M.Sc. Course
Data Science & Machine Learning (Data Science & Machine Learning)
Course number 22 700 (Tutorial 22 701)

Examiner Prof. Dr. Daniel Rösch

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Course Objectives The opportunities of data science & machine learning are presented to the Master students in a practical and theoretical way by using modern methods and techniques. After a repetition of basic statistical concepts, the course introduces the theory and application of important algorithms and concepts.

The theoretical content of the course is based on regression techniques. Generalized linear models, the most relevant variants of neural networks, natural language processing, and explainable artificial intelligence (XAI) build the course pillars. A special focus is on the application of the discussed methods to practical problems. In addition to a detailed discussion of case studies, this is also provided by software-based data analysis in the context of computer labs. The presented decision-making, forecasting as well as scenario techniques provide students a detailed insight into a wide range of applications of multivariate statistical methods.

In short, the topics covered in the course include:

- Linear Models
- Generalized Linear Models
- Feed-Forward Neural Networks
- Recurrent Neural Networks
- Convolutional Neural Networks
- Explainable Artificial Intelligence (XAI)

Primary Learning Outcomes The students know and understand advanced methods and techniques of data science and machine learning. A special focus is set on the application of the discussed methods to practical problems. In addition to a detailed discussion of case studies, this is also provided by software-based data analysis.

The presented decision-making, forecasting as well as scenario techniques provide students a detailed insight into a wide range of applications of data science & machine learning. The tutorial demonstrates the opportunities of the presented methods through examples and case studies so that the students acquire the skills to analyze practical problems independently.

Prerequisites Statistics 1 (obligatory)
Statistics 2 (obligatory)

Applicability of the MSc Module WiWi – MSc – Empirische Wirtschaftsforschung – Empirical Economics

Frequency	Winter term
Recommended Semester	First MSc semester
Examination	Written exam, 90 minutes (100% of final grade)
Workload	Overall: 180h (6 ECTS * 30h) Hours of presence: 60h Selfstudy: 120h
Credit Points	6 ECTS
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