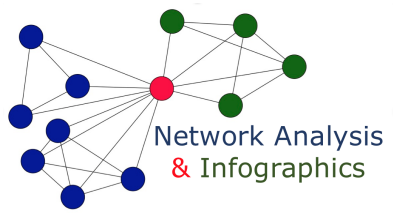
Network Models
–Seminar–

Yasemin Aslan
(Y.Aslan@sussex.ac.uk)

SPRU (Science Policy Research Unit)
Business School
University of Sussex



Week 8: 18 March 2022

Learning Outcomes

	Learning outcome	Assessment mode
1	Explain the concept of network and list the main network indicators	ESS
2	Describe and apply the major techniques for the collection of network data and their statistical analysis	ESS, GPN + GWS
3	Identify the main characteristics of networks by means of network measures	ESS, GPN + GWS
4	Employ network analysis techniques to produce network data-based infographics	GPN + GWS

Note: ESS: Essay; GPN: Group Presentation; GWS: Group Written Submission

Overview

1. Modelling and inference of networks [recap]
2. Modelling and inference of networks in *igraph*

Modelling and inference of networks [recap]

Modelling and inference of networks [recap]

- Mathematical models
  Based on 'simple' probabilist rules to capture specific mechanisms
  - Random graph models assume $\mathbb{P}_\theta(G)$ to be a uniform distribution
    - ★ Erdós-Rényi random graph model
    - ★ Bernoulli random graph model
    - ★ Generalised random graph models
  - Models based on mechanisms mimic certain properties observed in the real world
    - ★ Small-worlds models
    - ★ Preferential attachment models

- Statistical models
  The observed network is considered as one of the possible realisation of a process
  - Exponential Random Graph Models (ERGM): the presence/absence of a tie is the response variable that is dependent on endogenous and exogenous factors
  - Stochastic Actor-Oriented Models (SAOM): The co-evolution of a network structure and attributes is modelled as a stochastic process
  - Network Block Models model the propensity to establish a tie between two nodes as dependent on the 'class' membership of the two nodes

Modelling and inference of networks in *igraph*

Modelling and inference of networks in *igraph*

Model	**igraph function**
Mathematical models	
Erdós-Rényi	erdos.renyi.game()
Bernoulli	erdos.renyi.game()
Generalised	degree.sequence.game()
Small-worlds	sample_smallworld()
Preferential attachment	sample_pa()
Statistical models (not in this module)	
Exponential Random Graph Models (ERGM)	'ermg' package
Stochastic Actor-Oriented Models (SAOM)	'RSiena' package
Network Block Models	'blockmodels' package

Next time ...

Next time ...

- **Lecture: Innovation networks**
  - Use of network analysis to map science and technology
- **Seminar: Innovation networks**
  - Practice with VOSViewer