SEMINAR: Advanced statistical analysis

AUTHOR: Dr hab. Piotr Radkiewicz, prof. PAN
e-mail: Piotr.Radkiewicz@psych.pan.pl

SEMESTER: Spring 2022

HOURS: 30

FREQUENCY: Tuesdays, 9 meetings (5 x 4 hours, 3 x 3 hours and 1 x 1 hour). Except for the penultimate meeting, classes will be held every two weeks

THE COURSE CORRESPONDS TO TOPICS:

Basic statistics, data analysis, experimental and correlational research methodology, psychometry

CREDIT REQUIREMENTS:

- Attendance and active participation during the course
- Doing homework (practical analytical tasks using empirical data and a statistical package)
- Final test based on reading and material from the classes

COURSE AIMS AND CONTENT:

The aim of the course is to familiarize students with the most important and most frequently used methods of multivariate analyzes in psychological/sociological research. Particular methods will be discussed in terms of the basic criteria of their selection, including the division into experimental and correlational research, exploratory vs. confirmatory data analysis strategy, type of independent and dependent variables measurement, division into observable and latent variables, number of dependent variables. The classes will be of a seminar and exercise character. They will consist of two parts: (1) an introduction showing the principles of building a specific statistical model and (2) the model's demonstration in practice.

EDUCATIONAL OUTCOMES:

- acquiring knowledge about the methods of multivariate statistical analysis used in psychology/sociology
- ability to compare the most popular methods of data analysis
- ability to choose an analytical method adequate to the research problem
- performing selected analyzes in practice
- interpretation of results

During the classes, it will be possible to independently perform tasks shown by the teacher, similar to those that will be performed in the homework. It is a good idea to have a laptop with you, with SPSS Statistics and SPSS Amos installed.

THE CLASSES AND READINGS:

1. Analysis of Variance I: One-way and factorial Analysis of Variance (ANOVA) 01 March 12:00-15:15

Readings:

- George Ferguson, Yoshio Takane (1989). *Statistical analysis in psychology and education* (chapters: 15, 16)

2. Analysis of Variance II: Repeated Measures ANOVA, Multivariate Analysis of Variance (MANOVA) and Analysis of Covariance (ANCOVA) 15 March 12:00-15:15

Readings:

- George Ferguson, Yoshio Takane (1989). *op. cit.* (chapters: 19, 20)
- Jacques Tacq (1997). *Multivariate analysis techniques in social science research: From problem to analysis* (chapter 11.1)

3. Multivariate Regression Analysis I: Linear regression model 29 March 12:00-15:15

Readings:

- Jacob Cohen, Patricia Cohen, Stephen West, Leona Aiken (2003). *Applied multiple regression/correlation for the behavioral sciences* (chapters: 2, 3, 5)

4. Multivariate Regression Analysis II: Nonlinear and linearized relationships, dummy coding, testing moderation and mediation effects 12 April 12:00-15:15

Readings:

- Jacob Cohen, Patricia Cohen, Stephen West, Leona Aiken (2003). *op. cit.*(chapters: 6, 7, 8)
- Andrew Hayes, Nicholas Rockwood (2020). Conditional process analysis: Concepts, computation, and advances in modeling of the contingencies of mechanisms. *American Behavioral Scientist, 64,* 19-54.

5. Structural Equation Modeling (SEM) 26 April 12:00-15:15

Readings:

- Jacob Cohen, Patricia Cohen, Stephen West, Leona Aiken (2003). *op. cit.* (chapter 12)
- Piotr Tarka (2018). An overview of structural equation modeling: its beginnings, historical development, usefulness and controversies in the social sciences. *Quality & Quantity, 52,* 313-354

6. Generalized linear model: Logistic, Probit and Poisson regression 10 May 12:00-14:30

Readings:

- Jacob Cohen, Patricia Cohen, Stephen West, Leona Aiken (2003), *op. cit.* (chapter 13)

7. Hierarchical Linear Modeling (HLM) 24 May 12:00-14:30

Readings:

- Jacob Cohen, Patricia Cohen, Stephen West, Leona Aiken (2003), *op. cit.* (chapter 14)

8. Selected exploratory methods: Factor Analysis, Cluster Analysis and Multidimensional Scaling	31 May 12:00-14:30

Readings:

- George Ferguson, Yoshio Takane (1989). *op. cit.* (chapter 28 - *Factor analysis*)
- Pang-Ning Tan**,** Michael Steinbach**,** Anuj Karpatne**,** Vipin Kumar (2005). *Introduction to data mining* (chapter 8 - *Cluster analysis: Basic concepts and algorithms*)
- Joseph B. Kruskal, Myron Wish (1978). *Multidimensional Scaling* (pp. 7 -72)

9. Final test	07 June 12:00-12:45

Readings:

- Jacques Tacq (1997). *op. cit.* (chapter 3 - *The analysis technique as the mirror of the research problem*)