## Course handbook

Advanced statistical methods, 6 hp

769A26



VT 2023 (v. 13 – v. 22)

**Course leader:** Erik Marsja & Emil Holmer

**Examiner:** Erik Marsja

**Administrator:** Carl Löfstrand

 **Revised:** 03/07-23

# INTENDED LEARNING OUTCOMES

On completion of the course, the student should be able to

- choose, motivate, and critically evaluate statistical analysis methods in relation to research questions

- perform multivariate analysis of variance, regression analysis, and factor analysis

- apply statistical analysis methods so that they are reproducible

# COURSE CONTENT

The following is studied in the course

- choice of analysis methods

- analysis of variance

- regression analysis

- factor analysis

- interaction effects

- reproducibility of analysis

- open data

- presentation of results in journals

# EXAMINATION

The course is examined through two written assignments, the first corresponding to 2 credits (U, G), and the second 4 credits (U, G, VG). To pass the course, you must pass both written assignments. To get VG on the course, you need to pass the first assignment and get VG on the second assignment.

# GRADES

Three-grade scale, U, G, VG.

# TEACHING AND WORKING METHODS

The course will take place on Campus. Teaching will take the form of lectures, workshops, and supervision of assignments. Students are expected to work independently.

NOTE: 6 HP = 160 hours of work

Timetabled = 18 hours

Independent study = 142 hours

## **Lectures, Workshops, and Supervision**

During the course, five lectures, two workshops, and two occasions for supervision will be held. The workshops will involve demonstrations and examples, but mainly individual work in a structured way (i.e., answering pre-made questions using statistical software). Attending lectures, workshops, and supervision occasions will help you with the written assignments, but it is optional.

**Schedule**:

Lecture 1, March 29 – Course introduction & Statistics refresher (Emil Holmer, Erik Marsja)

Lecture 2, Match 31 – Reproducibility and Open science (Lucija Batinovic)

Lecture 3, April 5 – Analysis of Variance: ANOVA (Cristina Tobías)

Lecture 4, April 12 – Regression (Erik Marsja)

Workshop 1, April 14 – ANOVA and regression (Emil Holmer)

Deadline 1, April 17, 17:00 – Assignment 1

Lecture 5, April 19 – Factor analysis (Erik Marsja)

Workshop 2, April 21 – Factor analysis (Erik Marsja)

Supervision 1, May 3 – Assignment 2 (Erik Marsja)

Supervision 2, May 17 – Assignment 2 (Erik Marsja)

Deadline 2a, May 24, 17:00 – Assignment 2

Deadline 2b, June 2 – Assignment 2, revision (if applicable)

## Written report 1 (2 hp)

The first written report will take the form of an analysis of your choice (e.g., multiple regression, factorial ANOVA), which must be presented adequately and fully reproducible. This means that you will not only perform and, in written form, describe the analysis and your results but also extract the syntax of your analysis and hand it in as a supplement to your written report. Research question and data set are provided by the course. For a detailed description of the assignment, see the separate document on Lisam.

## Written report 2 (4 hp)

The first written report will take the form of an analysis of your choice (e.g., multiple regression, factorial ANOVA), which must be presented adequately and fully reproducible. This means that you will not only perform and, in written form, describe the analysis and your results but also extract the syntax of your analysis and hand it in as a supplement to your written report. Research question and data set are provided by the course. For a detailed assignment description, see the separate document on Lisam.

# PLAGIARISM

### Plagiarism is not allowed. See the following website for details of LiUs policy on plagiarism (including definitions), and for links to other useful resources: https://liu.se/en/article/plagiering-upphovsratt

Written assignments will be analysed for possible plagiarism using the web-based service ’Urkund’.

# COURSE EVALUATION

The course will be evaluated via an EvaLiUate form, which will be sent out at the end of the course. Your opinions are important, so please remember to fill it in! If you have any questions or suggested improvements during the course, please contact Erik.

# PRACTICAL INFORMATION

Course leader: Erik Marsja, erik.marsja@liu.se

Emil Holmer, emil.holmer@liu.se

Examiner: Erik Marsja

Course administrator: Carl Löfstrand, carl.lofstrand@liu.se,

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Program administrator: Anna Grabska Eklund, anna.grabska.eklund@liu.se,

tel: 013-282362

# LITERATURE

Examples of useful literature, not obligatory. See Lisam for additional resources.

Borg, E., & Westerlund, J. (2021). *Statistik för beteendevetare: faktabok* (fjärde uppl.). Stockholm: Liber. ISBN: 9789147129409 **(repetition of the very basics)**

Field, A. (2017). *Discovering statistics using IBM SPSS statistics* (5th ed.). London: Sage. ISBN: 9781526419521, 9781526419514, 9781526422989

Navarro, D. J., & Foxcroft, D. R. (2022). *Learning statistics with jamovi: a tutorial for psychology students and other beginners* (Version 0.75). DOI: 10.24384/hgc3-7p15 [Available from url: <http://learnstatswithjamovi.com>]

Navarro, D. J. (2019). *Learning statistics with r: a tutorial for psychology students and other beginners* (Version 0.6.1). [Available from url: <http://learnstatswithr.com>] **(does not include factor analysis)**

Navarro, D. J., Foxcroft, D., & Faulkenberry, T. J. (2019). *Learning Statistics with JASP: A Tutorial for Psychology Students and Other Beginners (version 1/*$\sqrt{2}$*)*. [Available from url: <http://learnstatswithjasp.com>] **(does not include factor analysis)**

Nosek, B. A., Hardwicke, T. E., Moshontz, H., Allard, A., Corker, K. S., Dreber, A., Fidler, F., Hilgard, J., Kline Struhl, M., Nuijten, M. grave le B., Rohrer, J. M., Romero, F., Scheel, A. M., Scherer, L. D., Schönbrodt, F. D., & Vazire, S. (2022). Replicability, Robustness, and Reproducibility in Psychological Science. *Annual Review of Psychology*, *73*, 719–748. https://doi.org/10.1146/annurev-psych-020821-114157

Zhang, Z. & Wang, L. (2017-2022). *Advanced statistics using R.* [https://advstats.psychstat.org]. Granger, IN: ISDSA Press. ISBN: 978-1-946728-01-2. **(Available as a pdf on the linked page)**