UNIVERSITY OF OXFORD
Grand Union Doctoral Training Partnership

Social Network Analysis (Workshop)

Academic Year: 2025-26

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Introduction

Networks are all around us: from neural connections in the brain, the spread of disease, to transport systems, the internet, and our own family and friend groups, i.e. social networks. Social Network Analysis (SNA) is the study of these networks of relationships among people, organisations, and entities. Although every network is unique, there are also striking regularities and law-like patterns that shape how they function. Social networks are driven both by connections and by the absence of connections (gaps can be as consequential as connections.) These patterns of linkage form structures that profoundly influence our behaviour, opportunities, and outcomes.

The study of social networks combines mathematics, physics, computer science and social science, making it an exceptionally rich and interdisciplinary field of inquiry.

Rather than focusing solely on the attributes of individuals, SNA allows us to understand the world through the connections between people. For example, one network structure might slow the spread of a virus, while another might accelerate it. The same principles apply to the flow of information, such as job opportunities or news stories. Network analysis can reveal why one TikTok video goes viral while another vanishes, how sexual diseases spread and how lives can be saved by mapping the transmission of HIV/AIDS, and even which mafia-soldier is likely to be murdered next. (These are all examples drawn from research papers we will discuss in this workshop.)

This two-day workshop introduces the theory and practice of Social Network Analysis (SNA) combining insights from sociology, data science, and computer science. Conducting network analysis requires computational methods. To collect, prepare, and analyse network data, participants will use the programming language R. Through lectures, interactive analysis walk-throughs, and hands-on exercises, we will cover the fundamentals of graph theory, key network concepts, and the principles of visualising, modelling, and interpreting network structures.

Objectives

This workshop introduces the core concepts and methods of social network analysis, from foundational graph theory and personal networks to contemporary network science approaches and statistical modelling.

Participants will learn how to design and conduct network-based research, focusing on the analysis of social networks, i.e., sets of actors connected by relationships. By the end of the course, participants will have the conceptual and technical grounding to develop their own network research project and to think critically about the world through the lens of networks.

By the end of this workshop, participants will:

- Understand the theoretical foundations and key concepts of social network analysis
- Understand principles of research design and data collection for network studies
- Be able to apply computational methods to analyse network data in R
- Develop skills in visualising, modelling, and testing hypotheses using network data
- Engage critically with research in network science and its applications
- Able to formulate and theorise research questions using SNA approaches
- Design and conduct their own network-based research project

Syllabus

Part A: Theory

- What are networks, and why analyse them?
- Types of networks and network components
- Network theory:
    1. Mathematical, physical, and computational foundations
    2. Social theory and applications

Part B: Practical Application

- Research design for network studies
- Network data: finding, collecting, and preparing datasets
- Analysing network data in R:
    1. Descriptive network measures and statistics
    2. Visualising networks
    3. Modelling networks and testing hypotheses

Part C: Your Project

- Developing and refining your own network-based research project

Structure and Format

Duration: Two days
Format: In-person
Location: University of Oxford

- **Day 1**
  Theoretical foundations of social network analysis and introductory hands-on exercises using R.
- **Day 2**
  Morning: guided practical session on analysing network data in R.
  Afternoon: development of participants' own research questions and project designs.

Prerequisites

Participants should have a basic working knowledge of a data science or statistics programming language, preferably R (or alternatively Python). The workshop will use R for all exercises and examples.

Familiarity with introductory statistics is encouraged but not required.

Before the workshop, please ensure you have installed R, RStudio, and the following R packages:

```
c("tidyverse", "janitor", "readxl", "haven", "lubridate", "forcats",
  "igraph", "tidygraph", "ggraph", "statnet", "intergraph",
  "RColorBrewer", "viridis")
```