Metodos generales de análisis de redes en la vigilancia y epidemiología de enfermedades infecciosas

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A toolbox of methods for:

- **Exploring** the topology of networks (i.e. relationship between individuals)
- **Identifying** subgroups
- **Statistical analysis** of network data
  - Characterising the **role** of individuals
- and more…

Research questions:

Size, duration and probability of an outbreak

- **Network centrality is a measure of an individuals "position" in a network**

- **Many centrality measures exist;**
  - Degree
  - Betweenness
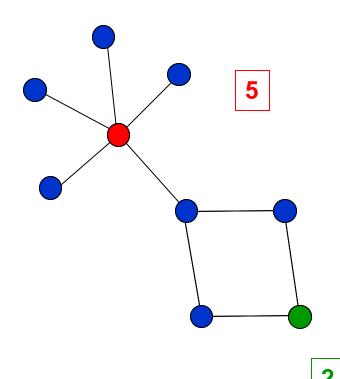 - Closeness
  - K-Core
  - Eigenvector
  - …

Definition: the sum of unique contacts made by a node to all other nodes. Individual level measure of connectivity
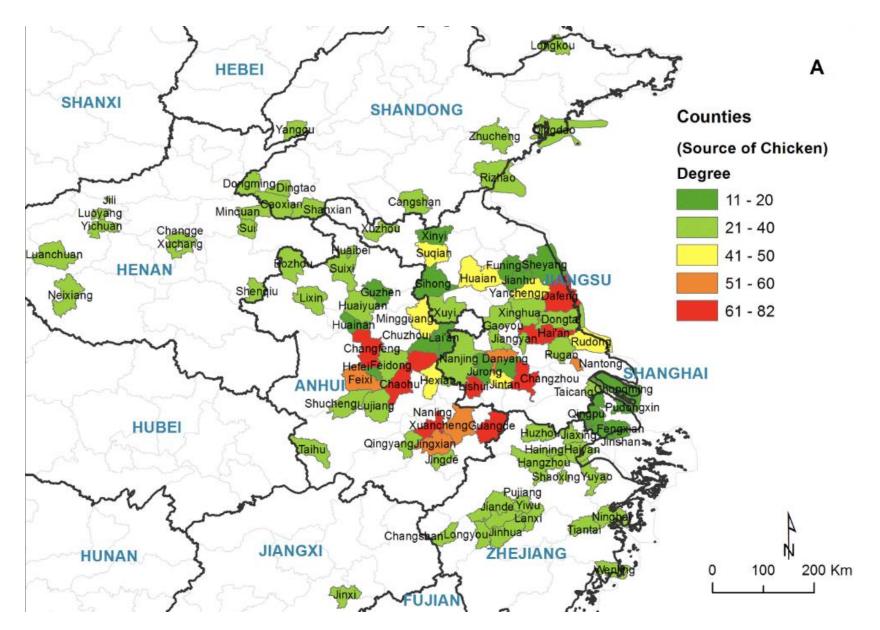
Directed graphs, can describe the:

- **In-degree**: the number of ties connecting **to** a node

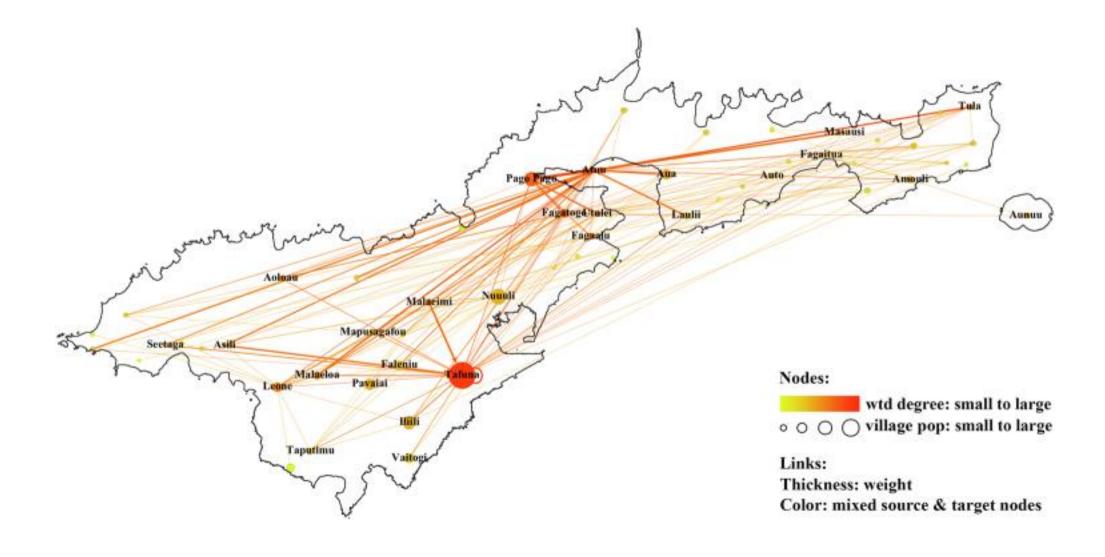- **Out-degree**: the number of ties leaving a node

5

2

Disassortative network - nodes tend to connect to other nodes that have different degree.

Assortative network – nodes connected to other nodes that have similar degree.
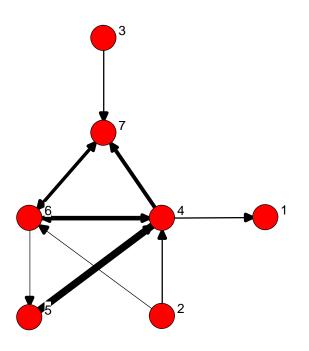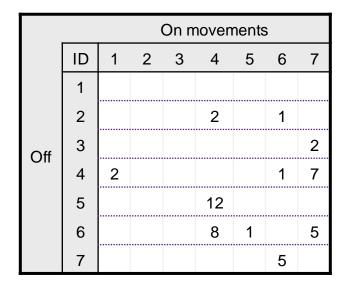
Degree: the sum of unique contacts made by a node to all other nodes.

	On movements						
ID	1	2	3	4	5	6	7
1							
2				2			1
3							2
4	2					1	7
5				12			
6				8	1		5
7							5

(Off)

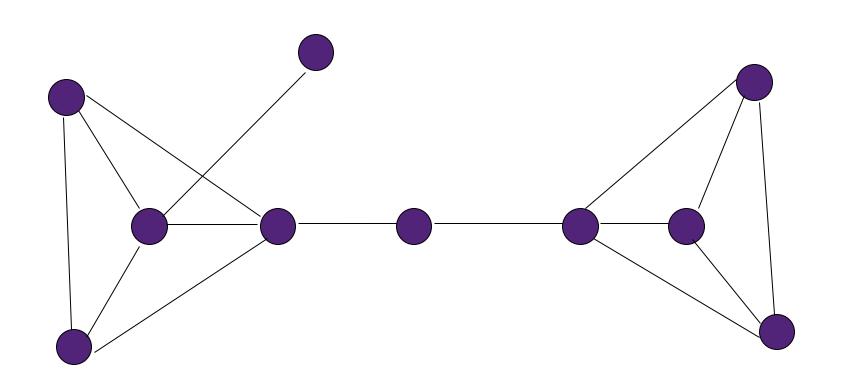| ID	Out degree	In degree
1	0	1
2	2	0
3	1	0
4	3	3
5	1	1
6	3	3
7	1	3

Definition

Maximal subgraph (subgroup of nodes) in which each node has at least degree k within the subgraph (ie., 2-core, 3-core …..etc….)
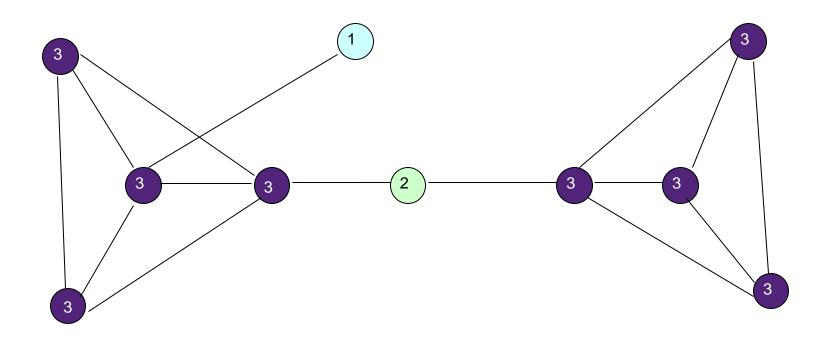
- Identifies relatively dense subgraphs
- Uses degree to identify clusters
- Generally used on undirected networks
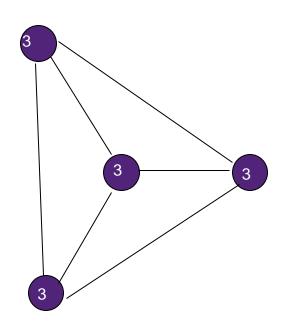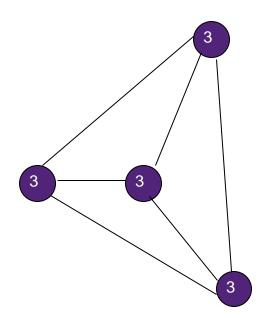- A component always a 1-core

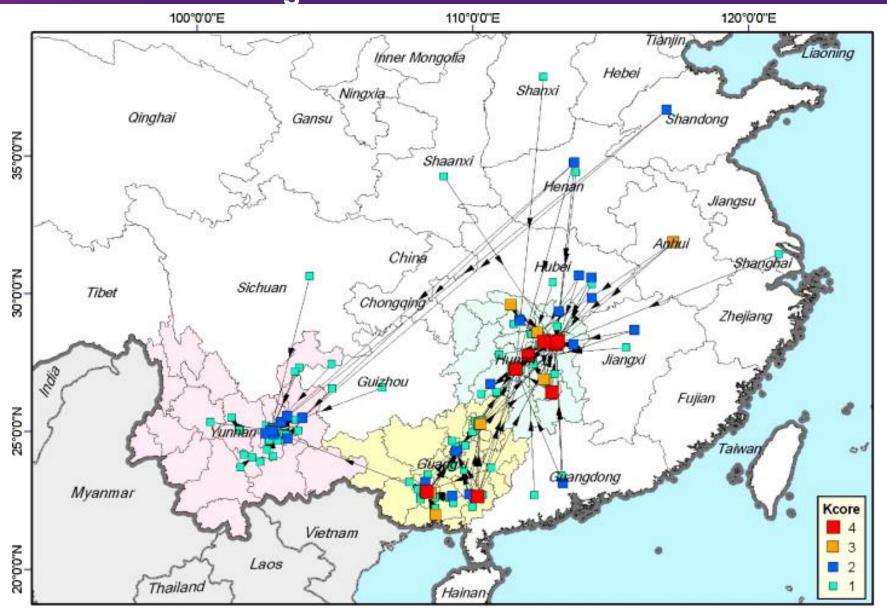Remove lowest k-cores until the network breaks up into relatively dense components

Remove lowest k-cores until the network
breaks up into relatively dense components

Use Case	Statistical Tests
Continuous variable similarity (e.g., income, score)	Moran's I, Geary's C or t-test
Categorical attribute clustering (e.g., gender, role)	Join Count or Assortativity
Testing relationship between attribute matrix and network ties	QAP or Mantel Test
Modeling influence or behavior diffusion	Network autocorrelation models or SAOM
Group or community-based clustering	Modularity / ERGMs

Month/County infection status	Not-infected	Infected	Two-tailed t-test probability of the difference of the mean degree
January			
Poultry outbreaks	47	21	-0.203 (P = 0.933)
Market infection	43	25	0.577 (P = 0.768)
Human outbreaks	53	15	-6.974 (P = 0.001)
February			
Poultry outbreaks	61	24	4.561 (P = 0.018)
Market infection	59	26	5.475 (P = 0.001)
Human outbreaks	68	17	-1.941 (P = 0.202)
March			
Poultry outbreaks	57	20	5.325 (P = 0.076)
Market infection	57	20	5.325 (P = 0.078)
Human outbreaks	65	12	-8.559 (P = 0.011)
April			
Poultry outbreaks	41	19	1.972 (P = 0.324)
Market infection	40	20	2.100 (P = 0.281)
Human outbreaks	49	11	-5.187 (P = 0.018)

The connectivity among counties experiencing human infection was significantly higher compared to counties without human infection for the months of January, March and April. Conversely, counties with poultry infections were found to be significantly less connected than counties without poultry infection for the month of February.

Gracias - preguntas?

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