



Aachen International
Summer School
in Research Methods

RWTHAACHEN
UNIVERSITY



10TH AACHEN INTERNATIONAL SUMMER SCHOOL IN RESEARCH METHODS AND DATA SCIENCE (ACISS)

SOCIAL NETWORK ANALYSIS USING DATA ANALYTICS

UNIV.-PROF. DR. RICHARD WEBER

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SUMMER 2024

1 COURSE OVERVIEW

Course Name:	SOCIAL NETWORK ANALYSIS USING DATA ANALYTICS
Degree Programmes:	<ol style="list-style-type: none"> 1. Post-Docs and PhD students 2. Master BWL (all): MSBWL10, MSBWL13 Master Wirtschaftswissenschaften (all specializations): MSWiWi10, MSWiWi14 Master Wirt.-Ing. (MSWiBau, MSWiEET, MSWiWPT, MSWiMB, all specializations): MSWi10, MSWi15
Lecturer:	Univ.-Prof. Dr. Richard Weber
Contact:	richard.weber@uchile.cl
Location and Time:	Kackertstr. 7, Room B301 19 th August to 23 th August, 9:00 am – 5:00 pm
Content Description:	Social networks play an ever increasing role in our society. TikTok, Instagram, and Twitter are just some examples of internet sites where users can network. Many traditional business decisions will be influenced by social network analysis (SNA). Loan granting or marketing campaigns are just two examples. But also less traditional areas, such as e.g. investigation of organized crime can benefit from this approach. This course first lays the foundation for social network analysis by introducing advanced data analytics techniques. Then the main topics related to SNA will be introduced. Applications with real-world data from social networks using the respective software tools will conclude the course.
Qualification Objectives:	<p>This course seeks to enhance participants' ability to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> understand the potential of social network analysis (SNA) in different areas, <input type="checkbox"/> select the adequate methods for network analysis, <input type="checkbox"/> analyze social networks using advanced data mining techniques, <input type="checkbox"/> propose decisions based on the respective network analyses.
Literature:	See readings below
Course Examination:	<p>The final grade will be composed as follows:</p> <ol style="list-style-type: none"> 1. Group work including student presentation and report (weight: 50%) and 2. Individual written exam (60 minutes) (weight: 50%).
Participation Requirements:	<ol style="list-style-type: none"> 1. Solid command of English. 2. Willingness to engage in preparatory readings of case studies and/or research papers. 3. Exchange and Erasmus students are cordially invited to apply for participation in this course.
Group Size:	30 participants (max)
Workload:	30 hours of lecturing and group work Additional individual and group preparation
Type of Teaching Event:	Lecture with integrated individual and group work on datasets
Language:	English
Credits:	5

2 SCOPE OF THE COURSE

Social networks play an ever increasing role in our society. TikTok, Instagram, and Twitter are just some examples of internet sites where users can network. Many traditional business decisions will be influenced by social network analysis (SNA). Loan granting or marketing campaigns are just two examples. But also less traditional areas, such as e.g. investigation of organized crime can benefit from this approach. This course first lays the foundation for social network analysis by introducing advanced data mining techniques. Then the main topics related to SNA will be introduced. Applications with real-world data from social networks using the respective software tools will conclude the course. This course seeks to enhance participants' ability to:

- (1) understand the potential of social network analysis (SNA) in different areas,
- (2) select the adequate methods for network analysis,
- (3) analyze social networks using advanced data mining techniques,
- (4) propose decisions based on the respective network analyses.

3 PARTICIPANTS AND REQUIREMENTS

Participants

1. Post-Docs and PhD students
2. Master BWL (all specializations): MSBWL10, MSBWL13
Master Wirtschaftswissenschaften (all specializations): MSWiWi10, MSWiWi14
Master Wirt.-Ing. (MSWiBau, MSWiEET, MSWiWPT, MSWiMB, all specializations): MSWI10, MSWI15

Due to the interactive teaching format, the number of participants is limited to 30.

Advanced master students are invited to participate, but preference will be given to PhD students.

Participants should bring a personal computer/laptop to practically employ the contents learned in theory sessions. The software environment for statistical computing and graphics R (<https://www.r-project.org/>) will be used to apply the concepts acquired in class. Other software tools or programming languages can also be used.

Requirements

- Solid command of English.
- Willingness to engage in preparatory readings of case studies and/or research papers.
- Exchange and Erasmus students are cordially invited to apply for participation in this course.

Grading

The final grade will be composed as follows:

1. Group work including student presentation and report (weight: 50%) and
2. individual written exam (60 minutes) (weight: 50%).

Complete attendance of each session of the course is obligatory. Absolutely no exceptions apply. Leaves will only be granted in cases of illnesses or if the person demanding a leave

is required to participate in an official activity of the University, Faculty, or Institute. In the first case, the doctor's medical certificate must be presented to the Chair immediately (i. e. latest by the first working day following the absence day). Failure to comply with this rule leads to a no-pass grade. Passing grades can generally not be earned by students who miss more than 20% of the total class-time.

4 TENTATIVE COURSE SCHEDULE

The lecturing days will comprise a morning session (9:00-12:00) and an afternoon session (14:00-17:00) that cover the indicated topics.

Day 1: Motivation and Introduction to Social Network Analysis

Preparatory Readings:

Fan, W., Gordon, M.D. (2014): The Power of Social Media Analytics. Communications of the ACM 57, No.6, 74-81

Han, S.-H., Chae, C., Passmore, D.L. (2019): Social network analysis and social capital in human resource development research: A practical introduction to R use. Human Resource Development Quarterly 30, 219–243. <https://doi.org/10.1002/hrdq.21341>

Telatnik, M. (2020): How To Get Started with Social Network Analysis. A Complete Beginner's Guide to Getting Up and Running Making Beautiful Network Graphs <https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374>"

Additional Readings:

Scott, J. (2017): Social Network Analysis. 4th ed., Sage, Los Angeles, London

Day 2: Data Analytics as a Tool for Social Network Analysis

Preparatory Readings:

Fayyad, U., Piatetsky-Shapiro, G., Smyth, P. (1996): From Data Mining to Knowledge Discovery in Databases. AI Magazine Fall 1996, 37-54

Additional Readings:

Baesens, B. (2014): Analytics in a Big Data World: The Essential Guide to Data Science and its Applications. John Wiley & Sons, Inc.

Verbeke, W., Baesens, B., Bravo, C. (2017): Profit-Driven Business Analytics. John Wiley & Sons, Inc.

Day 3: Basic concepts of Social Network Analysis

Preparatory Reading:

Nettleton, D. F.(2013): Data mining of social networks represented as graphs. Computer Science Review 7,1-34

Atzmueller, M., Günnemann, S., Zimmermann, A. (2021): Mining communities and their descriptions on attributed graphs: a survey. *Data Mining and Knowledge Discovery* 35: 661–687

Rostami, M. Oussalah, M., Berahmand, K. Farrahi, V. (2023): Community Detection Algorithms in Healthcare Applications: A Systematic Review, *IEEE Access* 11, 30247-30272, doi: 10.1109/ACCESS.2023.3260652.

Additional Readings:

Tabassum, S., Pereira, F. S. F., Fernandes, S., Gama, J. (2018): *Social Network Analysis : An Overview*.

Slijepčevića, D., Henzl, M., Klausner, L. D., Dam, T., Kieseberg, P., Zeppelzauer, M. (2021): k-Anonymity in practice: How generalisation and suppression affect machine learning classifiers. *Computers & Security* 111, <https://doi.org/10.1016/j.cose.2021.102488>

Day 4: Applications of Social Network Analysis

Preparatory Reading:

Bonchi, F., Castillo, C., Gionis, A., Jaimes, Al. (2011): *Social Network Analysis and Mining for Business Applications*. *ACM Transactions on Intelligent Systems and Technology*, Vol. 2, No. 3, 22.1 – 22.36

Additional Readings:

Surian, D. et al. (2016): Characterizing Twitter Discussions About HPV Vaccines Using Topic Modeling and Community Detection. *Journal of Medical Internet Research* 18(8), DOI: 10.2196/jmir.6045

Rahimi, M. M., Naghizade, E., Stevenson, M., Winter, S. (2020): Service quality monitoring in confined spaces through mining Twitter data. *Journal of Spatial Information Science* 21, 229–261

Troncoso, F., Weber, R. (2020): Integrating relations and criminal background to identifying key individuals in crime networks. *Decision Support Systems* 139.

<https://doi.org/10.1016/j.dss.2020.113405>.

Day 5: Integration into decision-making processes and evaluation

Preparatory Reading:

Ray M. Chang, Robert J. Kauffman, Young Ok Kwon (2014): Understanding the paradigm shift to computational social science in the presence of big data. *Decision Support Systems* 63, 67–80.

Additional Readings:

Fernandes, E., Moro, S., Cortez, P., Batista, F., Ribeiro, R. (2021): A data-driven approach to measure restaurant performance by combining online reviews with historical sales data. *International Journal of Hospitality Management* 94,

<https://doi.org/10.1016/j.ijhm.2020.102830>.

Rodríguez-Ibáñez, M., Casánez-Ventura, A., Castejón-Mateos, F., Cuenca-Jiménez, P.-M. (2023): A review on sentiment analysis from social media platforms. *Expert Systems with Applications* 223.

<https://doi.org/10.1016/j.eswa.2023.119862>.

CONTACT DETAILS

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