

Advanced Statistical Learning

Chapter 0: Introduction and Overview

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Department of Statistics – TU Dortmund

Summer term 2023



ORGANISATION

Suitable modules: MS 6/7; MD1; ME 7

Lecture

- Thursday, 4-5 pm, Q&A session planned in physical presence; first meeting on April 6 in lecture room EF 50 HS 3

Prof. Dr. Andreas Groll (groll@statistik.tu-dortmund.de)

ORGANISATION

Exercises

- TBA
- TBA
- TBA

General organization: Dr. Daniel Horn
(dhorn@statistik.tu-dortmund.de)

ORGANISATION

Website

<https://moodle.tu-dortmund.de/course/view.php?id=39078>

Enrollment key: ASL23SoSe

Exams

- 1st date: July 13, 2023, 16:00-18:00 pm, EF 50 / HS 3
- 2nd date: September 15, 2023, 8:00-10:00 am, SRG 1 HS 1

GOALS

- learn to understand advanced models and estimation methods; be aware of their limitations
- become able to adapt methods to unusually structured data
- learn to choose appropriate methods for real data and apply them by means of statistical software
- understand the underlying mathematical theory

Partly builds upon the BA course “Introduction to Statistical Learning”.

⇒ For a short recap consult the pre-course eLearning slides with videos by Alexander Gerharz:

<https://moodle.tu-dortmund.de/course/view.php?id=16736>

(Password: vlds)

(PRELIMINARY PLANNED) CONTENT

- 1 Introduction and Formalization
- 2 Classification Tasks
- 3 Hypothesis Spaces and Capacity
- 4 Risk Minimization
- 5 Univariate and Linear Modeling
- 6 Information Theory
- 7 (Multiclass Classification)
- 8 Curse of Dimensionality
- 9 Boosting
- 10 Advanced Performance Evaluation (???)

LITERATURE

References

- Hastie, T., R. Tibshirani, and J. Friedman. "The elements of statistical learning: prediction, inference and data mining." Springer-Verlag, New York (2009).
- James, G., Witten, D., Hastie, T., and Tibshirani, R. (2013). "An introduction to statistical learning". New York: Springer.
- Alpaydin, E. (2009). "Introduction to machine learning." MIT press.
- Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.
- Shalev-Shwartz, S., and Ben-David, S. (2014). "Understanding machine learning: From theory to algorithms." Cambridge university press.
- Robert, C. (2014). "Machine learning: A probabilistic perspective." MIT press.