



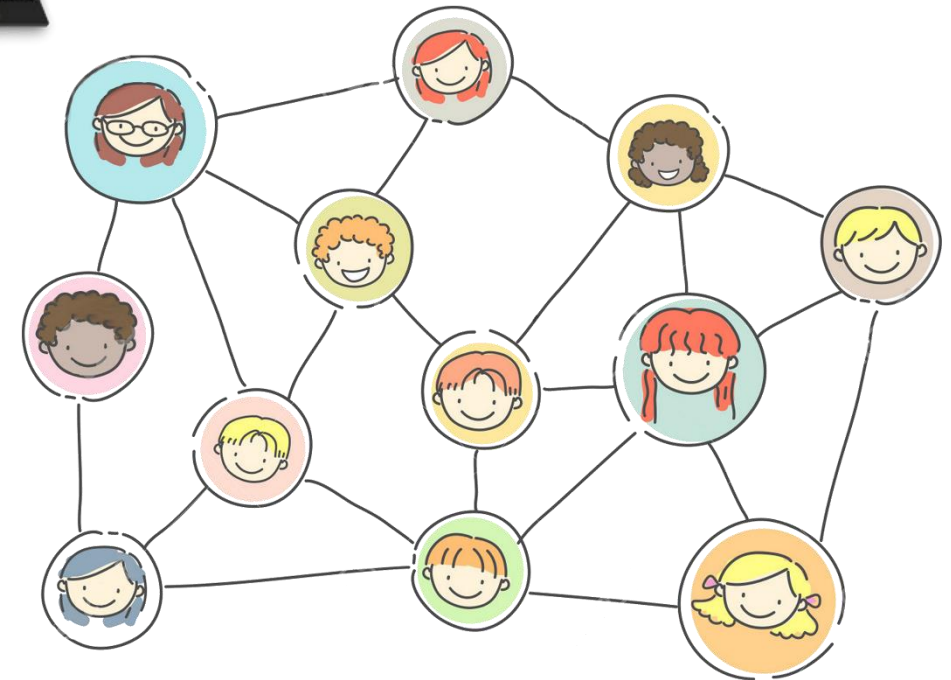
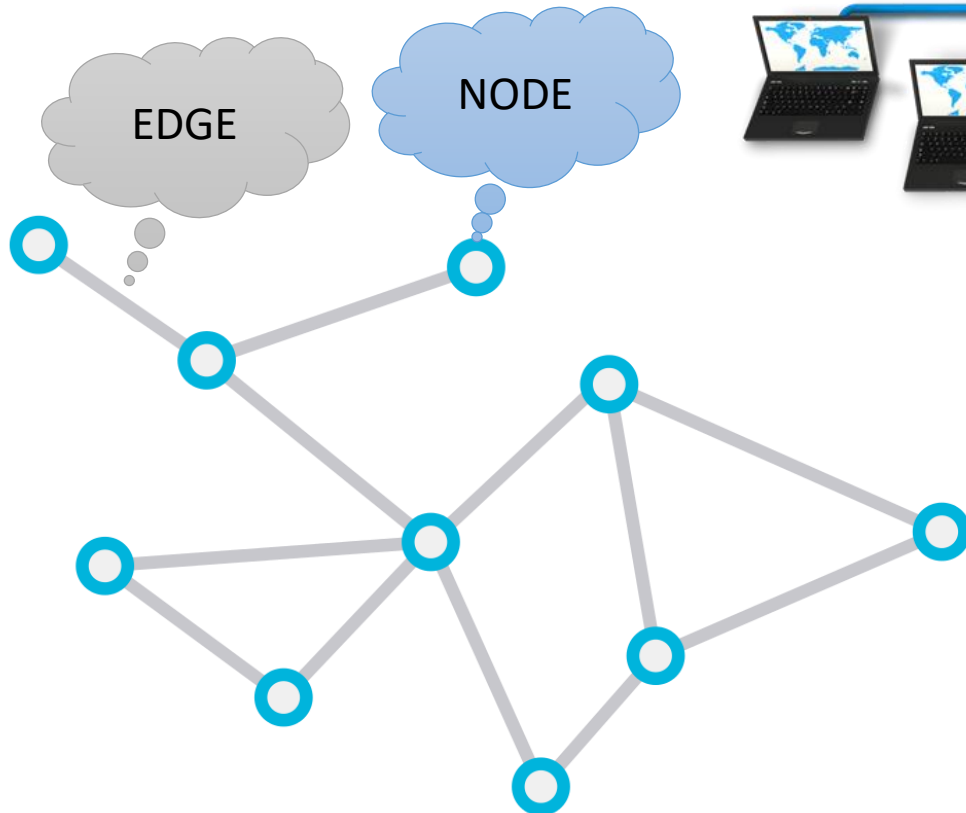
Network Analysis dan Pengaplikasiannya

Diana Purwitasari

Rabu, 17 Maret 2021



Network



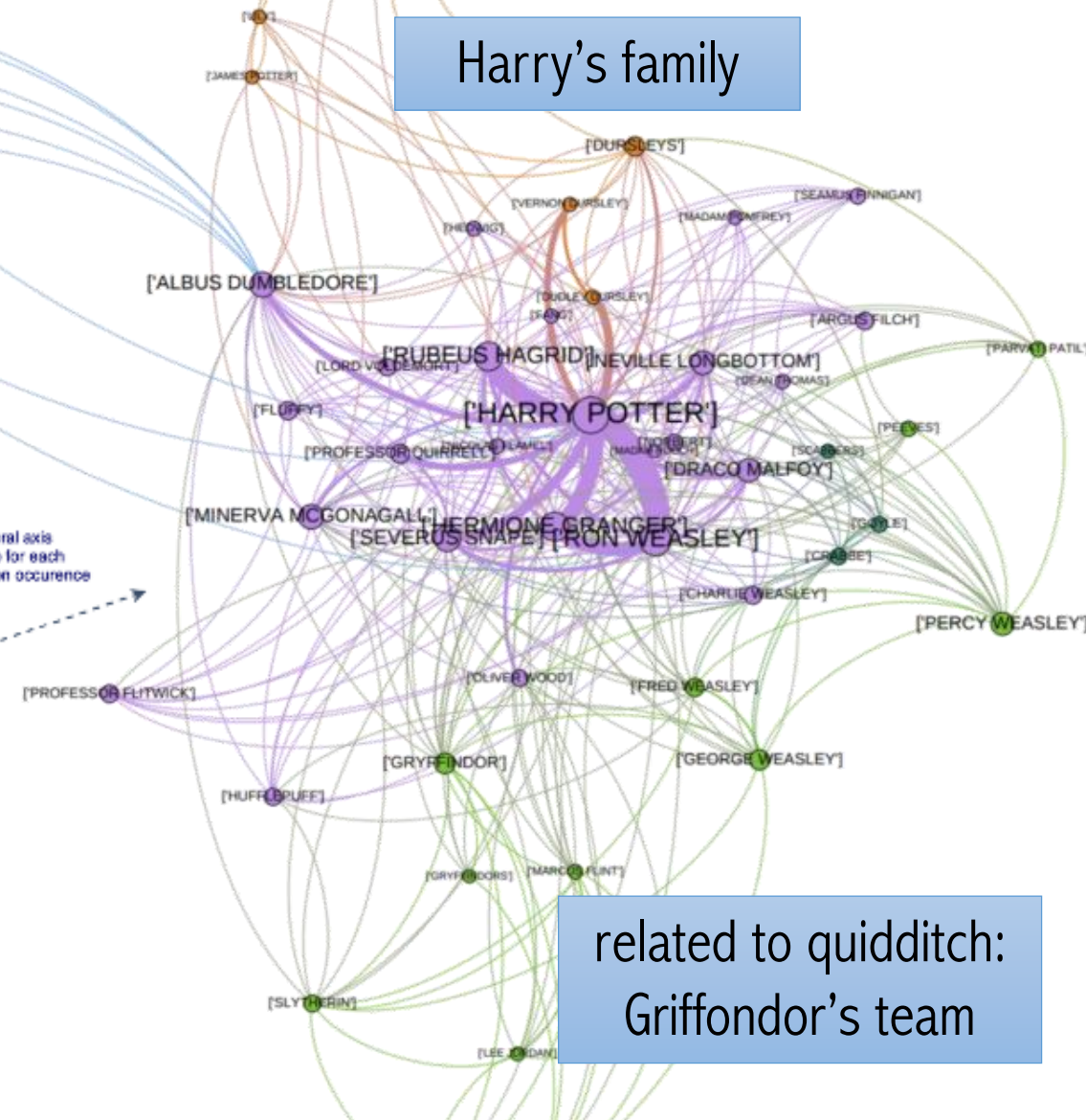
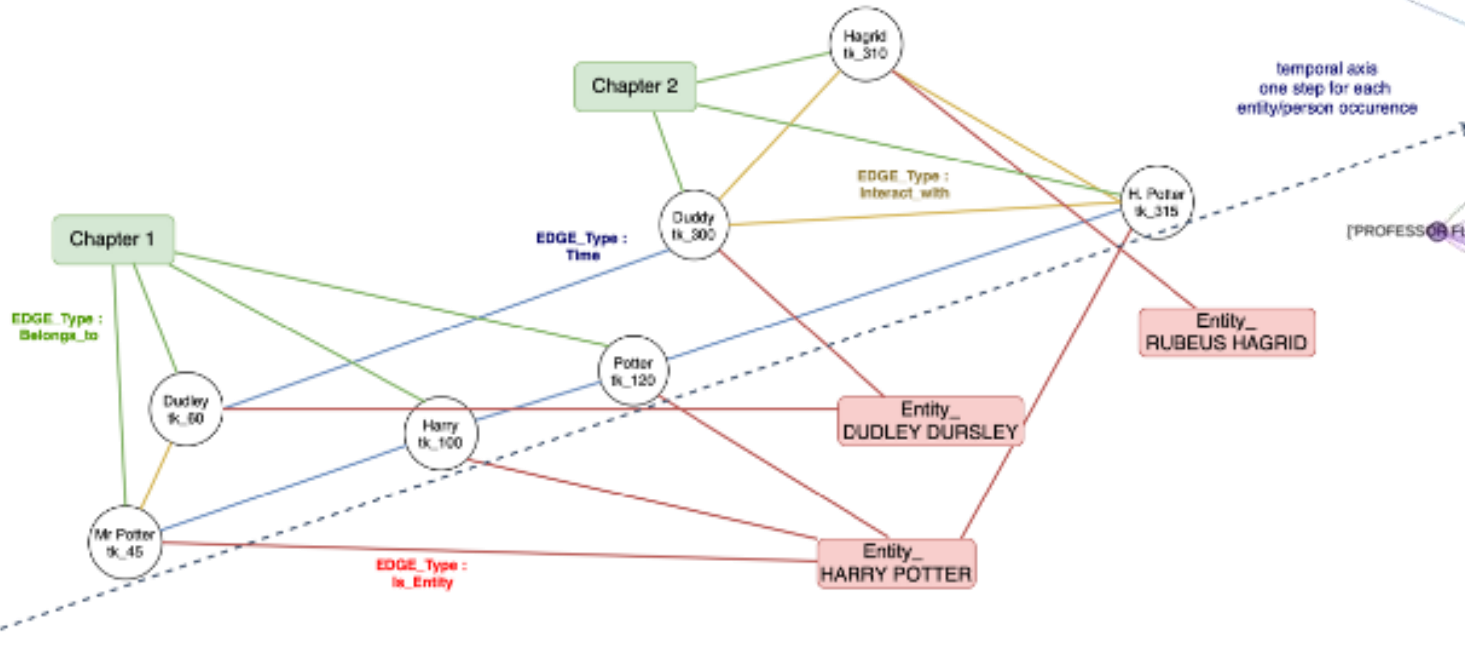
Network Analysis

<https://towardsdatascience.com/explore-harry-potter-via-a-dynamic-social-network-of-characters-f5bed9a39f01>

Explore Harry Potter via a dynamic social network of characters

Harry's family

related to quidditch:
Griffondor's team



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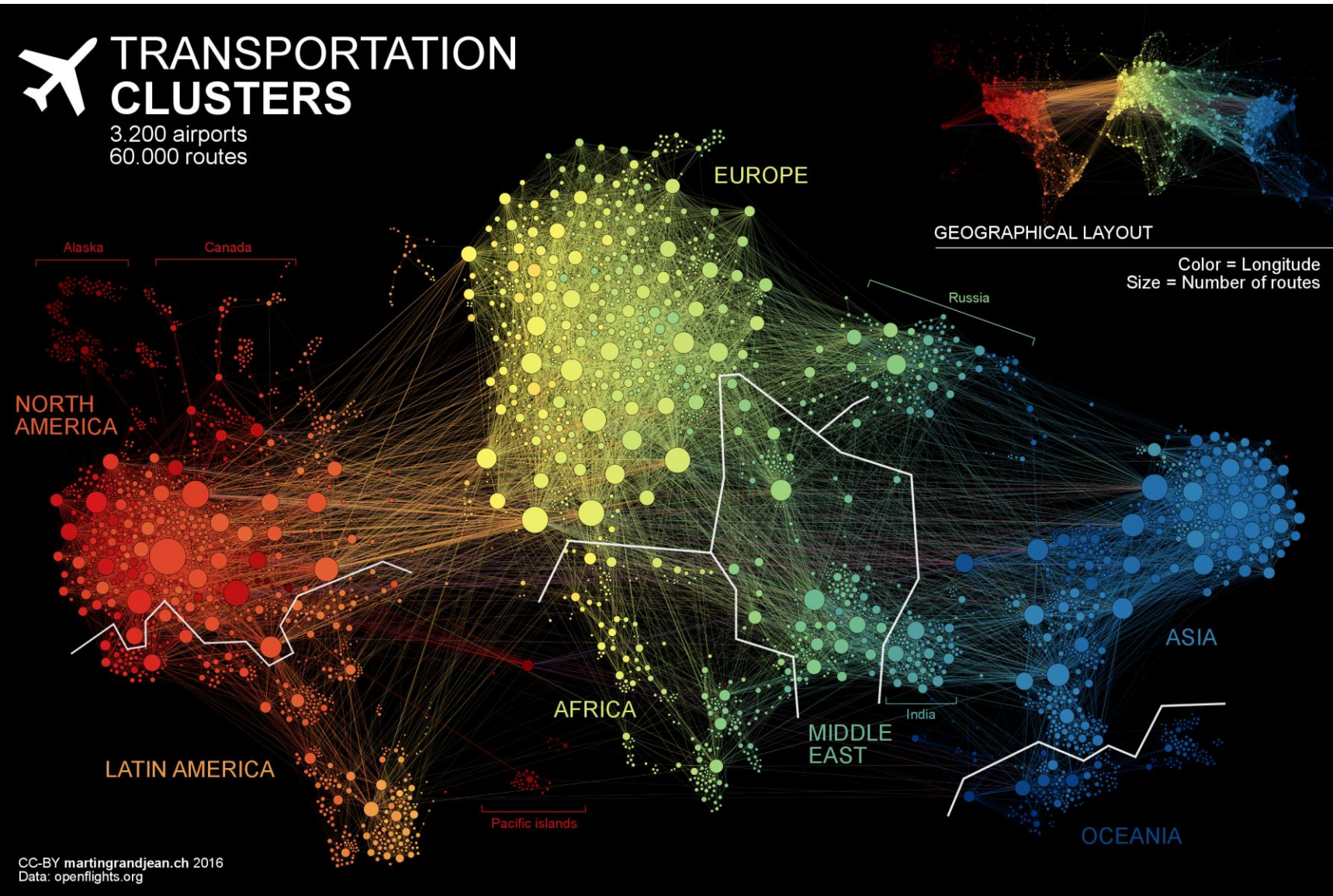
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Network Analysis

<http://www.martingrandjean.ch/connected-world-air-traffic-network/>
ON 26/05/2016



a graph of ± 3200 airports
($\pm 37K$ single routes – the
weighted total is higher
because many airlines take
the same route),
OpenFlights.org data

i.e. India is more connected
to the Middle East than to
South and East Asia



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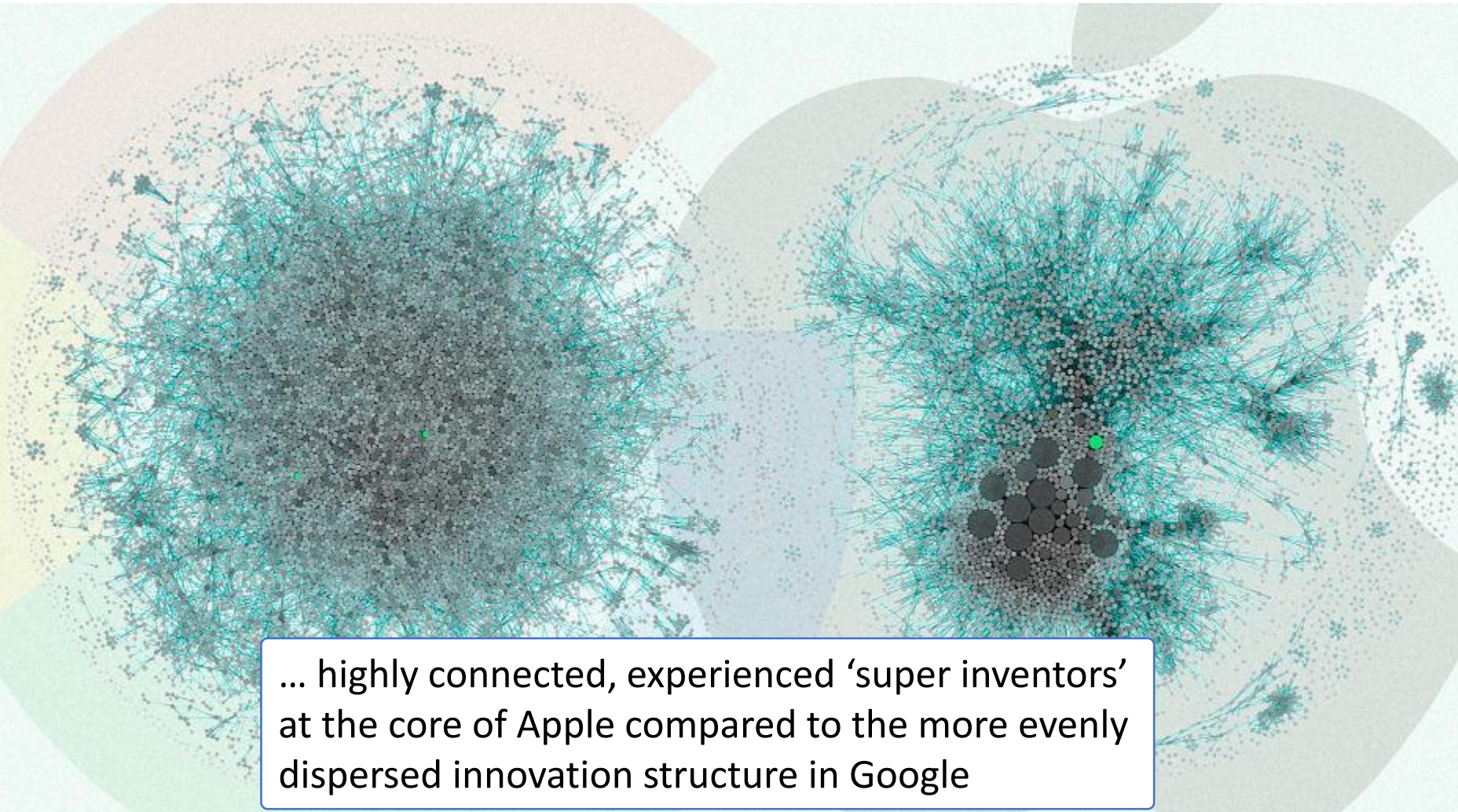


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Network Analysis

<https://www.fastcompany.com/3068474/the-real-difference-between-google-and-apple>

... compares “innovation signatures” charting the last 10 years of patents filed at Apple and Google.



... indicate a top-down, more **centrally controlled** system in Apple vs. potentially more **independence and empowerment** in Google

02-24-17



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Network Analysis

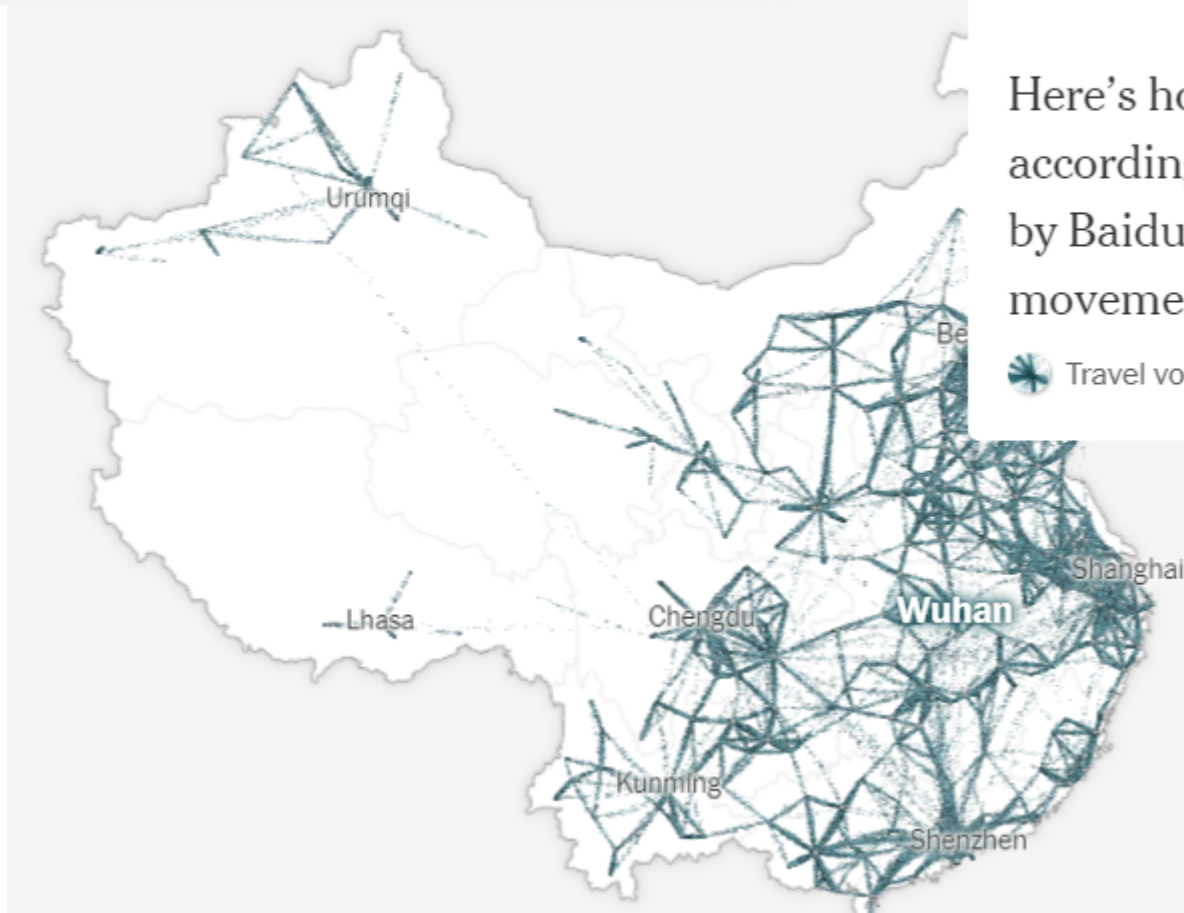
nytimes.com/interactive/2020/03/22/world/coronavirus-spread.html?auth=link-dismiss-google1tap



Update

How the Virus Got Out

By Jin Wu, Weiyi Cai, Derek Watkins and James Glanz March 22, 2020



worse. **Hundreds of millions of people** were about to travel back to their hometowns for the Lunar New Year.

Here's how people moved around on Jan. 1, according to a Times analysis of data published by Baidu and major telecoms, which tracked the movements of millions of cell phones.



Travel volume on **Jan. 1**. Minor routes not shown.

The **departures from Wuhan accelerated** over the next three weeks. About 7 million people left in January, before travel was restricted.



Travel from Wuhan on **Jan. 21**



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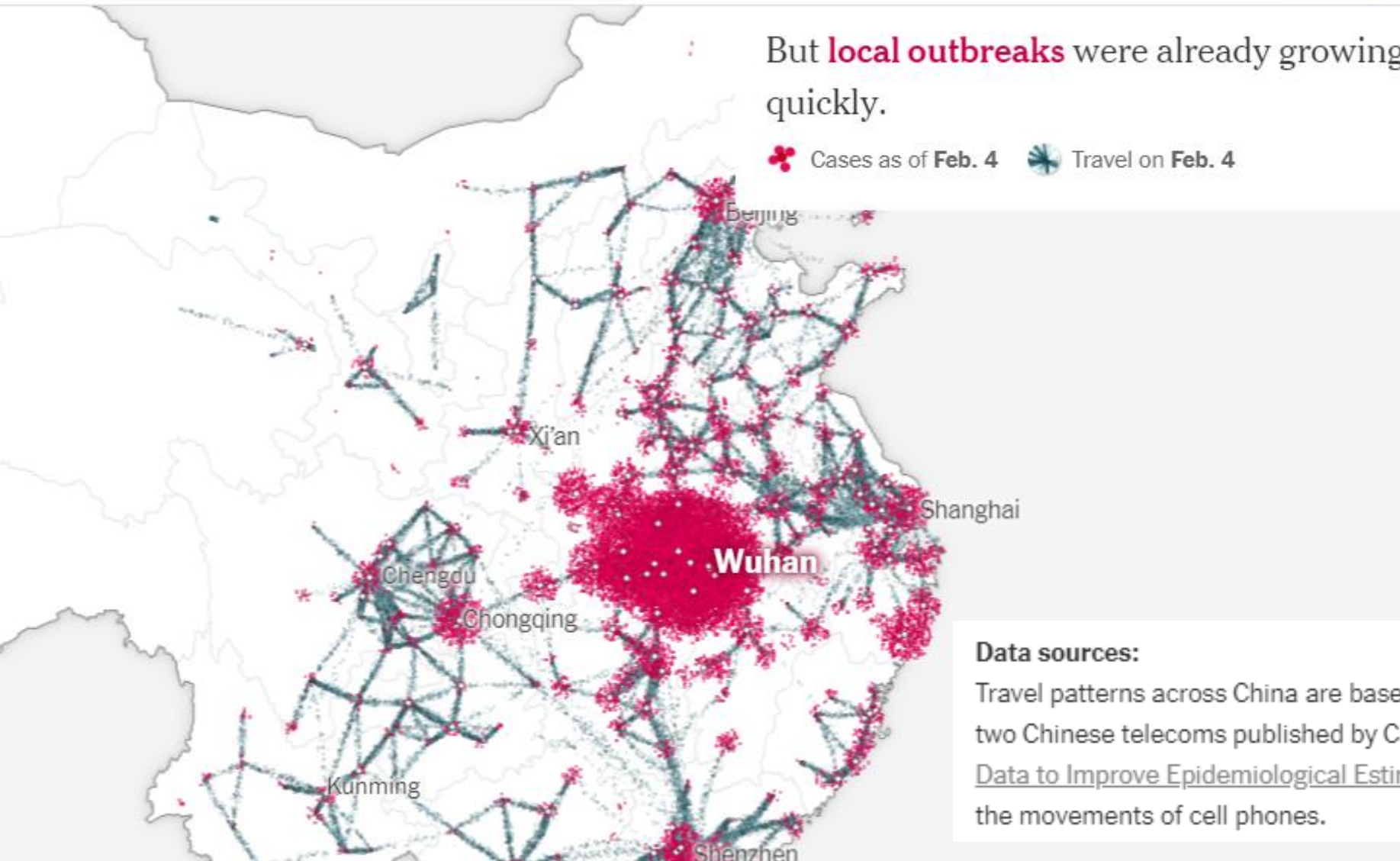
Network Analysis

nytimes.com/interactive/2020/03/22/world/coronavirus-spread.html?auth=link-dismiss-google1tap



But **local outbreaks** were already growing quickly.

 Cases as of **Feb. 4**  Travel on **Feb. 4**



Data sources:

Travel patterns across China are based on data published by [Baidu](#), and data from two Chinese telecoms published by Cao et al., "[Incorporating Human Movement Data to Improve Epidemiological Estimates for 2019-nCoV](#)." Both sources tracked the movements of cell phones.



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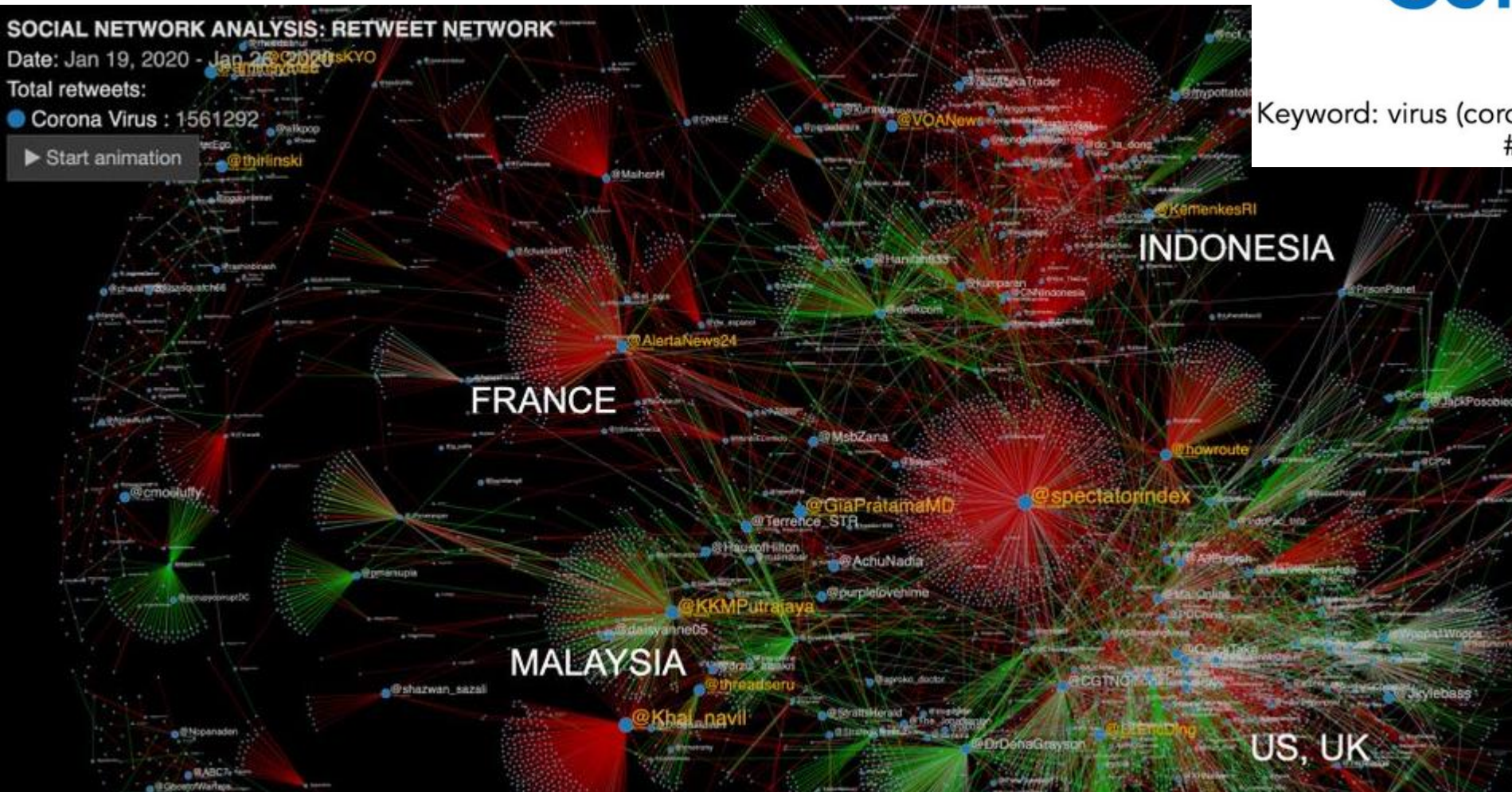
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Network Analysis

<https://pers.droneemprit.id/corona-virus/>

27 JANUARY 2020

Corona Virus



Keyword: virus (corona, wuhan), #coronavirus, #wuhanvirus, #coronavirusoutbreak

Drone Emprit just started the data collection as of 25 Jan 2020. The volume of conversation is very high internationally. Initially we got 1M mentions per day (25/01), and increased to 2M per day (26/01).



Investigating Information Operations in West Papua: A Digital Forensic Case Study of Cross-Platform Network Analysis

October 11, 2019

At first glance, it appeared as if K-pop star Kim Jennie was tweeting lots about Papua. After a closer look, however, it became clear that while the profile picture was of the pop star blowing a kiss to the camera, it was actually a fake automated account, otherwise known as a bot.

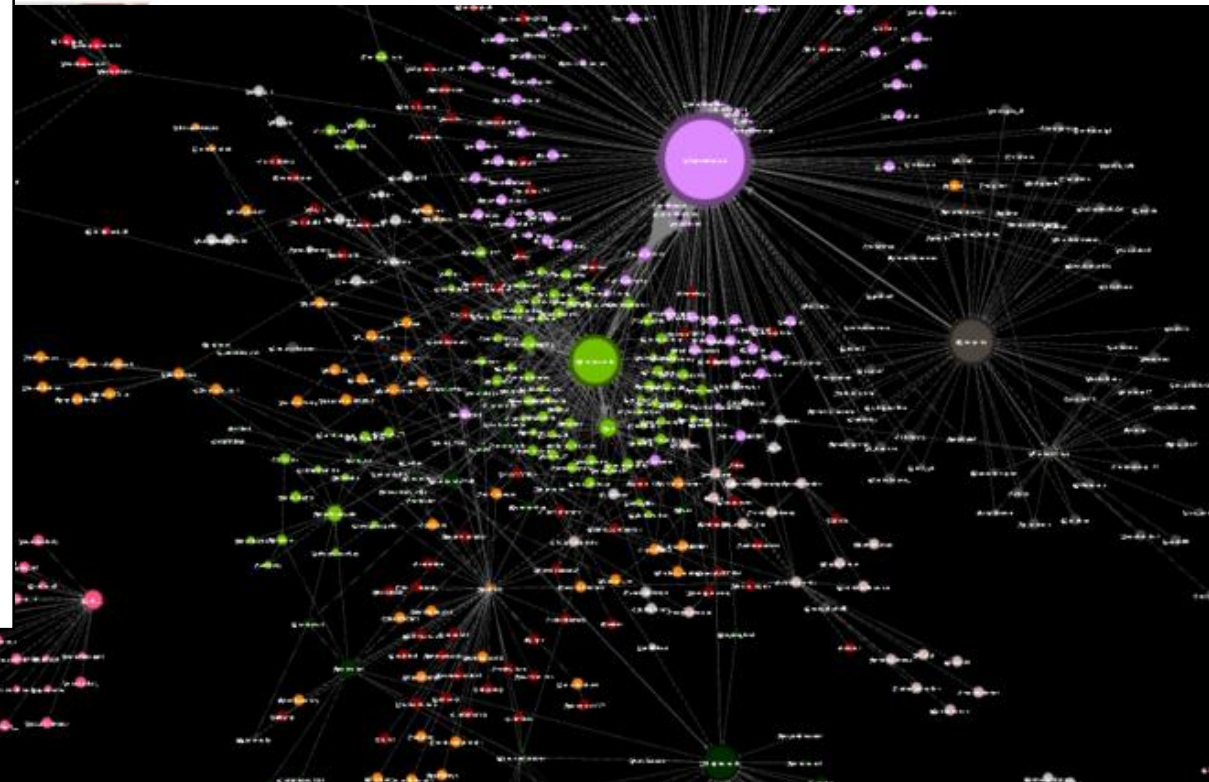
... Twitter took action against those accounts and suspended all of them ...

Facebook said the accounts were “involved in domestic-focused coordinated inauthentic behavior in Indonesia” and that the campaigns “created networks of accounts to mislead others about who they were and what they were doing”. ...

Why Is This Important? The Danger Of Disinformation ...

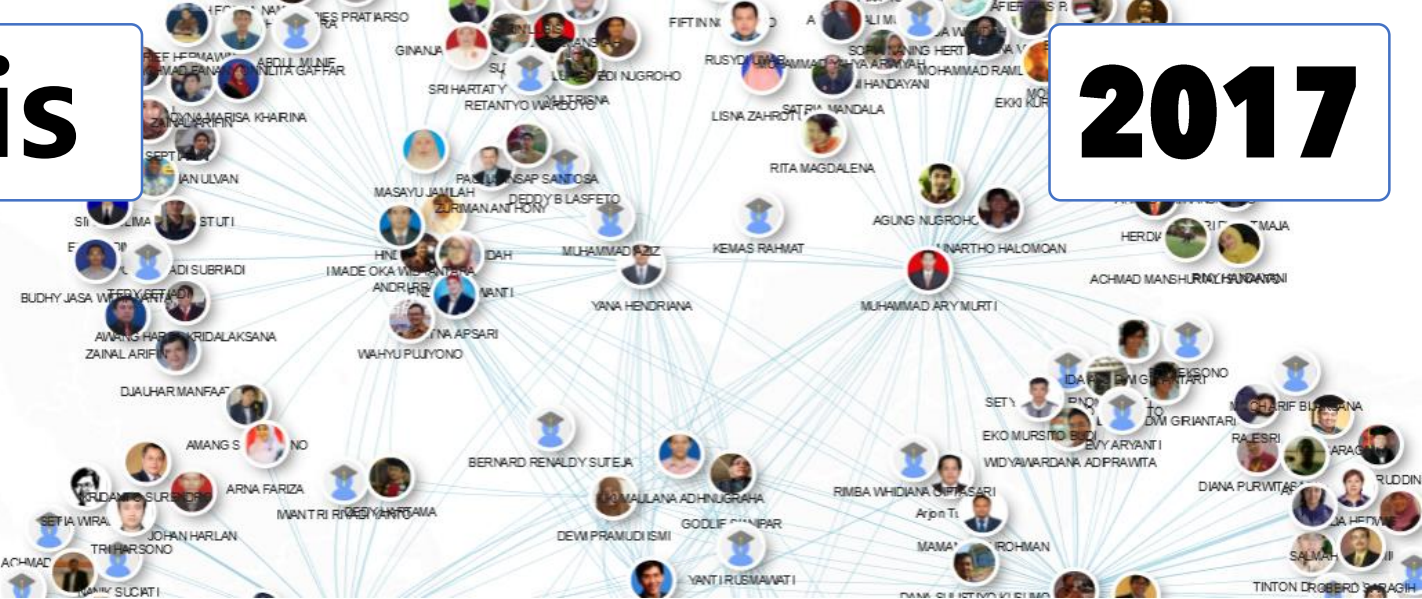
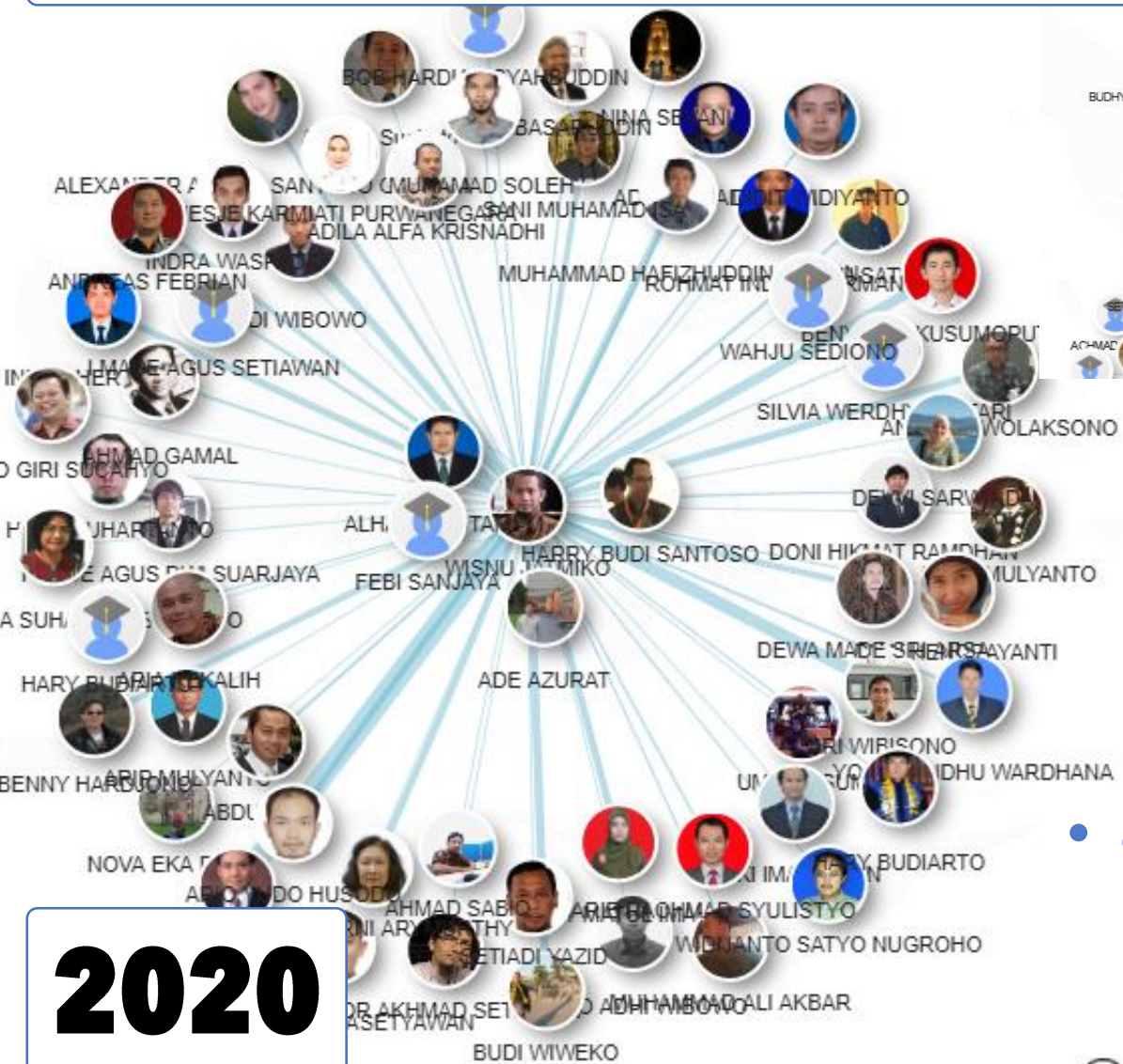


JFB? Jennie.
@yerxi1



Network Analysis

2017



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Science and Technology Index

Ego
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Network Analysis

By Jure Leskovec

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Stanford Network Analysis Project

SNAP for C++: Stanford Network Analysis Platform

Stanford Network Analysis Platform (SNAP) is a general purpose network analysis platform for C++ and easily scales to massive networks with hundreds of millions of nodes, and large graphs, calculates structural properties, generates regular and random graphs, and edges. SNAP is also available through the [NodeXL](#) which is a graphical front-end for Microsoft Office and Excel.

Snap.py: SNAP for Python

Snap.py is a Python interface for SNAP. It provides performance benefits of SNAP and the SNAP C++ functionality is available via Snap.py in Python.

Stanford Large Network Dataset Collection

Stanford Large Network Dataset Collection

- [Social networks](#) : online social networks, edges represent interactions between people
- [Networks with ground-truth communities](#) : ground-truth network communities in social and information networks
- [Communication networks](#) : email communication networks with edges representing communication
- [Citation networks](#) : nodes represent papers, edges represent citations
- [Collaboration networks](#) : nodes represent scientists, edges represent collaborations (co-authoring a paper)
- [Web graphs](#) : nodes represent webpages and edges are hyperlinks
- [Amazon networks](#) : nodes represent products and edges link commonly co-purchased products
- [Internet networks](#) : nodes represent computers and edges communication
- [Road networks](#) : nodes represent intersections and edges roads connecting the intersections
- [Autonomous systems](#) : graphs of the internet
- [Signed networks](#) : networks with positive and negative edges (friend/foe, trust/distrust)
- [Location-based online social networks](#) : social networks with geographic check-ins
- [Wikipedia networks, articles, and metadata](#) : talk, editing, voting, and article data from Wikipedia
- [Temporal networks](#) : networks where edges have timestamps
- [Twitter and Memetracker](#) : memetracker phrases, links and 467 million Tweets
- [Online communities](#) : data from online communities such as Reddit and Flickr
- [Online reviews](#) : data from online review systems such as BeerAdvocate and Amazon
- [User actions](#) : actions of users on social platforms.
- [Face-to-face communication networks](#) : networks of face-to-face (non-online) interactions
- [Graph classification datasets](#) : disjoint graphs from different classes



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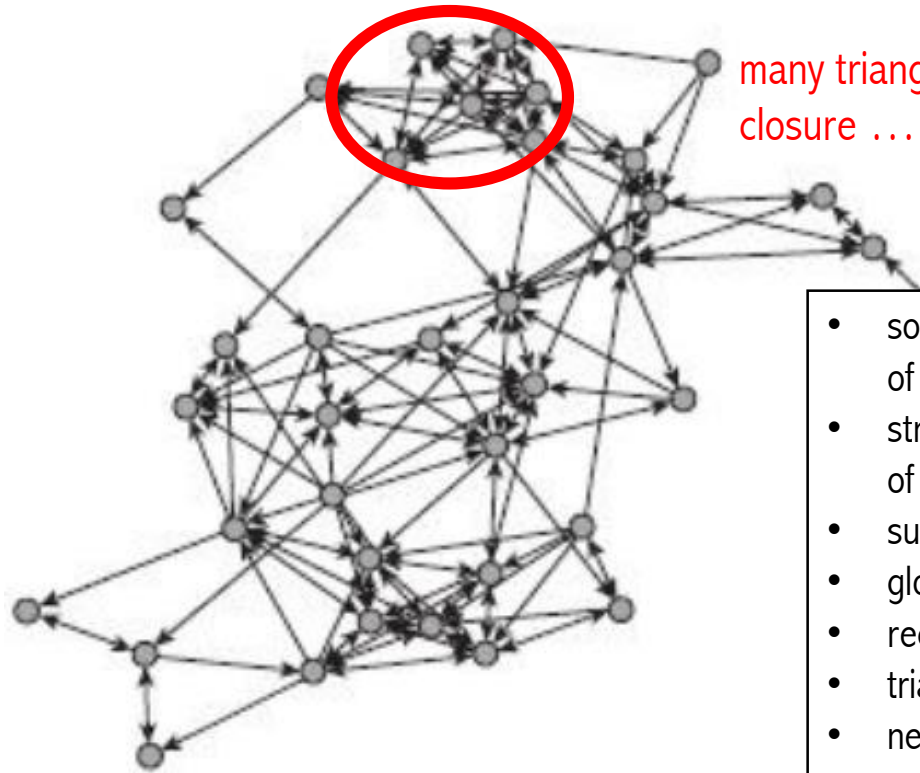


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Network Analysis: The sporting team



(a) After hours socializing

many triangles → an indication of network closure ... group-like cooperation

- social activity and popularity (degrees, centrality of individuals)
- structural position (e.g., being on the periphery of the network, or in the core)
- subgroups of actors
- global network structure (e.g., centralization)
- reciprocation
- triangulation (network closure)
- network brokerage
- outcomes for the system as a whole, as against outcomes for individuals
- the interplay of ties and attributes



(b) Nodal attribute – experience

a tendency for experienced athletes to socialize together

The size of a node indicates the playing experience of an individual in terms of number of games played

- each node ~ a player in the team and the network tie is one of socializing after hours
- an arc present from the athlete to the team-mate → if an athlete nominated a team-mate as someone with whom they spent time after hours

The goal was to study whether important aspects of club culture could be inferred from network structures and athlete attitudes (and other attributes)

a network perspective → dependence and connectivity

What is a social network?

- A social network comprises (at least) a set of social actors and a relationship among them in the form of dyadic relational ties
 - The nodes represent social actors and the edges the ties between them
 - A social network is more than a graph
- A relational tie in a social network may have many different qualities, positive or negative, with a past and presumably a future
 - many types of networks – from electricity grids to subway systems to protein–protein interactions, none of which are social networks
 - need to think about how best to abstract the observed social system in network form

Important Network Concepts

1. **Network activity and degrees:** density and degree distributions are basic descriptive statistics of the network; a description of how much social activity is occurring in the social system (density); how much of that activity or popularity is due to the particular actor (degree).
2. **Network patterns:** reciprocation and triangulation invoke fundamental human social processes; how much cooperation in small groups
3. **Network connectivity**
4. **Centrality:** to understand which actors are most important in the network
5. **Cohesive subsets of nodes:** reflective of group or community processes
6. **Community structure:** there are often regions of the network, sometimes with many nodes, that have higher densities than the rest of the network
7. **Structural equivalence and positions:** an approach to partitioning nodes into distinct sets, based on position in the network rather than community

Some social network theoretical ideas

1. Reciprocity : tend to reciprocate relationships, especially those involving positive affect.
2. Preferential attachment : Popular actors often tend to become more popular because they have high visibility (the rich get richer) → degree distributions are often positively skewed, with a small number of actors with very high degree, and many actors with lower degrees.
3. Closure : Network closure refers to triangulation in networks, tendencies to operate in small groups ... network clustering
strong and weak ties : strong ties tend to exhibit network closure, closing into triangles, whereas weak ties do not, so that weak ties provide connectivity across the network.
4. Small worlds : actors tend to live in cohesive groups in the network (high closure) but can reach across the network in an efficient way
5. Network brokerage : Actors occupying structural holes — where they bridge (or broker between) different parts of the network — are in special positions. These actors do not need to be actors with high degree status .

Some social network theoretical ideas

6. Positive (friendship, communication or collaboration) and negative (competition, dislike, working difficulty) ties close in particular ways in triangles → 'The enemy of my enemy is my friend'
7. Actor attributes 1: Social selection : Actors may select network partners based on attributes → homophily, where a tie is formed between actors with the same attribute.
8. Actor attributes 2: Social influence/diffusion : Actors may be influenced by network partners, changing certain attributes (opinions, behaviors) to accord with those of their partners.
9. Dynamic network processes: network structure (ties) and actor attributes may co-evolve (influenced to like certain movies by friends, and then choose new friends because they like certain movies)
10. Embeddedness : The more embedded an actor is within a network, the more opportunities may be available at the same time that more constraints may operate.
11. Multiplexity : need to consider multiple types of tie, simultaneously.

Social Network Analysis ... observes a social environment, social context or social system

1. An individualized study of bullying in a school class: participant's internal response to the social environment / on the individual characteristics ... asked whether they are victims of bullying, how they respond to bullying, what are their personal traits and characteristics
2. In a whole network study of bullying, every student in the class also nominates the other students who bully them
The network study measures not just individual characteristics but also the relationships between bullies and the bullied
→ ask questions like: Do the bullied also bully? Are there groups of bullies who bully certain individuals? Is there a hierarchy of bullying in this classroom?
3. The goal is to understand the overall pattern of bullying, not just to study the behaviors, characteristics and feelings of bullies and the bullied.
 - the point is: if bullying is not just an individual behavior but is embedded within the social system, then individual interventions may not be sufficient to eradicate it.
 - need to understand the social purposes of bullying, how that relates to other social processes (e.g., status achievement), and whether there is a culture of bullying in this class

How and why social networks can add to theory and interpretation

1. Study whether the social environment affects individual outcomes. social partners might affect individuals, through contagion or influence or other social processes. Perhaps some property (disease, money, health, opinions, information) 'flows' across the network from one individual to another.
2. Study whether individuals in certain social positions have different individual outcomes. Popular individuals may have different outcomes from isolates or peripheral individuals; or network entrepreneurs might reap benefits from bridging between distinct groups.
3. Study how individuals affect social structure. Are there individual factors that affect why individuals choose their social partners, or why they seek certain positions in the social system?
4. Study how individual outcomes and the social system are intertwined. What causal processes might be present: are individual or social factors (or both) the best explanation of the issue you are studying?
5. Study the global outcomes of the social system. Is the system effective or responsive for some purpose? Is it possible to intervene to improve either individual or system outcomes?