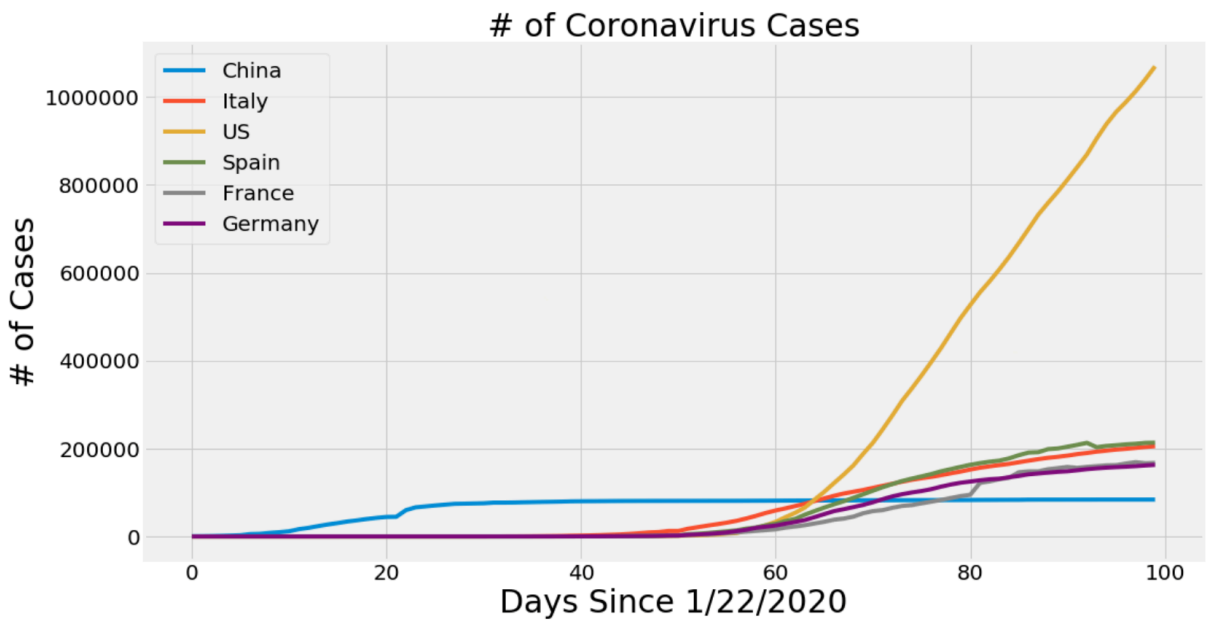
Is Wearing Mask Helpful For Us to Prevent From Getting the Covid-19 Virus?
Does Quarantine Work for Control/Reduce the Covid-19 Positive Increase Number for A Country?

I have saw a joke on a video game reddit that there are two players argue for their countries. The background is that the U.S just exceed China and become the first country which have the most number of Covid-19 case.
Player A: I am so proud to be the citizen of our country!
Player B: XXXX XXXX(Some dirty word) Chinese.
Player A: Dude, I am an American…
Player B: …

As we all know that China is the country which implemented quarantine rule and promoted every citizen to wear mask. China was the country which had the most Covid-19 case, however, right now China had already controlled the spreading of Covid-19 and restart people's work and resume cities' daily operation.



So, here are two questions: is wearing mask helpful for us to prevent from getting the Covid-19 Virus? And does quarantine work for control or reduce the Covid-19 positive increase case for a country?

I track back some news about quarantine rule and government recommended citizens to wear mask as necessary.

Important Updates From ISSS Inbox ×

Intl Student and Scholar Services No Reply Mailbox <intl-student-scholar-services-noreply@sjsu.e... Tue, Mar 17, 7:51 AM

to bcc: me

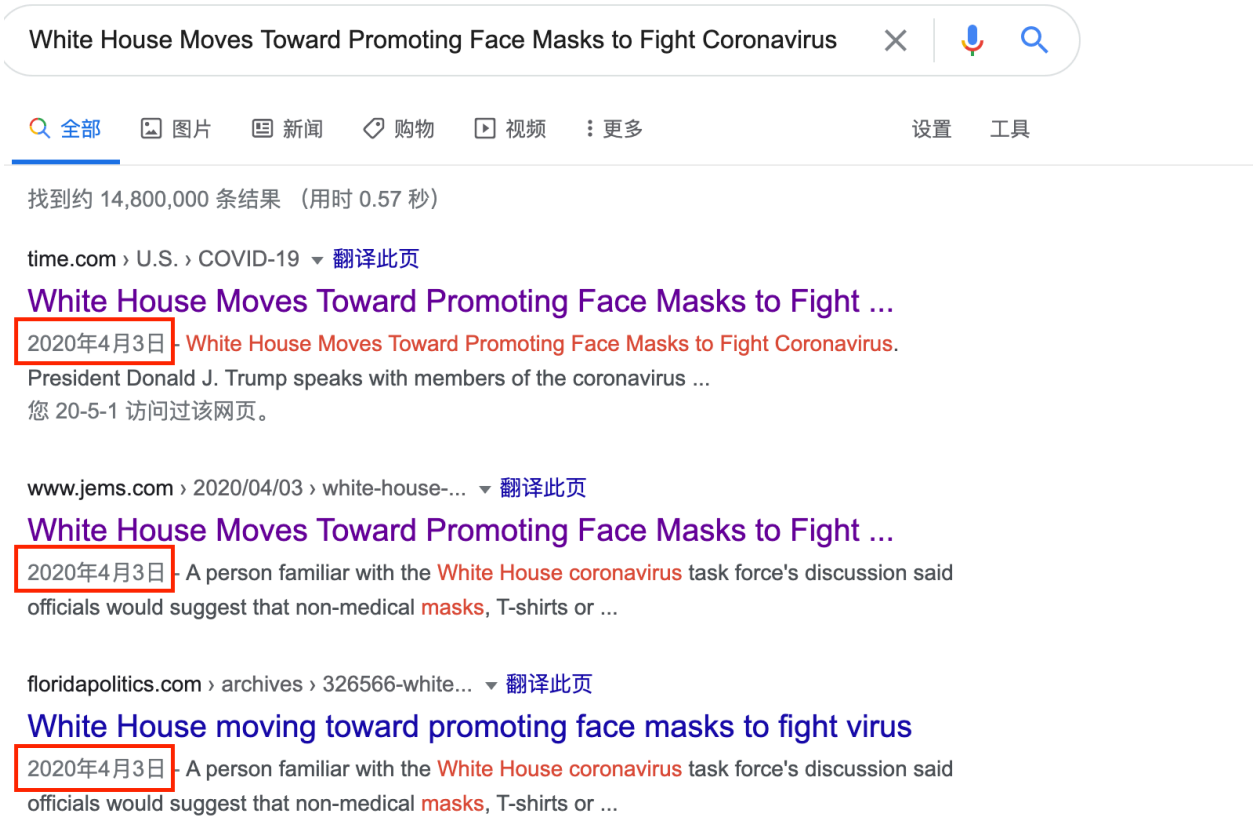
Dear International Students,

In light of the evolving and dynamic situation with COVID-19, please know that your health and safety continues to be our top priority. As has been announced by President Papazian, classes for the rest of the semester will continue online. I know that online education is new to many of you. As you try to navigate this new mode of learning, I would like to offer some resources to support you:

- Here is a recording of a one-hour Zoom training session: https://sjsu.zoom.us/rec/play/vJV4cL2uqmg3T9bH4gSDVqUrW9W9equs0yMdrKUIzhq1B3MFZ1uhZecaYOrAT3Izo2kPI-IzgDVHo8bB
- Additional Zoom resources : https://ischool.sjsu.edu/zoom
- See tips from an iSchool student: https://ischool.sjsu.edu/mara-blog/back-school

In addition, we want to reassure you that the Student and Exchange Visitor Program (SEVP) is aware of this unusual circumstance and ***online enrollment will be acceptable to maintain your F-1 status***. SEVP has also acknowledged that as long as this situation continues and online remains the only mode of teaching, an F-1 student may continue their course work either in the United States or abroad.

I know that these are difficult times and some of you are eager to return home and be with your family for the rest of the spring semester. However, for those of you considering returning home, please think long-term and consider the possibility of not being able to get back into the United States, depending on how the situation evolves. Please know that our advisors are here to assist you with thinking through the different case scenarios. If you decide to return home for the rest of the semester, please be sure to let us know by email us.



We could assume that the quarantine start date is around Mar 17th, and the promoting face masks date is April 3rd. Then we will see whether data got affected after these two dates.

Below is the data about grocery & retailer mobility corresponding to date. The higher mobility, the more people go to grocery & retailer. From the data, we notice that, the mobility have increase dramatically from Mar.11th to Mar.17th, which also is the panic period—people purchased over amount of grocery to prepare for staying at home in long time. After Mar.17, we can view that the mobility begin to decrease. The citizen did efficiently cooperate with government's rule.

```
[60]: gdf.groupby('date').sum()
```

t[60]:

date	mobility_change
2020-02-16 00:00:00	2.270424
2020-02-17 00:00:00	0.411845
2020-02-18 00:00:00	-1.155781
2020-02-19 00:00:00	0.330587
2020-02-20 00:00:00	-0.114897
2020-02-21 00:00:00	-1.032018
2020-02-22 00:00:00	3.079493
2020-02-23 00:00:00	4.160803
2020-02-24 00:00:00	0.884714
2020-02-25 00:00:00	0.496855
2020-02-26 00:00:00	3.752815
2020-02-27 00:00:00	2.758578
2020-02-28 00:00:00	4.334583
2020-02-29 00:00:00	6.899925
2020-03-01 00:00:00	10.077881
2020-03-02 00:00:00	6.076379
2020-03-03 00:00:00	10.144463
2020-03-04 00:00:00	7.225985
2020-03-05 00:00:00	7.333442
2020-03-06 00:00:00	3.714879
2020-03-07 00:00:00	8.025964
2020-03-08 00:00:00	8.910986
2020-03-09 00:00:00	6.796222
2020-03-10 00:00:00	7.940155
2020-03-11 00:00:00	11.112553
2020-03-12 00:00:00	23.071795
2020-03-13 00:00:00	26.021271
2020-03-14 00:00:00	16.617140
2020-03-15 00:00:00	12.744449
2020-03-16 00:00:00	22.501060
2020-03-17 00:00:00	14.218900
2020-03-18 00:00:00	9.250626
2020-03-19 00:00:00	5.564495
2020-03-20 00:00:00	5.901660
2020-03-21 00:00:00	-1.621531
2020-03-22 00:00:00	-11.625060
2020-03-23 00:00:00	-8.546016
2020-03-24 00:00:00	-11.930900
2020-03-25 00:00:00	-13.116520
2020-03-26 00:00:00	-13.200815
2020-03-27 00:00:00	-14.556980
2020-03-28 00:00:00	-19.209776
2020-03-29 00:00:00	-21.727735
2020-03-30 00:00:00	-16.728827
2020-03-31 00:00:00	-14.986839
2020-04-01 00:00:00	-9.334111
2020-04-02 00:00:00	-12.363243
2020-04-03 00:00:00	-10.882022
2020-04-04 00:00:00	-14.237122
2020-04-05 00:00:00	-18.072340
2020-04-06 00:00:00	-14.413942
2020-04-07 00:00:00	-13.165580
2020-04-08 00:00:00	-12.966324
2020-04-09 00:00:00	-12.572190
2020-04-10 00:00:00	-10.547565
2020-04-11 00:00:00	-6.517688

Panic Period

Citizen Cooperate with Gov to stay at home

Then, let check whether some fluctuation reflected on the covid-19 dataset. First of all, we will calculate the positive increase ratio per day. For example, Day 1, the increase number is 100, Day 2 is 50. Then the increase ratio should be -50%. etc…

```
df2[['recovered','positiveIncrease']]
df3['increase_rate']=0.001
for q in range(1,len(df3)):
    df3['increase_rate'][q-1]=((df3['positiveIncrease'][q]/df3['positiveIncrease'][q-1])-1)*100
df3
```

:

	positive	positiveIncrease	recovered	death	day	increase_rate
0122	1.0	0.0	0.0	0.0	1	NaN
0123	1.0	0.0	0.0	0.0	2	NaN
0124	1.0	0.0	0.0	0.0	3	NaN
0125	1.0	0.0	0.0	0.0	4	NaN
0126	1.0	0.0	0.0	0.0	5	NaN
0127	1.0	0.0	0.0	0.0	6	NaN
0128	1.0	0.0	0.0	0.0	7	NaN
0129	1.0	0.0	0.0	0.0	8	NaN
0130	1.0	0.0	0.0	0.0	9	NaN
0131	1.0	0.0	0.0	0.0	10	NaN
0201	1.0	0.0	0.0	0.0	11	NaN
0202	1.0	0.0	0.0	0.0	12	NaN
0203	1.0	0.0	0.0	0.0	13	NaN
0204	1.0	0.0	0.0	0.0	14	NaN
0205	1.0	0.0	0.0	0.0	15	NaN
0225	2.0	0.0	0.0	0.0	35	NaN
0226	2.0	0.0	0.0	2.0	36	NaN
0227	2.0	0.0	0.0	2.0	37	inf
0228	9.0	7.0	0.0	4.0	38	28.571429
0229	18.0	9.0	0.0	5.0	39	33.333333
0301	40.0	12.0	0.0	8.0	40	8.333333
0302	53.0	13.0	0.0	11.0	41	215.384615
0303	94.0	41.0	0.0	14.0	42	-12.195122
0304	207.0	36.0	0.0	16.0	43	80.555556
0305	275.0	65.0	0.0	20.0	44	67.692308
0306	387.0	109.0	0.0	26.0	45	35.779817
0307	538.0	148.0	0.0	27.0	46	23.648649
0308	721.0	183.0	0.0	31.0	47	59.562842
0309	1013.0	292.0	0.0	35.0	48	-8.561644
0310	1280.0	267.0	0.0	37.0	49	46.816479
0311	1672.0	392.0	0.0	43.0	50	17.857143

From the data, we knew that the covid-19 explode date for the US nation should be on Feb.28th. Before Feb.28th, the number of Covid-19 case still a few. And we can jump until Feb 28th.

	positive	positiveIncrease	recovered	death	day	increase_rate	avgR_count
0228	9.0	7.0	0.0	4.0	38	28.571429	54.685518
0229	18.0	9.0	0.0	5.0	39	33.333333	54.685518
0301	40.0	12.0	0.0	8.0	40	8.333333	54.685518
0302	53.0	13.0	0.0	11.0	41	215.384615	54.685518
0303	94.0	41.0	0.0	14.0	42	-12.195122	54.685518
0304	207.0	36.0	0.0	16.0	43	80.555556	53.447834
0305	275.0	65.0	0.0	20.0	44	67.692308	53.447834
0306	387.0	109.0	0.0	26.0	45	35.779817	53.447834
0307	538.0	148.0	0.0	27.0	46	23.648649	53.447834
0308	721.0	183.0	0.0	31.0	47	59.562842	53.447834
0309	1013.0	292.0	0.0	35.0	48	-8.561644	26.055814
0310	1280.0	267.0	0.0	37.0	49	46.816479	26.055814
0311	1672.0	392.0	0.0	43.0	50	17.857143	26.055814
0312	2142.0	462.0	0.0	51.0	51	86.580087	26.055814
0313	3004.0	862.0	0.0	55.0	52	-12.412993	26.055814
0314	3759.0	755.0	0.0	63.0	53	43.576159	42.529831
0315	4843.0	1084.0	0.0	77.0	54	17.896679	42.529831
0316	6130.0	1278.0	0.0	98.0	55	68.857590	42.529831
0317	8288.0	2158.0	0.0	120.0	56	19.416126	42.529831
0318	10865.0	2577.0	0.0	145.0	57	62.902600	42.529831
0319	15063.0	4198.0	0.0	189.0	58	37.613149	20.447707
0320	20840.0	5777.0	0.0	253.0	59	13.069067	20.447707
0321	27372.0	6532.0	0.0	306.0	60	37.201470	20.447707
0322	36334.0	8962.0	0.0	436.0	61	19.158670	20.447707
0323	47013.0	10679.0	0.0	521.0	62	-4.803821	20.447707
0324	57179.0	10166.0	0.0	725.0	63	20.932520	14.785317
0325	69473.0	12294.0	147.0	953.0	64	40.849195	14.785317
0326	86789.0	17316.0	97.0	1231.0	65	7.836683	14.785317
0327	105462.0	18673.0	2422.0	1604.0	66	3.641622	14.785317
0328	124815.0	19353.0	3148.0	2038.0	67	0.666563	14.785317
0329	144297.0	19482.0	4061.0	2527.0	68	8.941587	10.523322
0330	165521.0	21224.0	4560.0	3060.0	69	15.326988	10.523322
0331	189998.0	24477.0	5666.0	3877.0	70	2.867999	10.523322
0401	215177.0	25179.0	7084.0	4823.0	71	11.434132	10.523322
0402	243235.0	28058.0	8586.0	5924.0	72	14.045905	10.523322
0403	275234.0	31999.0	10861.0	7112.0	73	4.747023	-0.415037
0404	308752.0	33518.0	12840.0	8487.0	74	-22.531177	-0.415037
0405	334718.0	25966.0	14542.0	9714.0	75	10.710159	-0.415037
0406	363465.0	28747.0	16584.0	10937.0	76	5.781473	-0.415037
0407	393874.0	30409.0	18477.0	12841.0	77	-0.782663	-0.415037
0408	424045.0	30171.0	21141.0	14737.0	78	13.403599	-3.178701
0409	458260.0	34215.0	24869.0	16659.0	79	0.967412	-3.178701
0410	492806.0	34546.0	29054.0	18751.0	80	-13.503734	-3.178701
0411	522687.0	29881.0	31631.0	20686.0	81	-2.215455	-3.178701
0412	551906.0	29219.0	34151.0	22237.0	82	-14.545330	-3.178701
0413	576875.0	24969.0	35442.0	23754.0	83	3.300092	2.752484
0414	602668.0	25793.0	39347.0	26066.0	84	18.032024	2.752484
0415	633112.0	30444.0	43522.0	28564.0	85	1.882144	2.752484
0416	664129.0	31017.0	48945.0	30722.0	86	1.982784	2.752484
0417	695761.0	31632.0	53644.0	32785.0	87	-11.434623	2.752484
0418	723776.0	28015.0	62961.0	34557.0	88	-1.799036	2.693400
0419	751287.0	27511.0	67339.0	36224.0	89	-8.647450	2.693400
0420	776419.0	25132.0	69636.0	37913.0	90	3.099634	2.693400
0421	802330.0	25911.0	73002.0	40471.0	91	7.649261	2.693400
0422	830223.0	27893.0	78230.0	42508.0	92	13.164593	2.693400
0423	861788.0	31565.0	82194.0	44385.0	93	9.355299	-3.716296
0424	896306.0	34518.0	101517.0	46251.0	94	4.108002	-3.716296
0425	932242.0	35936.0	112783.0	48069.0	95	-24.821906	-3.716296
0426	959258.0	27016.0	116801.0	49164.0	96	-19.025763	-3.716296
0427	981134.0	21876.0	121609.0	50327.0	97	11.802889	-3.716296
0428	1005592.0	24458.0	139342.0	52525.0	98	12.703410	4.693114
0429	1033157.0	27565.0	147484.0	55225.0	99	1.374932	4.693114
0430	1061101.0	27944.0	153947.0	57266.0	100	0.001000	4.693114

Because the increase ratio is not static, it will influence by each day's increase number. It would be better for us to count the average to get a period's increase rate. Then we can compare the data between the period before quarantine and after the quarantine. And the period before promoting mask VS after promoting mask.

And we can view that, after the government implements quarantine rule, the increase positive ratio got obvious decrease. From 40-50% down to 10-20%, we can view that the covid-19 positive case increase speed get slow down.
More importantly, after April 3rd, the covid-19 positive case increase ration from 10-20% down to below 5%. It is very convincing that quarantine rule/ promoting mask have positive effect for a country to fight with Covid-19.

However

The decrease of the covid-19 positive case increase speed does not mean the US nation already pass the turning point. Actually, the US nation still have not passed the turning point, though some state already passed the turning point.

I have implement a turning point algorithm. Let Just take Italy as the example.

	CurrentPositiveCases	NewPositiveCases	day	avg3_count	avg5-count
02-24	221	221	1	130.666667	176.0
02-25	311	93	2	130.666667	176.0
02-26	385	78	3	130.666667	176.0
02-27	588	250	4	242.666667	176.0
02-28	821	238	5	242.666667	176.0
02-29	1049	240	6	242.666667	440.2
03-01	1577	566	7	458.000000	440.2
03-02	1835	342	8	458.000000	440.2
03-03	2263	466	9	458.000000	440.2
03-04	2706	587	10	711.333333	440.2
03-05	3296	769	11	711.333333	1216.6
03-06	3916	778	12	711.333333	1216.6
03-07	5061	1247	13	1512.000000	1216.6
03-08	6387	1492	14	1512.000000	1216.6
03-09	7985	1797	15	1512.000000	1216.6

Because the new increase case get influenced every, we can count the average increase number first. We can set the ratio as 3-day a period and 5-day a period. 3-day period could get more in precise date for turning point. However, if the data fluctuate in very huge range, we would recommend to use large scale range.

```
            if ee['avg5-count'][m]==ee['avg5-count'][m-1]:
                Dlist.append(m-1)
                continue
            else:
                Dlist.append(m-1)
                break
        break
ThreeDList = []

for x in range (1,len(Dlist)):
    if ee['avg3_count'][Dlist[x-1]]<=ee['avg3_count'][Dlist[x]]:
        continue
    else:

        ThreeDList.append(Dlist[x-1])
        ThreeDList.append(Dlist[x-1]-1)
        ThreeDList.append(Dlist[x-1]-2)
for  s in range(len(ThreeDList)):
    print(ThreeDList[s])
```

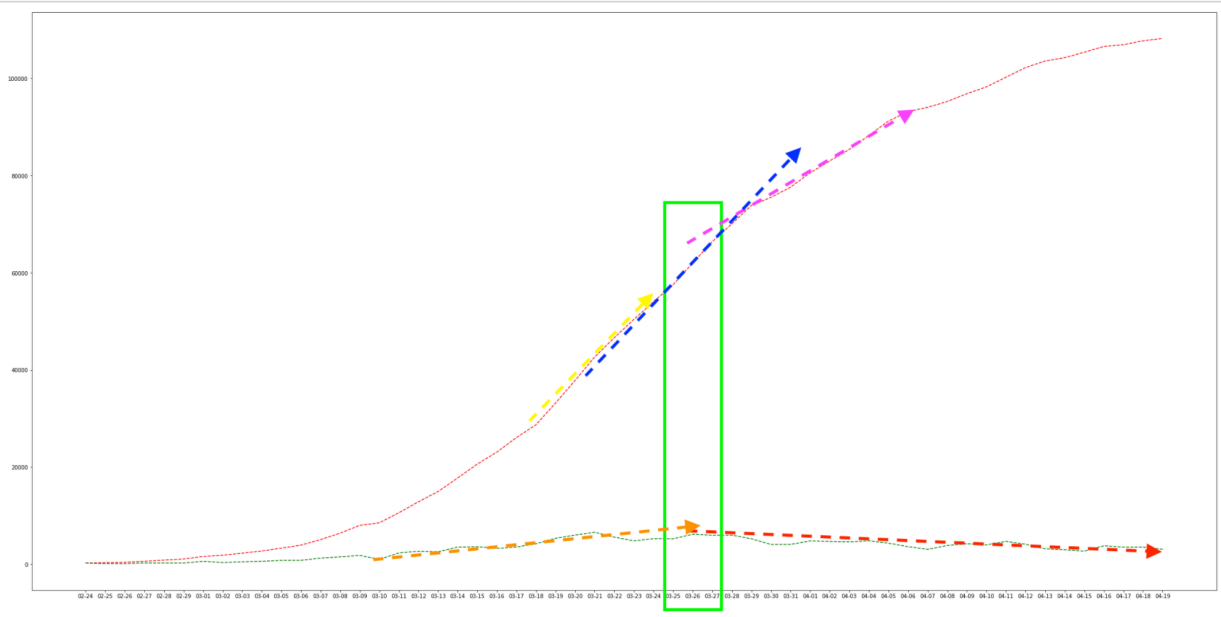
```
32
31
30
```

```
/usr/local/lib/python3.7/site-packages/ipykernel_launcher.py:6: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

From the turning point algorithm, we can know that, the turning point will be appear around the 30-32 row of dataframe.

03-18	28710	4207	24	3655.333333	3975.6
03-19	33190	5322	25	5955.000000	3975.6
03-20	37860	5986	26	5955.000000	5628.2
03-21	42681	6557	27	5955.000000	5628.2
03-22	46638	5560	28	5199.333333	5628.2
03-23	50418	4789	29	5199.333333	5628.2
03-24	54030	5249	30	5199.333333	5628.2
03-25	57521	5210	31	5774.000000	5702.6
03-26	62013	6153	32	5774.000000	5702.6
03-27	66414	5959	33	5774.000000	5702.6
03-28	70065	5974	34	5080.333333	5702.6
03-29	73880	5217	35	5080.333333	5702.6
03-30	75528	4050	36	5080.333333	4427.6
03-31	77635	4053	37	4501.000000	4427.6
04-01	80572	4782	38	4501.000000	4427.6
04-02	83049	4668	39	4501.000000	4427.6
04-03	85388	4585	40	4568.666667	4427.6
04-04	88274	4805	41	4568.666667	3919.0
04-05	91246	4316	42	4568.666667	3919.0
04-06	93187	3599	43	3491.333333	3919.0
04-07	94067	3039	44	3491.333333	3919.0

Which between 3-25 to 3-27.



and we do find it the increase number vector get decrease after the turning point.

IF we implement this into the US dataset:

```
R=5
getPT(df3, R , "positiveIncrease")
findPT(df3,R)
```

```
75
76
77
78
79
```

```
In [21]: df3
```

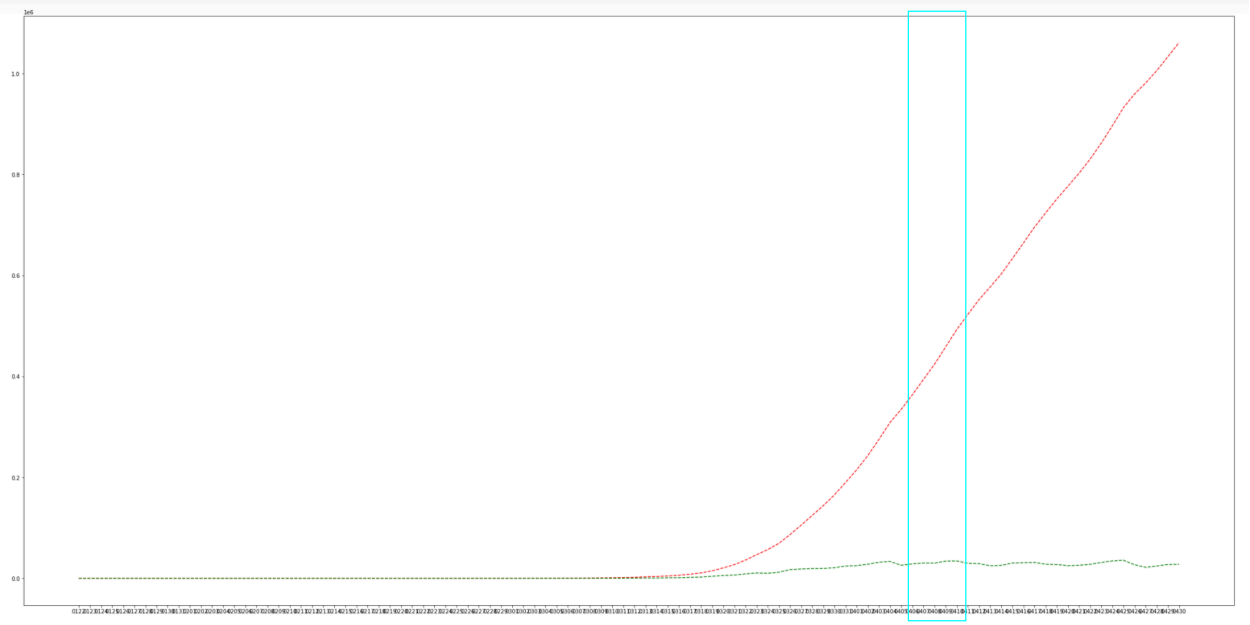
0403	275234.0	31999.0	10861.0	7112.0	73	4.747023	28944.0
0404	308752.0	33518.0	12840.0	8487.0	74	-22.531177	28944.0
0405	334718.0	25966.0	14542.0	9714.0	75	10.710159	28944.0
0406	363465.0	28747.0	16584.0	10937.0	76	5.781473	31617.6
0407	393874.0	30409.0	18477.0	12841.0	77	-0.782663	31617.6
0408	424045.0	30171.0	21141.0	14737.0	78	13.403599	31617.6
0409	458260.0	34215.0	24869.0	16659.0	79	0.967412	31617.6
0410	492806.0	34546.0	29054.0	18751.0	80	-13.503734	31617.6
0411	522687.0	29881.0	31631.0	20686.0	81	-2.215455	28061.2
0412	551906.0	29219.0	34151.0	22237.0	82	-14.545330	28061.2
0413	576875.0	24969.0	35442.0	23754.0	83	3.300092	28061.2
0414	602668.0	25793.0	39347.0	26066.0	84	18.032024	28061.2

```
R=3
getPT(df3, R , "positiveIncrease")
findPT(df3,R)
```

```
78
79
80
```

```
df3[78:81]
```

	positive	positiveIncrease	recovered	death	day	increase_rate	avgR_count
0409	458260.0	34215.0	24869.0	16659.0	79	0.967412	32880.666667
0410	492806.0	34546.0	29054.0	18751.0	80	-13.503734	32880.666667
0411	522687.0	29881.0	31631.0	20686.0	81	-2.215455	32880.666667



And we will find it the turning point for the US nation not come yet. But at the period from April 6 to April 10 will have the most increase case per day. After that, later date's increase case per day is decreasing with very low rate.

Why quarantine rule and wearing mask work, why we still have lot of increase case per day?
Previous work, such as quarantine rule and wearing mask, we just control the increase rate for increase covid-19. If we not implements those work, right now, we may have not rather 30000 additional number per day, but 50000, 60000 additional number per day.

Why we still don't have turning point yet?
Although for some state that already have turning point, the U.S is a very big country, that Covid-19 condition is different from states to states. Until all the states from U.S pass the turning point, then the whole nation will pass the turning point then.

In conclusion, we just control the increase from additional case, there is still a distance for us to ultimately beat the virus.