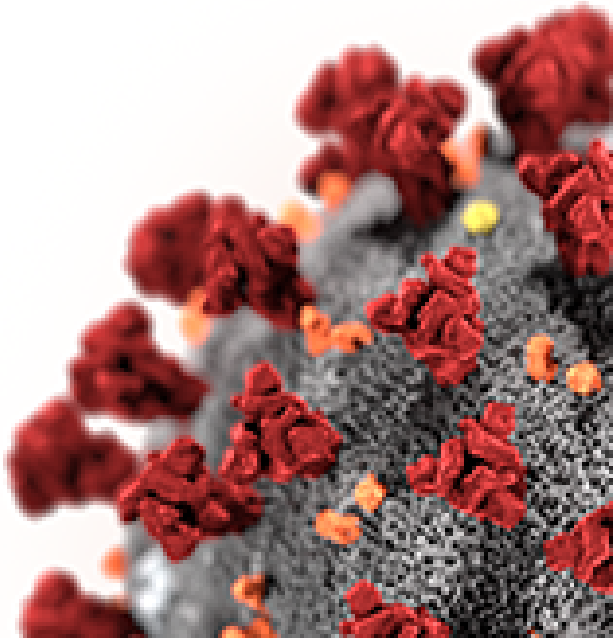
COVID-19 Spreading Network Analysis

Uncover another perspective of COVID-19 spreading pattern characteristics to find alternative solutions



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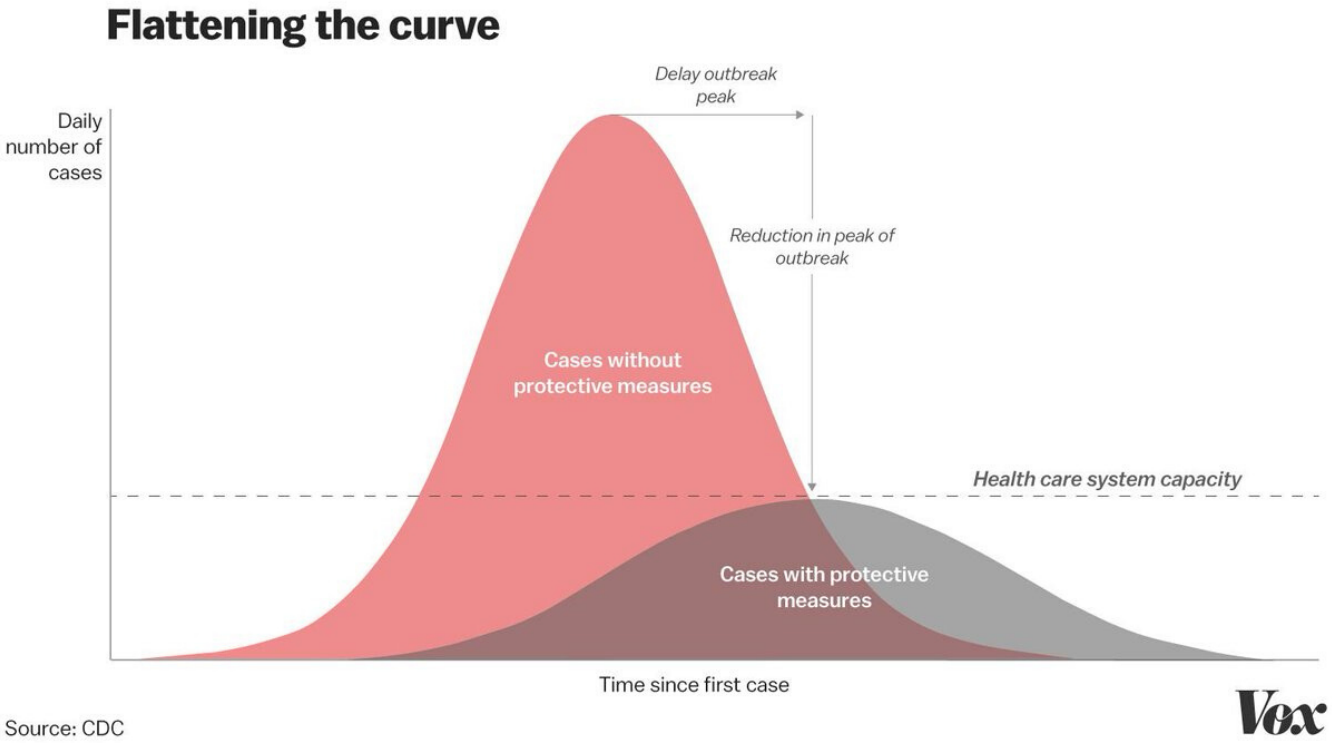
Remember The Curve?



As COVID-19 cases continue to exponentially increased worldwide, **curve in the left** is more describing global condition which cannot slow down the spread of this virus. The **Lockdown** policy is applied to delay the spread of this virus from one city to another. However, some countries **will not apply** this policy because of various reasons.

Is there any other way to slow down the expansion of this virus from one city to another?

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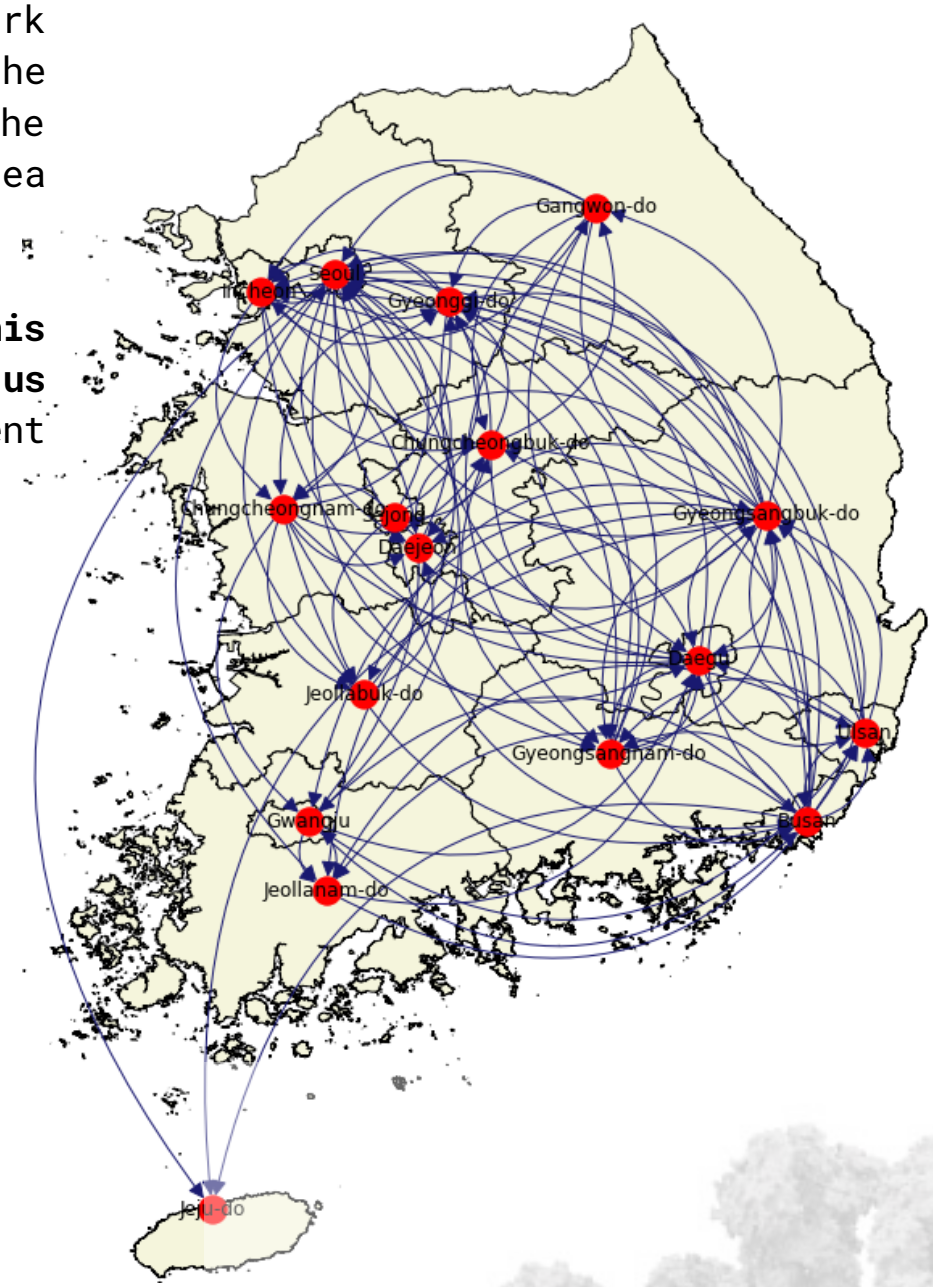
The Case of South Korea

This analysis uses network structure formed by the spreading patterns of the COVID-19 in South Korea **based on patient routes**.

The question is, **how this scrambled line can help us** solve COVID-19 deployment problems?

Enter:
Social Network Analysis



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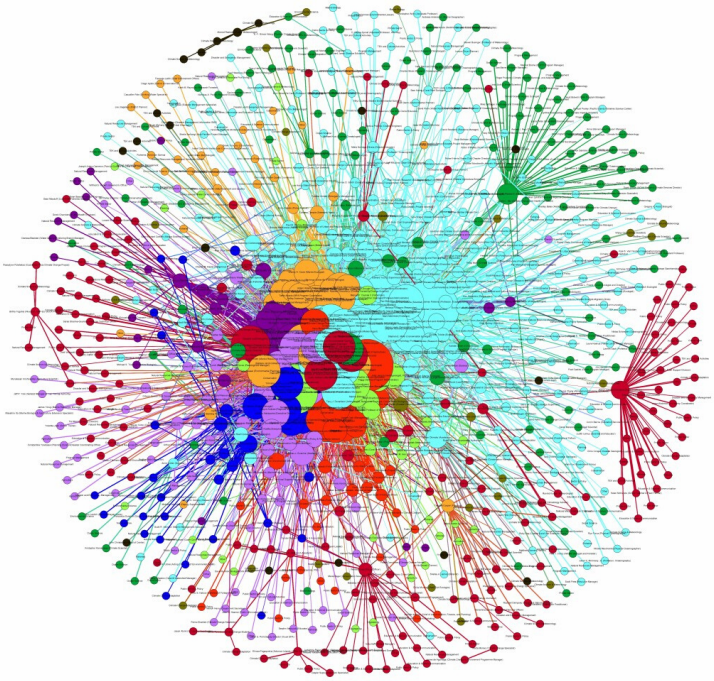
Let Me Introduce You

The Social Network Analysis

Social network analysis (SNA) is a method that **explain structures** through the use of networks and graph theory using centrality concepts.



This analysis uses one of SNA centrality **concept called Betweenness Centrality to see another perspective** of COVID-19 spreading pattern by charactirizes its structures to produce alternative solution.

Wait, Betweenness Centrality?

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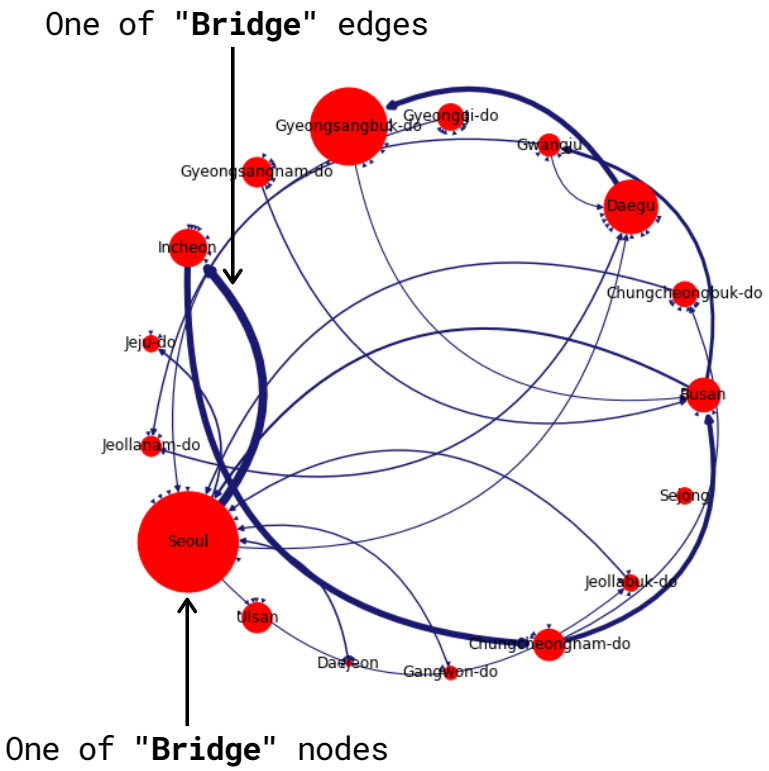
What is Betweenness Centrality ?



Betweenness centrality is one of SNA's famous centrality concepts. Betweenness Centrality works by identifying nodes (or edges) that **connected one groups to another** in a network. This nodes (or edges) called "**Bridge**". In the picture above, "Bridge" indicated with bigger node size and wider edge line denotes.

The identification is being done by calculating the probability of a node (or edge) **is in the shortest path** of the other observed nodes.

Confuse? Swipe!

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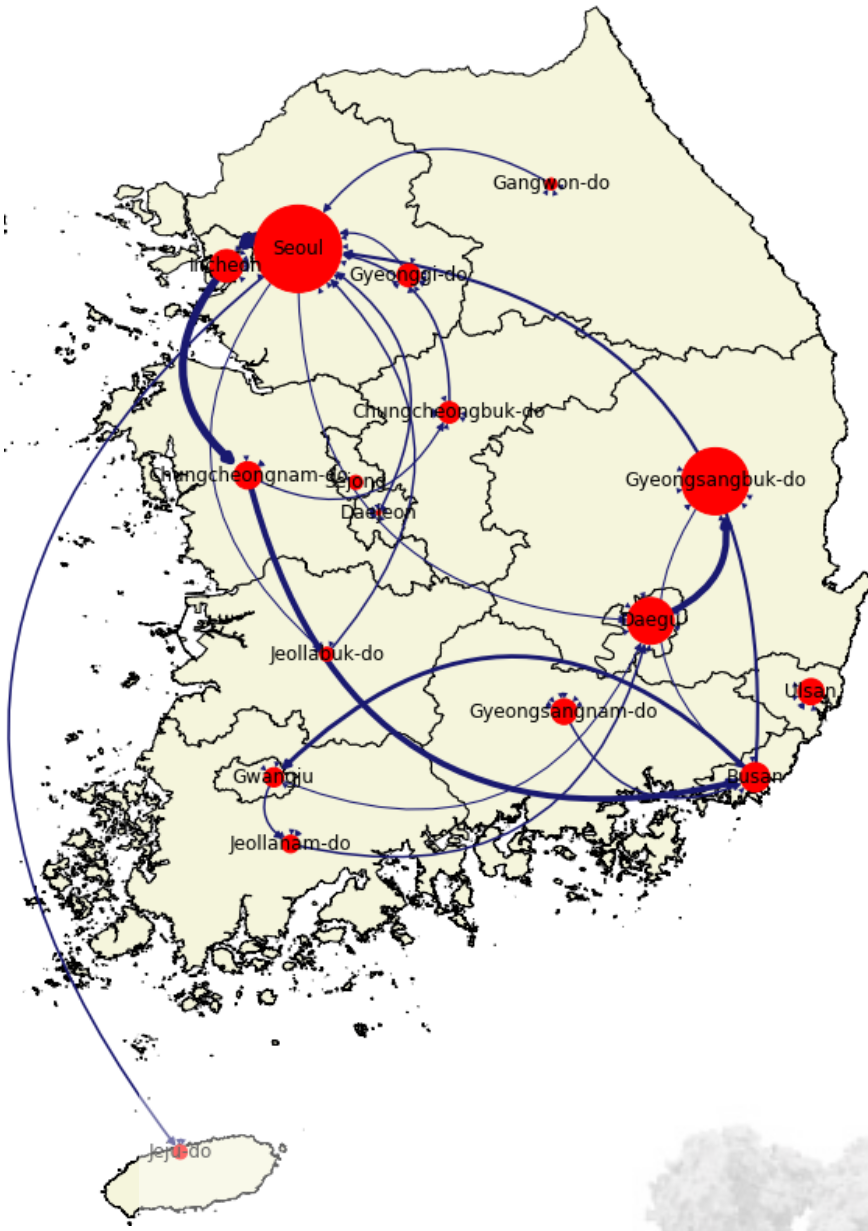
The Case of South Korea

Betweenness centrality will **show you cities and routes that become "Bridge"** that connect several COVID-19 spreading groups. If we close those cities and routes, the spreading groups cannot be connected to each other and we can slow down the spreading pace.

In South Korea's case, **Seoul, Gyeongsangbuk-do, and Daegu** should be top prioritized provinces to be shutdown. Meanwhile, they should close all movements on **Seoul to Incheon, Incheon to Chungcheongnam-do,and Daegu to Gyeongsangbuk-do** routes.



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What's Next for Indonesia?

This analysis can help to determine transportation routes between provinces in Indonesia that need to be limited in order to delay the spread of the COVID-19. **If patient route data in Indonesia are available**, then a similar analysis can be carried out to support *Pembatasan Social Bersakala Besar* policy.

With those data, these alternative solutions can be applied:

- **Citizens movement from and to provinces that connected by "Bridge" route is extremely limited**. This policy can lead to strong protests from the community. Nevertheless, we can go another way to approach this solution that bring us to next alternative solution.

- **Highly restrict transportation modes that go through "Bridge" routes**. Even though this solution might not as effective as solution number one, this may delay the spread of this virus in Indonesia remembering "Mudik" will come very soon.

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Thank You!

Thank you very much for reading this analysis. Hopefully, this analysis can help solve little part of the COVID-19 problems. However, this analysis still has many shortcomings. Therefore, you can contact the author's by information below for further discussions. Once again, thank you so much!

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Data

Data Science for COVID-19 (DS4C): Data Science for COVID-19 in South Korea by datartist on Kaggle

References

1. Sayama, H., 2015, Introduction to the modeling and analysis of complex systems. New York: Open SUNY Textbooks.
2. Scott, J., 2000, Social Network Analysis - A Handbook. 2nd ed. London: Sage.

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