Econometrics IV: Machine Learning (only PhD)

Course instructor:
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Office hours: by arrangement

Timetable: September 18-22, 2023 (10am to 4pm, room 2544)

Prerequisites: Ideally, Econometrics I and II (TUM) or equivalently solid introductory courses in econometrics. Preferably some basic knowledge of R and Python. Participants should bring their own laptop with R and/or Python installed. The target audience are PhD students.

Grading: Successful participation (3 ECTS); details below

Registration: Until September 11, 2023, via email.

Course description:
The course is part of a series of econometrics courses at TUM School of Management that also comprises “Econometrics I: Research Design and Estimation Methods” by Prof. Dr. Hanna Hottenrott, “Econometrics II: Causal Inference” by Prof. Dr. Joachim Henkel and “Econometrics III: Advanced Econometrics” by me. Econometrics IV will be a block lecture but conceptualized as a seminar based on student presentations. The course covers a selection of state-of-the-art methods in econometrics and machine learning. It aims to provide students with a sound understanding of the methods discussed, such that they are able to do research using modern econometric techniques, as well as critically assess existing studies.

In particular, the course will likely cover the following topics:

- Regression Shrinkage Methods (Ridge, Lasso, Elastic Net)
- Decision Trees, Random/Causal Forests
- Advanced Identification Strategies (e.g., Double Machine Learning)
- Introduction to Neural Networks

In the morning, we will briefly discuss the econometric methods (including some applications to illustrate them). Students will then apply these methods and will replicate recent research papers in economics. I will also assign a (replication) project to each student. You can also come up with an own application and/or dataset you are interested in.

Recommended textbooks:

- Goodfellow Ian, Bengio Yoshua and Courville Aaron. Deep Learning, MIT Press, available here
- Bishop Christopher. Pattern Recognition and Machine Learning, Springer, available here
- Hansen Bruce. Econometrics, available here
- Hastie Trevor, Tibshirani Robert and Friedman Jerome. The Elements of Statistical Learning, Springer, available here
- James Gareth, Witten Daniela, Hastie Trevor and Tibshirani Robert. An Introduction to Statistical Learning with Applications in R, Springer, available here
Papers you definitely should read:


Papers you could read if you have plenty of time: