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UNIVERSITÄT LEIPZIG

Big Data and Smart Cities

Master of Science in Management, Elective Course
Module Number 07-201-2101

Content of the Module

Data is everywhere - and the amount available is growing by the second. At the same time, our world is becoming more urbanized. More than half of the world's population is now living in cities, and urban development has to be managed in a sustainable way.
In this course, students will learn how to gather, process and analyze (big) data. They will get know statistical methods to draw insights from (big) data, discover patterns and relationships, and make predictions for urban life. In a nutshell, the question to be answered is: How we use (big) data in a responsible way to make cities more efficient and sustainable?

Goals of the Module

Students are able to reflect on the importance of data science to manage cities more efficiently and sustainably. They can independently analyze large amounts of data, from domains such as housing, transportation or pollution. They know methods of statistical data analysis and machine learning and can apply them to practical case studies, interpreting and questioning the results. They are able to present their findings in English and defend them argumentatively.

Module Format

Lecture "Big Data and Smart Cities" (2 SWS) = 30 hours of class attendance und 105 hours of independent study = 135 hours
Seminar with practical part "Big Data and Smart Cities" (4 SWS) = 60 hours of class attendance und 105 hours of independent study = 165 hours
Time and date: Monday 13:15-14:45, 15:15-16:45 Lecture Hall Seminarraum 12,
Tuesday 11:15-12:45, Lecture Hall Seminarraum 12

Grade

Students work together in groups to conduct their own urban data analysis project, applying machine learning methods, discussing and reflecting upon their results. The grade for the module is made up of a 30-minute presentation (30%) and a 12-page written paper (70%).
The **presentations** take place between 29 June and 7 July.
Deadline for submitting the 12-page **seminar paper** of each group as a PDF by email to melanie.krause@uni-leipzig.de: **12 July 2026** (23:59)

Literature

No text book covers the material of the whole module. There are various textbooks on urban analytics and statistical learning which will be made reference to in the individual units.

Module Overview

- Getting Started: Course Overview and Very First Steps in Python
- Describing and Visualizing Data in Python
- Statistical Data Analysis and Exercises
- Moving on to Machine Learning: Regularization Methods and K-Nearest Neighbors
- Tree-Based Machine Learning Methods: Decision Trees, Random Forests, Gradient Boosted Machines
- Data Pre-Processing and Neural Networks
- Data Sampling and Interpretation of Results
- Case Studies of Predictive Analysis with ML
- A Glimpse at State of the Art ML Applications, such as Image Recognition
- Various Support Sessions
- Student Presentations in the last two semester weeks

This version is of 6 March 2026