C:\Users\dell\AppData\Local\Temp\ipykernel_2140\3934280466.py:2: RuntimeWarning:
overflow encountered in exp
  y=a*np.exp(-b*x)
```

[46]:
```
plt.bar(x,hist,alpha=0.6,align='edge',width=1)
plt.show()
```



[47]:
```
plt.bar(x,hist,alpha=0.6,align='edge',width=1)
plt.plot(x_fit,fit_eq,color='red')
plt.show()
```



This is our second Mini Project.In this we have the data of covid cases in United States which shows different data about the patients that can be death rate,submission rate,etc and we can show the information in the different ways .We can show it by taking small amount of information or can show information by plotting too.

[ ]: