

Computergestützte Statistik

WS 2021/2022

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Syllabus:

The goal of this course is to introduce

1. basic methods from Statistics/Econometrics
2. how to implement these methods in the language R
3. how to simulate from relevant data generating processes
4. how to interpret empirical results
5. also introduce some methods from machine learning/

This is a very applied course, where we want to emphasize how to *implement* a particular method and how to *interpret* the results.

To this end, the course will be divided into three blocks

1. Introduction to R
 - (a)
2. Basic Concepts Econometrics
 - (a) Linear Model (review and implementation)
 - (b) Bias/Variance tradeoff
 - (c) Nonparametric density estimation
 - (d) Nonparametric regression
 - (e) Maximum likelihood estimation
3. Machine learning/regularization
 - (a)
 - (b) Regularization: ridge regression, lasso
 - (c)

I will interweave applications from social science, as well as common pitfalls when implementing these methods and particular problems that occur in social science applications.

Literature and languages:

1. Programming: we will use R for all implementations. Please download any distribution of R for your machine <https://cran.r-project.org> and you may also download any other editor than the build-in one, I prefer <https://rstudio.com/products/rstudio/>.
2. The main reference will be my own script, I will publish an up-to-date version every week with the relevant chapters. I will add some more reading material

Format:

- The lectures will be held live at the times specified in BASIS on Tuesday and Wednesday.
- All materials will be available online on the GitHub repo <https://github.com/LJanys/CompStat>, (hopefully very soon after the lectures). I will also upload all other materials on this repo.
- If you cannot be present during the lecture, please contact me and we will find an arrangement.
- Wednesdays are reserved for implementation and presentation of problem sets. Once we finish the R introduction/ revision of some econometric concepts, I would like for everyone to present their results of the problem set by sharing their screen and discussing the results in class, so please expect to do that at some point and to participate actively in class, even if you are not presenting. This means (1) be prepared (2) think of one or two questions you would like to ask the presenters and/or that you had while working on the problem set. Be prepared to be called to ask those questions at the end of the presentation.

Feedback: Since there are many unknowns about the format of the lecture and how everything will work, I wanted to provide an environment where you can leave quick, anonymous and helpful feedback for the running of the course: [Survey](#). This is not a replacement for the typical course evaluations, but since I will not get them until the beginning of the next semester, any useful info about the content and format will be too late for you to benefit from.

Grade: Instead of an exam there will be a project/Hausarbeit, for which you will need to pick a topic in a couple of weeks, once you have decided that you want to stay in the course. You need to register for the course with the Prfungsamt until **May 4th**. You will also be asked to present (parts) of a problem set, possibly in groups. Once everyone has registered for the course, you will be assigned a problem set to present (possibly in groups). 10% of your grade will consist of that presentation. The problem sets will involve implementation of different methods in R and interpretation of the results.

Project: The deadline for the individual project will be August 15th, as the deadline has to be least 4 and at most 6 weeks after the topics were approved/assigned (this is stipulated by the examination office). This would mean that the topics will be finally chosen in the beginning of July, where we will do a “mini-workshop”, where everyone introduces their topic and we can discuss some issues that might arise. The project will involve a simulation study with a realistic empirical set-up, and (ideally) an empirical application of one of the methods discussed in class in a social science setting.

References