UCLouvain

lpsys2168

2026

Advanced workshops of analysis methods - Introduction to systemic thinking and network science

2.00 credits	15.0 h	Q2

Teacher(s)	Heeren Alexandre ;
Language :	English
Place of the course	Louvain-la-Neuve
Learning outcomes	
Evaluation methods	First session: The grade is based on two components: • (1) Oral examination on the theoretical aspects of the notions introduced during the course and on the use of R (exercise) for the application of network analysis (14 points / 20); • (2) Critical presentation of an article from the field of psychological sciences (cognitive, clinical, social, or neuropsychological) (6 points / 20). Although some exercises carried out during the course may, at the instructor's request, include the use of Generative Artificial Intelligence tools, their use is not permitted during the examination. Second session: Oral examination on the theoretical aspects of the notions introduced during the course and on the use of R (exercise) for conducting network analyses (20 points / 20). The use of Generative Artificial Intelligence tools is not permitted.
Teaching methods	Teaching and assessment will take place on the UCLouvain campus in Louvain-la-Neuve, Belgium.
Content	Over the past decades, many scientific fields have radically transformed their way of approaching the world. Rather than attempting to reduce the complexities of their domain into "simple" models for easier understanding, they have instead chosen to fully embrace these complexities by mapping them through network models. This pursuit of complexity has been made possible both by the increase in computational power (allowing more sophisticated calculations on ever-larger datasets) and by the development of network science. Network science offers key advantages that have enabled its adoption across fields as diverse as ecology, sociology, and epidemiology: (1) network science can be applied to any type of system, with nodes representing the element under study (e.g., people, viruses, computers) and edges representing the connections between these nodes (e.g., correlations, temporal dependencies, probabilistic dependencies); and (2) network science stems from graph theory, which provides researchers with mathematical rules to understand and predict networks. Researchers in psychology have also recently acknowledged the potential of network science. The aim of the course is to provide a general overview of the application of graph theory and network analysis in psychological sciences. Applications to real datasets will be presented throughout the workshop. Given the diversity of the audience, illustrations will range from social networks to brain networks and symptom networks. Through this course, participants will be able to: • begin to think about problems in their full complexity, cultivate systemic thinking, and overcome siloed approaches • become familiar with the general notions of graph theory and network analysis • model network data using R, implement algorithms derived from graph theory (e.g., community detection), and use recent tools of statistical network analysis to optimize network estimation and visualization • and develop the ability to critically evaluate articles dealing with network analysis and graph theory in the field of psychological sciences. Sustainability and Transition Elements (S&T): In line with recent charter "*For Teaching that Meets the Ecological Emergency*" (https://charteenseignantsecologie.be/la-charte/), this course also emphasizes the interdependence of individual, economic, ecological, and social aspects; the dangers of siloed thinking; and the urgent need to break down boundaries and to approach the various themes of psychology in their full complexity and interconnectedness.
Inline resources	The documents (slides, articles used as examples), as well as the sample R programming codes and the datasets used, will be made available via Moodle.
Bibliography	- Network Psychometrics with R: A Guide for Behavioral and Social Scientists, Edited By Adela-Maria Isvoranu, Sacha Epskamp, Lourens Waldorp, Denny Borsboom - Network Science, by ALBERT-LÁSZLÓ BARABÁSI

Faculty or entity in charge	EPSY

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Psychology	PSY2M	2		🔍
Master [120] in Education (shift schedule)	FOPA2M	2		🔍