

## Syllabus for Topics in Econometrics and Statistics

**Course URL:** [https://ecampus.uni-bonn.de/goto.php?target=crs\\_1643684](https://ecampus.uni-bonn.de/goto.php?target=crs_1643684)

**Instructor:** Joachim Freyberger, Institute for Finance and Statistics, [freyberger@uni-bonn.de](mailto:freyberger@uni-bonn.de).

**Lectures:** Tuesdays from 2:00 pm – 4:00 p.m. in room 0.042.

**Office Hours:** Please feel free to ask questions during the lectures or after class. I will also generally be available Mondays from 2:00 - 3:00 p.m. in my office (room 2.004). Please email in advance if you plan to stop by. You can also email me to set up appointments outside of this time.

**Course Description:** The course covers topics in nonparametric statistics, model selection and regularization, and machine learning, including:

- Kernel density estimation
- Kernel and series regression
- Tuning parameter selection
- Subset selection
- Shrinkage methods
- Regression trees and random forests
- Neural networks
- Applications in economics and finance

The course is designed for students with theoretical or applied interests and it covers technical results, tools that are useful for applied work, and recent developments in the field.

**Prerequisites:** The class requires a rigorous background in probability theory, statistics, and the linear regression model at a level that is similar to the material taught in the first semester of the first year of the PhD sequence.

**Readings:** Class notes will be distributed for the first part of the class. Useful references for the remaining parts are:

- [An Introduction to Statistical Learning with Applications in R](#). by James, Witten, Hastie, and Tibshirani.
- [The Elements of Statistical Learning: Data Mining, Inference, and Prediction](#) by Hastie, Tibshirani, and Friedman.

Both books can be downloaded free of charge. We will also discuss recent research papers.

**Evaluation:** Students will be required to present parts of the class material in the second half of the semester. They can choose between theoretical topics (either a chapter from the book on one of machine learning topics or a recent paper) and empirical applications. Students will also be required to complete a project, where the main focus will be on implementing some of the methods discussed in class.