

Syllabus
BAE4066 Data Science
Prof. Dr. Raphael Volz
Wintersemester 2024/25

Level	Bachelor	
Credits	3	
Student Contact Hours	2	
Workload	90 hours	
Prerequisites	You should have good command over the English language. Basic mathematical knowledge (at a high school level). You should be familiar with concepts like mean, standard deviation, and scatterplots.	
Time	s. LSF	
Room	s. LSF	
Start Date	s. LSF	
Lecturer(s)	Name	Prof. Dr. Raphael Volz
	Office	T2.3.15
	Virtual Office	Virtuelles Büro Prof. Volz
	Office Hours	Thursday, 15:30-17:00
	Phone	07231 28-6692
	Email	raphael.volz@hs-pforzheim.de

Summary

Through inspiring examples and stories, discover the power of data and use analytics to provide an edge to your career and your life.

In the last decade, the amount of data available to organizations has reached unprecedented levels. Data is transforming business, social interactions, and the future of our society. In this course, you will learn how to use data and analytics to give an edge to your career and your life. We will examine real world examples of how analytics have been used to significantly improve a business or industry. These examples include Moneyball, eHarmony, the Framingham Heart Study, Twitter, IBM Watson, and Netflix.

Through these examples and many more, we will teach you to apply following analytics methods: linear regression, logistic regression, trees, text analytics, clustering, visualization, and optimization.

We will be using the Python and Google Colab to build models and work with data. It is a challenging class, but it will enable you to apply analytics to real-world applications.

Outline of the Course

In this course, various topics related to data science, data visualization and machine learning are presented and elaborated. In terms of content, the event focuses on the organization and intelligent processing of large amounts of data. Various methods and technologies for data processing, analysis and visualization are discussed and demonstrated.

All topics are presented and motivated by the lecturer. Subsequently, content is further processed in individual and group work and further developed in joint discussions. Students learn to do research against this background and to apply their knowledge in practice. The lecturer acts as a coach. There will be demonstrations of all topics. Students will also submit a written paper (in the sense of a conference paper). Before the final submission, a review will be carried out by fellow students.

Course Intended Learning Outcomes and their Contribution to Program Intended Learning Outcomes / Program Goals

Program Intended Learning Outcomes	Course Intended Learning Outcomes
After completion of the program the students will be able...	After completion of the course the students will be able...
1 Expert Knowledge	
1.5 ...to demonstrate their solid key knowledge in Mathematics.	...use statistic methods.
1.6 ...to solve business problems based on profound data research skills and by applying quantitative methods.	...to apply algorithms Data Science, especially Neural Networks and OR-Algorithm (Simplex-Algorithm and Integer Optimization)
1.7 ...to demonstrate their solid key knowledge in Computer Science.	...to use Data Science (Software-Pakete R und H2O)
2 Digital Skills	
2.1 ...to know and understand relevant IT software tools used in business and their features and have a solid understanding of digital technologies.	... to do Statistical analysis of data with suitable software tools (e.g. Software R, Microsoft Excel/OpenOffice Calc)
3 Critical Thinking and Analytical Competence	
3.1 ...to implement adequate methods in a competent manner and to apply them to complex problems.	...to do data analyses as Strategy technic
3.2 ...to critically reflect and interpret findings and to develop comprehensive solutions for complex problems.	...to do an analyse of data from different topics.
4 Ethical Awareness	
5 Communication and Collaboration Skills	
6 Internationalization	

Teaching and Learning Approach

This lecture is accompanied by exercises (practical cases and a group project) that enable students to use and develop machine learning models. In addition to the lectures and exercises (approximately 30 hours in attendance), students are expected to spend time in self-study, approximately: about 15 hours of exam preparation, 30 hours of project work, pre- and post-processing of the lectures (including literature studies) and finally 15 hours presentation of the problem solving.

Literature and Course Materials

Literature and course contents can be found at:

<https://lms.hs-pforzheim.de/course/view.php?id=3252>

Assessment

Project and exam (60 min) at end of the course.

'Sehr gut' represents exceptional work, far above average. 'Gut' represents good work, above average. 'Befriedigend' represents average work. 'Ausreichend' represents below average work with considerable shortcomings. And 'mangelhaft' is just exceptional work in the wrong direction or with unacceptable shortcomings.

Schedule

Schedule and course update on eLearning (LMS)

Academic Integrity and Student Responsibility

In general, I expect that you will be using code, examples, and ideas from many different websites and resources for your exercises. This is allowed within reason. Wholesale copying of entire projects is definitely not allowed. Using code to round out a feature is allowed. If you ever have a question about what is or is not appropriate, ask first!

In all cases, you need to cite all sources at the top of the file where the code or algorithm was used, and you should note all sources in your documentation. Failure to properly attribute your sources will result in failing the complete lecture.

Code of Conduct for Students

- Read the syllabus
- Be on time and don't leave the lectures/exercises early
- Care for a pleasant atmosphere (i.e. silence)
- Ask questions if you don't understand something
- Build up your knowledge continuously
- Practice fair play to the other students

[Link to the Code of Conduct for online Teaching](#)

Teaching Philosophy

I care about your learning, helping you is important to me. If you are having a problem/question with some aspect of the course, do not hesitate to send an email. I will respond quickly and if it is necessary we will make an appointment.

Additional Information

Language: English

Learning Objectives:

By the end of the course students should be able to

- Understand the importance of data for businesses
- Cite case studies that show the use of analytics
- Apply methods for statistical analysis and machine learning
- Create data analysis based on machine learning by utilizing Python, Jupyter Notebooks and Google Colab