

Methods and Applications of Machine Learning

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Objects of this course

The impact of machine learning literature in the field of economics:

- Learn more about how machine learning can be used to measure the effects of interventions
- Understand the heterogeneous impact of interventions
- Design targeted treatment assignment policies

Contents of this course

- ➊ An introduction to the topics of supervised machine learning from the perspective of an economist: contrasting traditional econometrics with off-the-shelf machine learning
- ➋ Causal inference in economics: theoretical framework and empirical approaches
- ➌ An introduction to estimation of average treatment effects, with a focus on how machine learning methods can improve upon traditional methods for estimation
- ➍ General principles for the design of robust, machine learning-based algorithms for treatment effects estimation

Resources

Slides and other material provided in class

Books:

- Gareth J. et al An Introduction to Statistical Learning, Springer
- Hastie T. et al The Elements of Statistical Learning, Springer
- Angrist J.D. and Pischke J.S. Mostly Harmless Econometrics: An Empiricists's Companion

Articles:

- Athey, S., (2019), The Impact of Machine Learning on Economics, National Bureau of Economic Research
- Mullainathan S. and Spiess J. (2017), Machine Learning: An Applied Econometric Approach
- Susan Athey S., and Wager S. (2019) *Recursive partitioning for heterogeneous causal effects*
- Chernozhukov V., Hansen C. etl al. (2018), *Double/debiased machine learning for treatment and structural parameters*, The Econometrics Journal, 21

Structure of the course

Structure of the course:

- Theoretical lessons
- Computer sessions

For computer sessions we will use R Studio

Assessment

For **those who attend classes**: a written project + short presentation (10 + 1 points)

For **those who do not attend classes**: two questions (10 + 1 points), either:

- One/two theoretical questions, or
- One theoretical question and one question on interpretation of results