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Which Feasible Measures Can Other Countries Learn from Korea to Alleviate COVID-19?

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Github: https://github.com/CindyXin97/COVID-19_Reaserch_Project

Background

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Korea

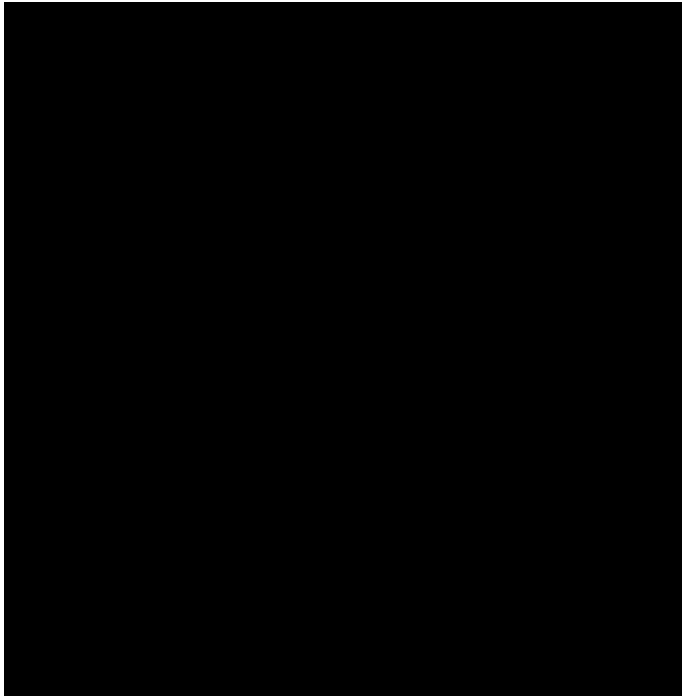
Coronavirus

Progressive Response

Social Distance

Intensive Testing

Other Factors ?



Data

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Time: Time series data of COVID-19 by region including test number, negative/positive number, released number and deceased number along with patient info like age, sex and location.

Case: Data of COVID-19 infection cases in South Korea including location, group infection,infection case(overseas or infected place).

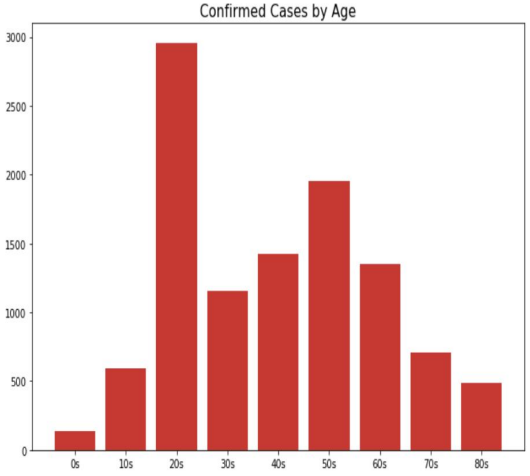
PatientInfo: Epidemiological data of COVID-19 patients in South Korea including age,sex,contact people number, confirm date, release date and decease date.

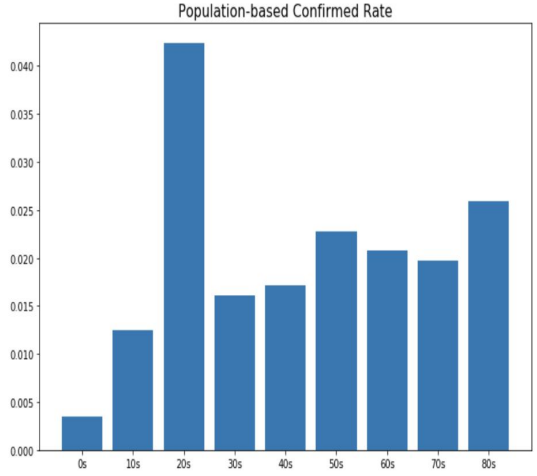
SearchTrend: Trend data of the keywords searched in Naver(largest portal in Korea). The keywords are cold, flu, pneumonia, coronavirus

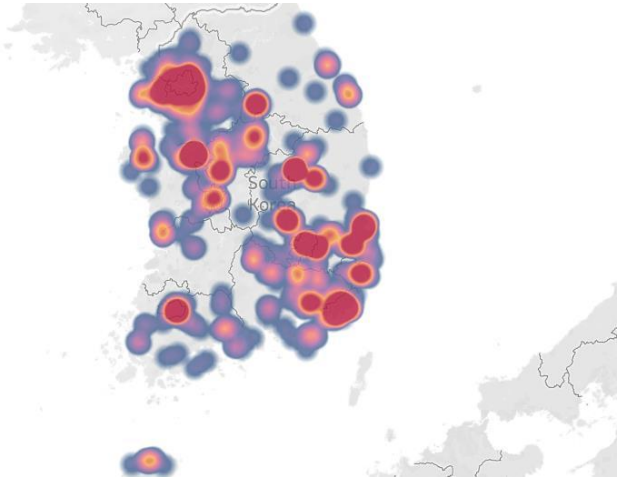
Region: Statistics of public infrastructure and age & educational structures grouped by city, such as the ratio of elder people, the number of hospitals and schools, etc.

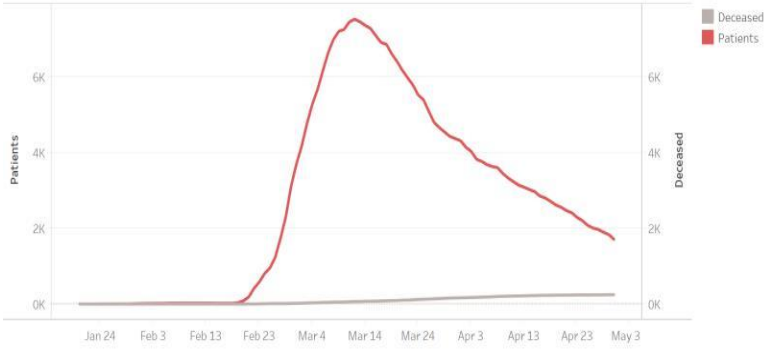
KOSIS - Korean Statistical Information Service: Demographic Population Distribution in South Korea (as of 2020)

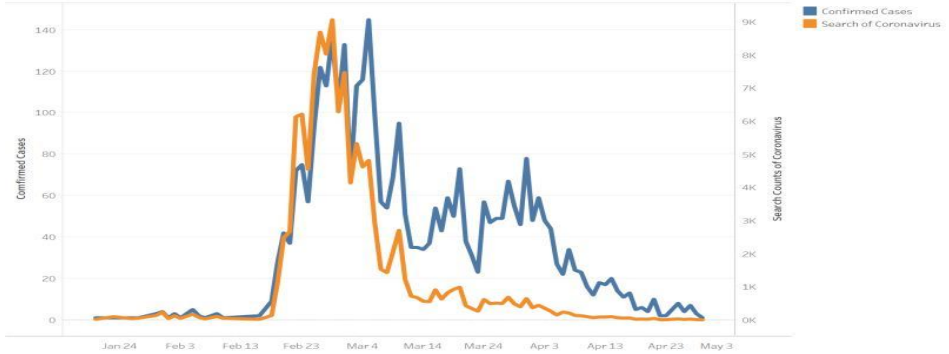
EDA


Confirmed Cases by Age
3000
2500
2000
1500
1000
500
0
0s
10s
20s
30s
40s
50s
60s
70s
80s


Population-based Confirmed Rate
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0s
10s
20s
30s
40s
50s
60s
70s
80s




Deceased
Patients
Patients
Deceased
6K
4K
2K
0K
Jan 24
Feb 3
Feb 13
Feb 23
Mar 4
Mar 14
Mar 24
Apr 3
Apr 13
Apr 23
May 3


Confirmed Cases
Search of Coronavirus
Confirmed Cases
Search Counts of Coronavirus
140
120
100
80
60
40
20
0
9K
8K
7K
6K
5K
4K
3K
2K
1K
0K
Jan 24
Feb 3
Feb 13
Feb 23
Mar 4
Mar 14
Mar 24
Apr 3
Apr 13
Apr 23
May 3

Methods - Time Series

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Comparison between 2 indicators: confirmed and recovered patients
Recovered = Released + Deceased

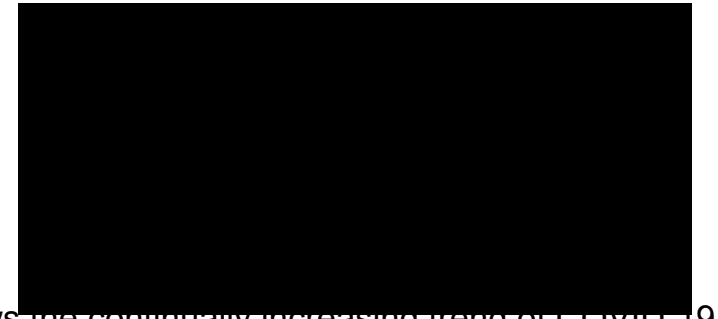
MLP (Multi-layer Perceptron):

	predicted_count
2020-01-20	-355
2020-01-21	-55
2020-01-22	10
2020-01-23	10
2020-01-24	10
...	
2020-05-06	417
2020-05-07	296
2020-05-08	174
2020-05-09	52
2020-05-10	-70

Length: 112, dtype: int64

Around May 10th

Prophet Model:

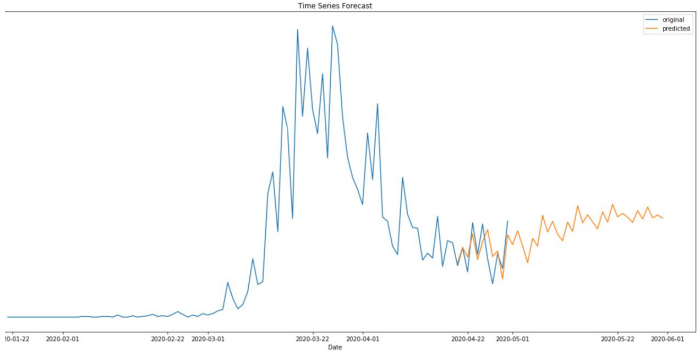


It shows the continually increasing trend of COVID-19

ARIMA

(Auto Regressive Integrated Moving Average)

	confirm	recover	sum_confirm	sum_recover
2020-05-13	25.805064	106.879051	10986.378184	10685.105086
2020-05-14	26.737430	133.961570	11013.115614	10819.066655
2020-05-15	30.671126	115.901459	11043.786740	10934.968114
2020-05-16	28.625066	124.656092	11072.411806	11059.624206
2020-05-17	30.708044	110.187927	11103.119850	11169.812133



Methods - Susceptible Infected Recovered (SIR) Analysis

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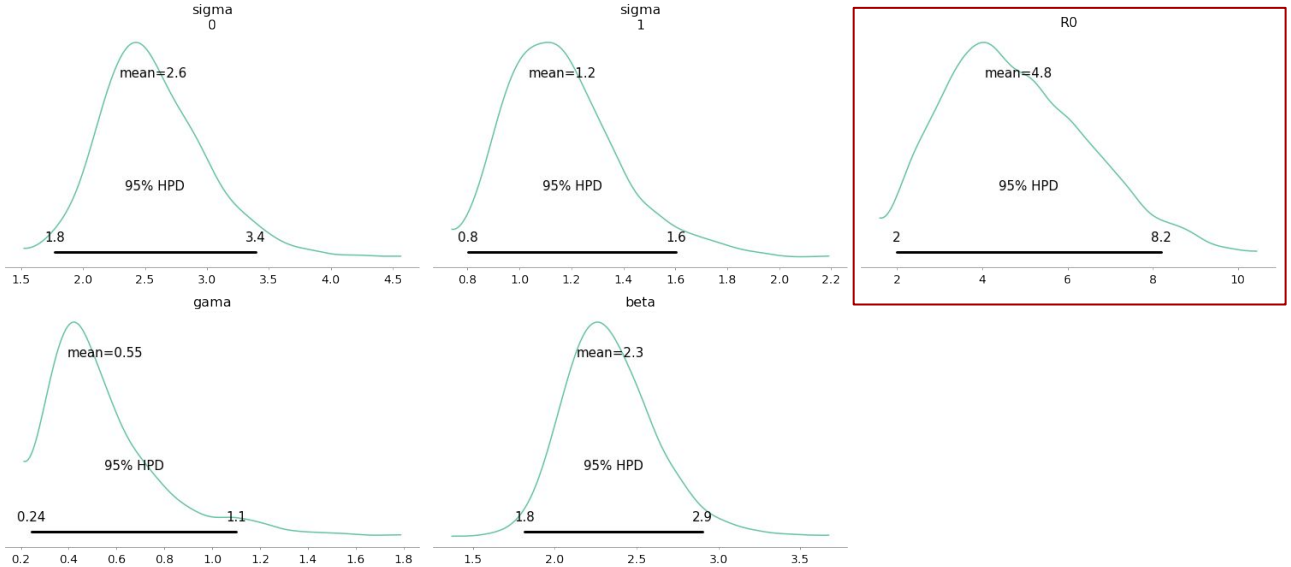
Susceptible(S): are those that have not acquired immunity yet and are susceptible to becoming infected.

Infected(I): have been infected with the disease.

Recovered(R): are cured and not susceptible anymore to the disease.

R0: indicates one infected person can infect how many susceptible individuals without control



Methods- Clustering

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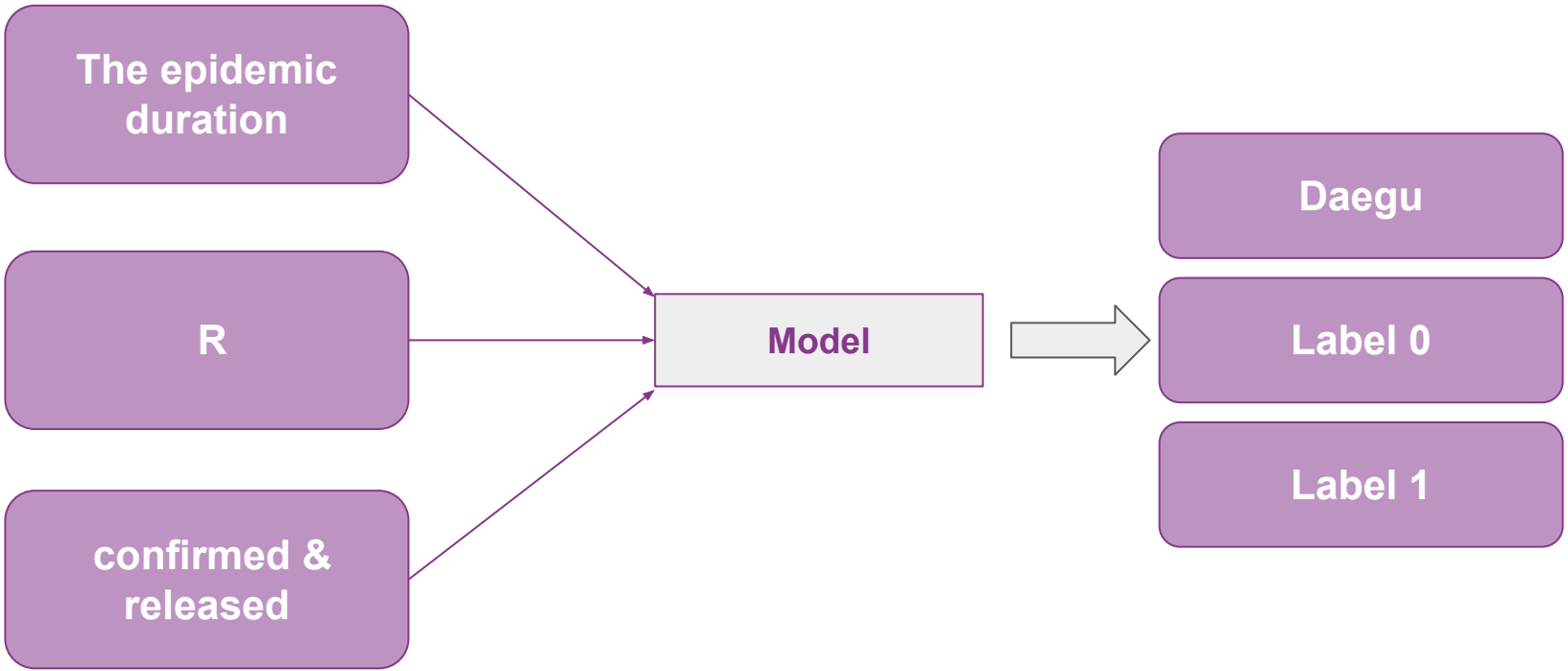

Methods- Classification

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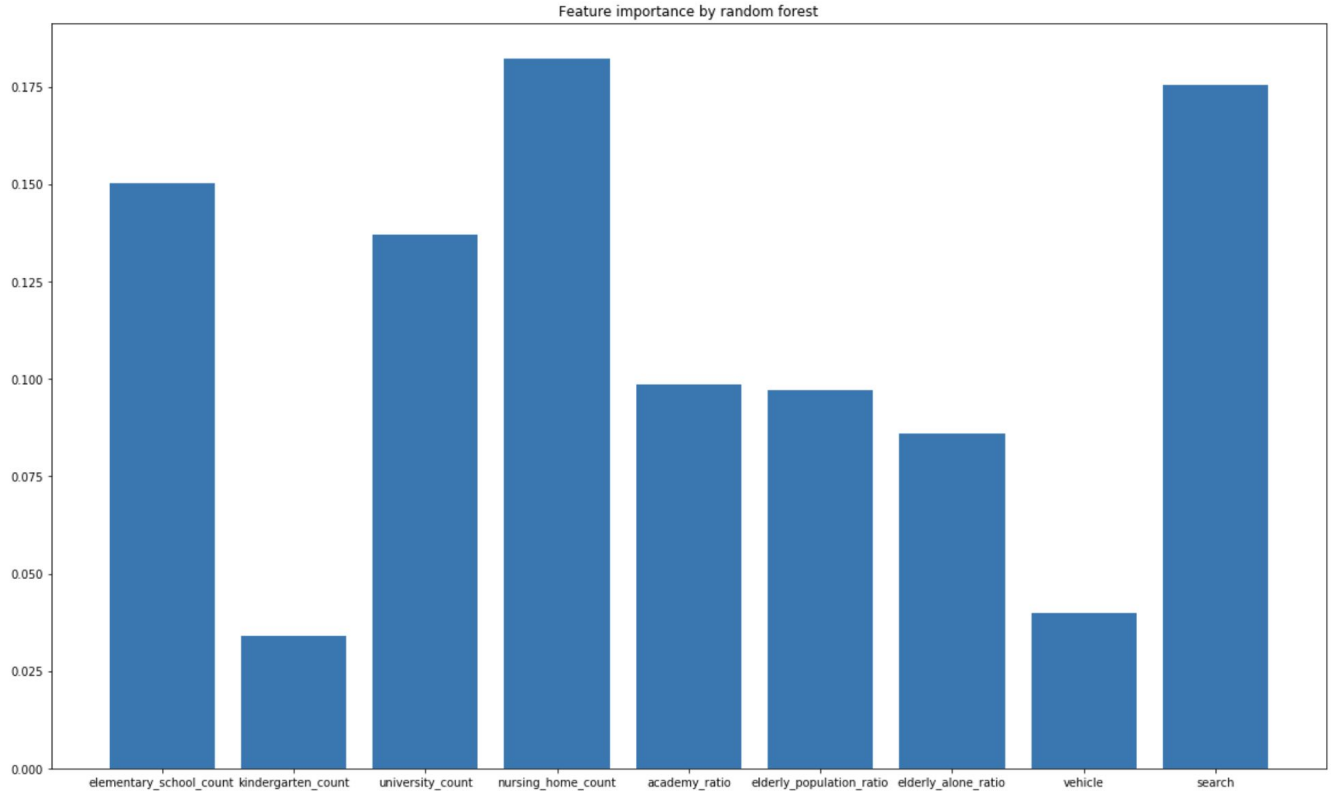
Decision Tree + Random Forest



- Nursing home counts and education level are important factors
- Google search trend(Feb-May) reflects people's awareness in different regions

Methods- Anomaly Detection + Policy

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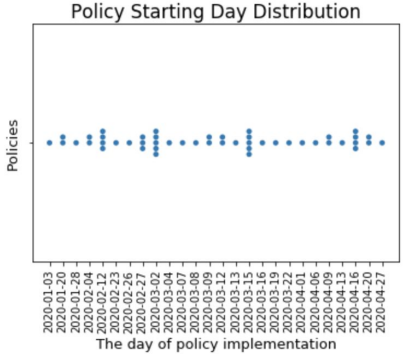
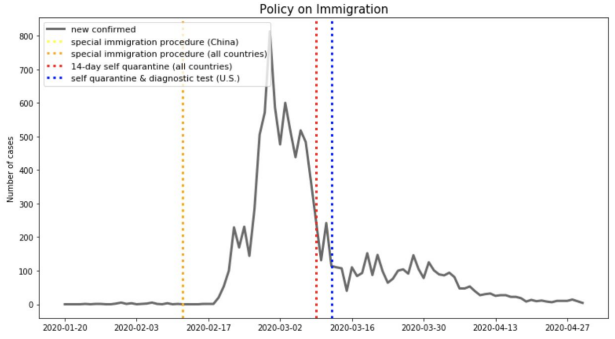
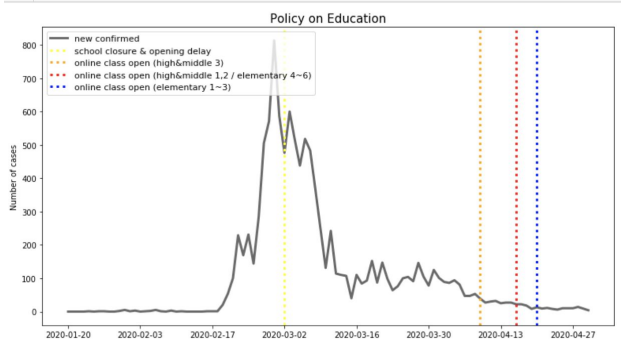




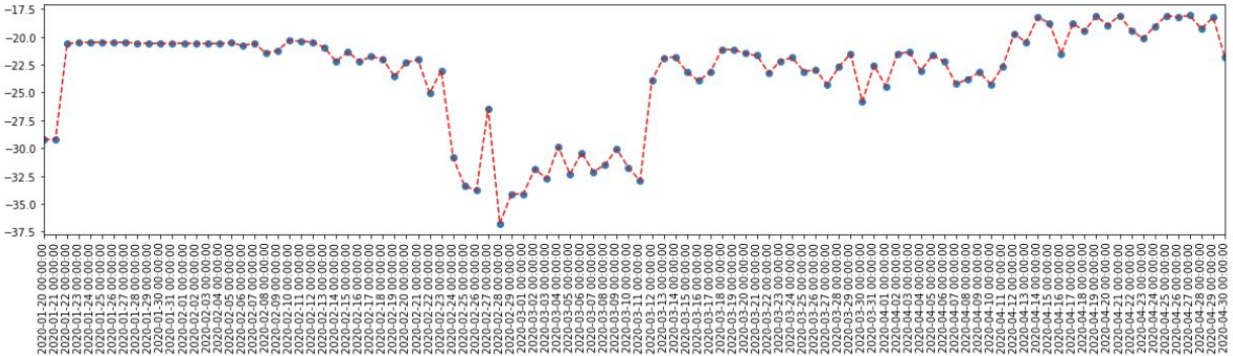


4-7 Days Come into Effect After Starting Date

Cluster-Based Anomaly Detection (unlabeled Data) - Kmeans, GussianMixture

	date	score
41	2020-03-01	98833.513066
42	2020-03-02	97430.184559
40	2020-02-29	91506.354090
52	2020-03-12	88969.205871
81	2020-04-10	87619.695657

```
0     42
2     21
4     14
1     14
3     11
dtype: int64
```



Conclusion

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03/01, 03/02, 02/29 are around 5-7 days later where **Korea started public scale mask distribution and alerts**, 03/12 is 4-7 days where **Korea government started Emergency Use Authorization of Diagnostic Kit**, 04/10 is 3-5 days after **school starts online classes**.

Academy ration, Nursing home counts, vehicle numbers and search trend

May 17 COVID-19

1. **Starting emergency diagnosis for the elderly**
2. **Closing the schools**
3. **limiting people's outdoor activities**
4. **Raising people's awareness are feasible measures**

Questions?

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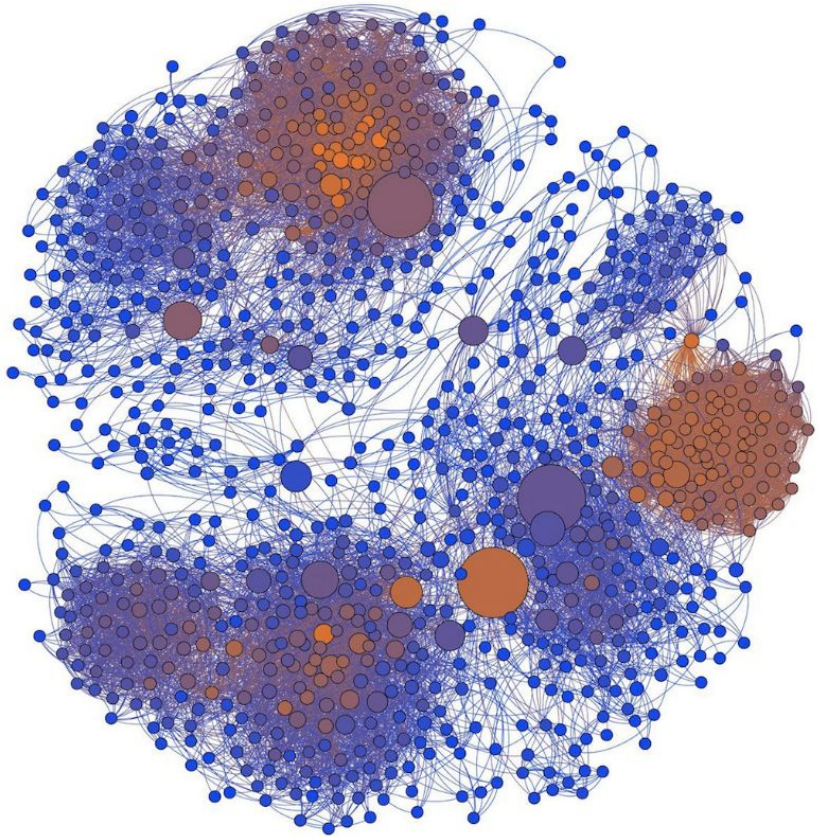
Thank you !



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