

Master-Module Microeconometrics and machine learning (5 ECTS)

for Master Arbeitsmarkt und Personal: Wahlpflichtbereich (2. FS)

for Master Economics: Elective compulsory subject

for Master in Management: Vertiefungsbereich

for Master Marketing: Wahlpflichtbereich der Modulgruppe „Statistik“

for Master Sozialökon.: Pflichtbereich „Vertiefung Methoden“ or „freier Vertiefungsbereich“

Lecture: Tue. 8:00-9:30 (LG 0.225) Riphahn. Start: 14.04.2026

Exercise: Tue. 16:45-18:15 (LG 5.155) Sauer. The classes of 05.05. and 12.05. take place in the PC Lab (LG 0.422). Start: 28.04.2026

Office hours: Riphahn: after class and by appointment

Sauer: after class and by appointment.

The course covers empirical methods from micro-econometrics and machine learning. Many econometric analyses rely on non-continuous dependent variables, i.e., variables that may be discrete or categorical. In these cases, OLS is often inappropriate. Instead, maximum likelihood procedures are used for cross-sectional and panel data settings. Recently, machine learning methods have been added to the econometric toolkit. The course introduces the most important ones. The lecture builds on introductory econometrics courses. It presents empirical methods and focuses on example-based applications. Students learn to critically assess the validity of empirical studies and to apply econometric methods independently. The exercise class reviews the material and shows how to apply these methods using Stata.

Content

A. Microeconometrics

- 1 Introduction and Maximum Likelihood estimation
- 2 Binary dependent variables
- 3 Multinomial and ordered dependent variables
- 4 Tobit and selection models
- 5 Duration and count data models

B. Machine Learning

- 1 Introduction and key concepts
- 2 Cross-validation
- 3 Linear methods for (regularized) regression
- 4 Linear methods for classification problems
- 5 Regression trees and forests
- 6 Neural networks and deep learning
- 7 Using machine learning to identify causal effects

Exams and credits

The course is completed by passing an exam (60 minutes). It is possible to hand in a voluntary empirical homework prepared in groups of up to two students. The grade of the homework counts for up to 20 percent of the grade only in the current summer semester if the exam is passed. Homework registration via StudOn is open until 30.04.2026. Topics are handed out starting 04.05.2026. The homework is due 17.07.2026 at noon.

Literature and readings

The lecture slides are available on StudOn. A course pack with reading materials is provided online. Recommended texts:

- Greene, William H., 2020, *Econometric Analysis*, 8. ed., Pearson
- Hansen, Bruce E., 2022, *Econometrics*, Princeton University Press, Princeton
- Wooldridge, Jeffrey M., 2010, *Econometric Analysis of Cross Section and Panel Data*, second edition, MIT Press, Cambridge/Mass., London
- Cameron, C.A. and P.K. Trivedi, 2005, *Microeconometrics. Methods and Applications*, Cambridge University Press
- Cameron, C.A. and P.K. Trivedi, 2022, *Microeconometrics Using Stata*, 2. ed. Stata Press
- Athey, S. und G. Imbens, 2019, *Machine Learning Methods Economists Should Know About*, *mimeo*, <https://arxiv.org/abs/1903.10075>