Prof. Regina T. Riphahn, Ph.D.
Dr. Selina Gangl

Summer 2025

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) Gangl. Start: 29.04.2025
Exercise:	Tue. 13:15 -14:45 (LG 5.152) or 16:45-18:15 (LG 5.155) Gangl, the classes of 13.05. and 20.05. take place in the PC Lab (LG 0.422). Start: 06.05.2025
Office hours:	Wed. 11:00–12:00 (Gangl) 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. The lecture builds on the content presented in introductory econometrics. In addition, the module introduces machine learning methods which are increasingly used in economic research. The lecture 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 STATA is applied.

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 and if the exam is passed. Homework registration via StudOn is open until 11.05.2025. Topics are handed out starting 12.05.2025. The homework is due 25.07.2025 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