

# *Course Description*

In the winter term 2021/2022 I am teaching the course (in English or German)

## *High-Dimensional Statistics*

### Lecture:

Tuesday, 13:15-15:00, Room 1.012, RUD25 (*First lecture: 19.10.*)

### Exercise:

Tuesday, 15:00-16:00, Room 1.012, RUD25

### A brief description:

The goal of this course is to provide a rigorous introduction to concepts and methods of high-dimensional statistics having numerous applications in data science, machine learning and signal processing.

### Topics:

- Compressed sensing and sparse recovery
- Low-rank matrix completion
- High-dimensional covariance estimation, (sparse) PCA
- Foundations of statistical learning theory: Glivenko-Cantelli classes, VC-dimension, metric entropy, classification and regression problems
- Minimax lower bounds
- Spiked covariance model, Marcenko-Pastur theorem
- Implicit regularization, Benign overfitting

### Prerequisites:

Stochastik I (and II), Lineare Algebra, Analysis;  
helpful but not necessary: Methoden der Statistik or Mathematische Statistik

### Literature:

[High-Dimensional Statistics](#) by Martin J. Wainwright

[High-Dimensional Probability](#) by Roman Vershynin

[Introduction to High-Dimensional Statistics](#) by Christophe Giraud

Lecture notes on [High Dimensional Statistics](#) by Philippe Rigollet and Jan-Christian Hütter