Wintersemester 2022/2023

Prof. Dr. Alfred Benedikt Brendel
Chair of Business Information Systems, esp. Intelligent Systems and Services

Data Science: Advanced Analytics

Dresden // 12.04.2023
Sommersemester 2023

The Team

Lecture

Prof. Dr. Alfred Benedikt Brendel
Hülße-Bau / Nordflügel, N 209A
Helmholtzstraße 10

Exercises

Martin Böhme
martin.boehme@tu-dresden.de

Ricardo RUBIANO CRUZ
Hülße-Bau / Nordflügel, N 207
Helmholtzstraße 10
ricardo_andres.rubiano_cruz@ tu-dresden.de

Contact Email:
ad_isd@tu-dresden.de

Latest Information:
Opal

Chair-Homepage

CHAIR OF BUSINESS INFORMATION SYSTEMS
ESP. INTELLIGENT SYSTEMS AND SERVICES

Opal Course

Prof. Dr. Alfred Benedikt Brendel
Chair of Business Information Systems, esp. Intelligent Systems and Services

About Us

We are an Interdisciplinary Research Team, Organized into Three Research Groups

IS&S

Research Groups

DWRG NeuroISRG IMRG

Research Focus

- **Design of human-computer interaction** in different industrial contexts
- **Artificial intelligence** for optimal support of data- and information-intensive processes

2020
Established

1
Location

>11
Employees

>10
Publications per year

>8
Lectures per year

Technische Universität Dresden
Faculty of Business and Economics

Chair of Business Information Systems, esp. Intelligent Systems and Services

Prof. Dr. Alfred Benedikt Brendel
Hülße-Bau / N-Wing,Rooms 207 - 211
Helmholtzstraße 10
D – 01069 Dresden

E: isd@tu-dresden.de
T: +49 351 463-33082

IS&S

Our Three Research Groups Address Leading Edge Topics in Information Systems and Services Research

Sascha Lichtenberg
Digital Work Research Group

DWRG

The DWRG focuses on the digitalization of business models in SMEs, the use of information systems in work processes and crowd working.

#Crowdworking #Onboarding #NewWork #WellBeing #Gamification

Dr. Stefan Greulich
Neuro-Information Systems Research Group

NeuroISRG

The research of NeuroISRG focuses on digital health, neuroadaptive and bio feedback systems, and practical application of brain-computer interfaces.

#Parkinson #BCI #Electroencephalography #AdaptiveComputing #Donation

Prof. Dr. Alfred Benedikt Brendel
Intelligent Mobility Research Group

IMRG

The IMRG addresses topics related to the sharing economy, smart city and sustainability in transportation.

#SharingVehicles #Sustainability #GreenIS #BusinessModels #DataScience

Our IS&S Research Team

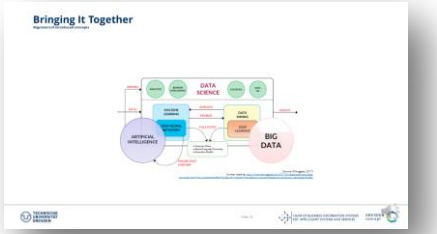
Professor of Business Information Systems, esp. Intelligent Systems and Services, TU Dresden
Prof. Dr. Alfred Benedikt Brendel

Office
Petzold

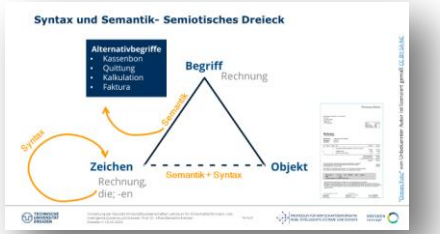
Research Groups	DWRG	NeuroISRG	IMORG
Research group leader	Lichtenberg	Dr. Greulich	Prof. Dr. Brendel
Research associates		Cruz	
External PhD Students	Marzok Stokelbusch	Pietrantoni	Böhme Hildebrandt
Student assistants (cross-sectional)			

Exemplary Insights Into Our Diverse Information Systems and Services Teaching Portfolio

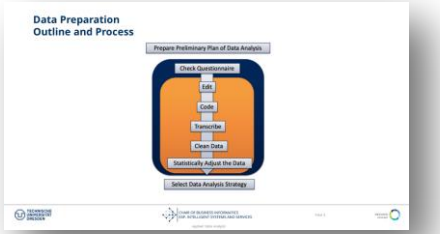
Data Science - Advanced Analytics



Programmieren & Datenbanken



Applied Data Analysis



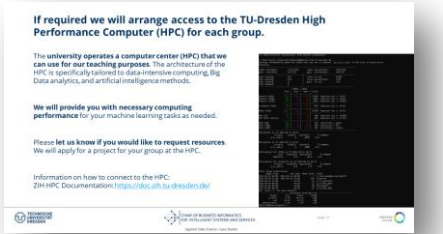
» Teaching orientated

» Application orientated

Design Science und Design Thinking

Gestaltungsansätze der Wirtschaftsinformatik

Applied Data Science: Case Studies



We Offer Various Types, Topics and Methods for Theses

Bachelor Theses | **Research Papers** | **Master and Diploma Theses** | **Doctoral Studies**

Topics

#DigitalWork, #SmartMobility, #Nudging, #DataScience, #NewMobility
#Crowdworking, #Donation, #Gamification, #Human-Brain-Interface
#Pre-Transplantation, #Sustainability, #Compliance, #MaaS, **... Your Topic**

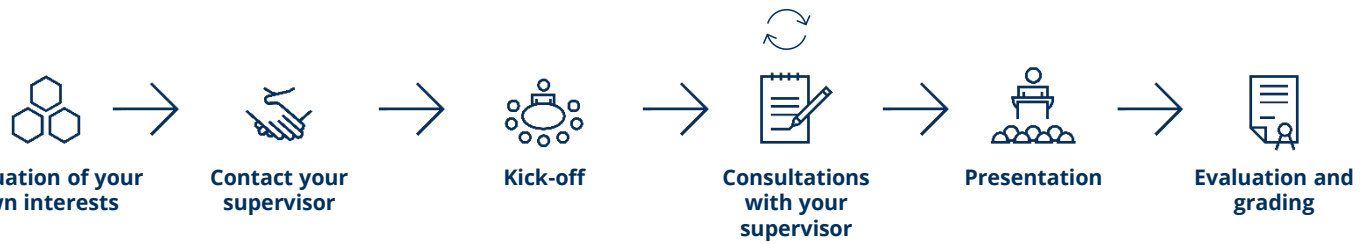
Methods

Coding, Content Analysis, Surveys, Experiments
Literature Research, Case Studies, Expert Interviews, User Acceptance

» Overview of types, topics and methods of theses

DWRG | NeuroISRG | IMRG

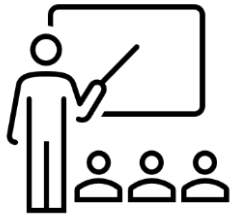
» Procedure for writing a thesis at our chair

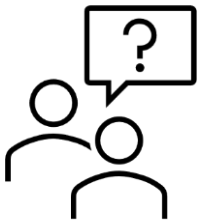


Take a look at our latest topics on our website!

Concept of this course -> Flipped Classroom

Traditional classroom:

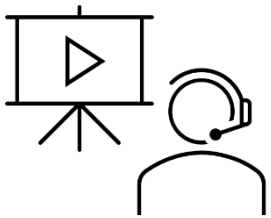




Frontal teaching of main topics

Students expected to deepen understanding by exercises on their own

Flipped classroom:



shift the classic explanation phases from frontal teaching to self-study

In depth understanding by working through exercise together with teaching staff

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Organization

Course Information – extracts of the module guide “Diplom Wirtschaftsinformatik”

Creditability:

MA-WW-WINF-0416b D-WW-WINF-0416b

Master:	BWL, VWL, Wing, Winfo, Wipäd
Diploma:	Wing, Winfo

Credit points:

5

Assessment:

120min exam (ONYX-Exam – further information during the semester)

All information: in [OPAL - https://bildungsportal.sachsen.de/opal/auth/RepositoryEntry/16864575517](https://bildungsportal.sachsen.de/opal/auth/RepositoryEntry/16864575517)

Course structure

Lecture:

- Will be provided on a weekly basis as video lectures on video campus Sachsen
- **first upload date:** 19.04.2023

Exercises:

- 3 Virtual Exercises as MS Teams Call
- free **Python courses on DataCamp**

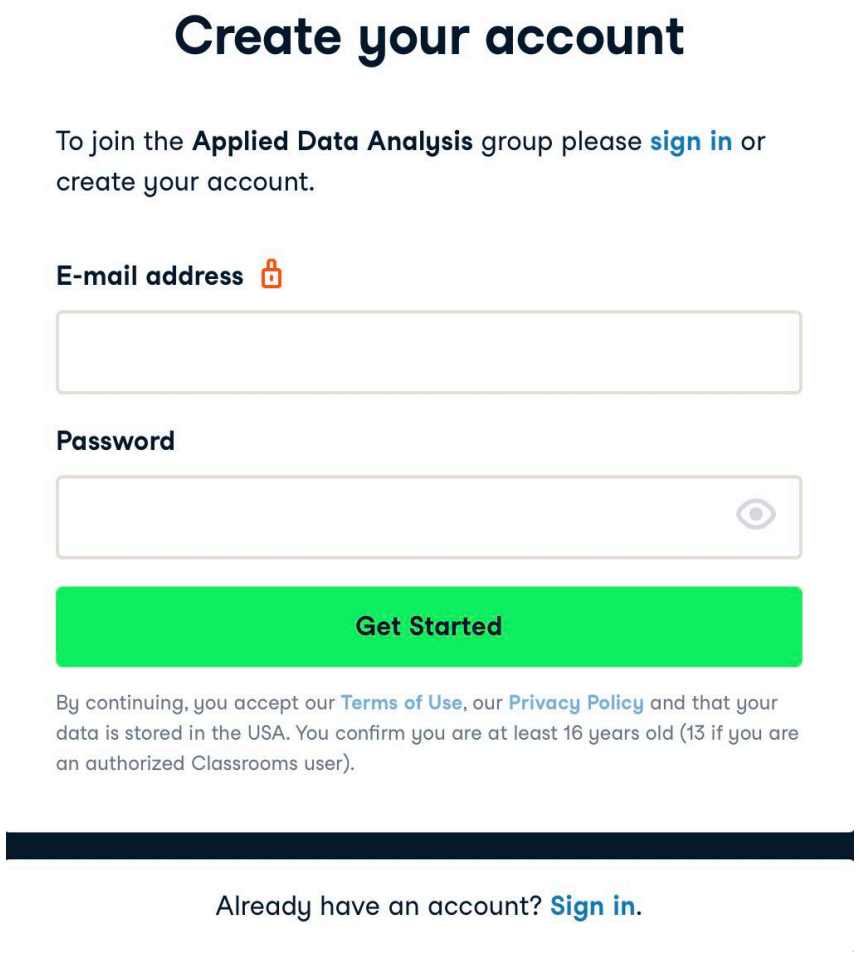
Trial exam: 30 min online (OPAL)

Exam:

- 120 min online (hybrid PC-Pool via OPAL)
  - Thrusday, August the 3-th.

Week number	Date	Holiday	Topic
14	05.04.2023	Eastern (Fr.)	-
15	12.04.2023	Eastern (Monday)	Kick-off
16	19.04.2023		Lecture - Introduction & Segmentation basis
17	26.04.2023		Lecture - Segmentation Methods
18	03.05.2023	1. May (Monday)	Lecture - Association Analysis
19	10.05.2023	Dies Academicus (Wednesday)	-
20	17.05.2023	Himmelfahrt (Thursday)	Exercise 1 - Segmentation
21	24.05.2023		Lecture - Text Mining
22	31.05.2023	Pfingsten (entire week)	-
23	07.06.2023		Exercise 2 - Text Mining
24	14.06.2023		Lecture - Deep Learning
25	21.06.2023		Lecture - Anomaly Detection
26	28.06.2023		Lecture - Process Analytics
27	05.07.2023		Exercise 3 - Deep Learning
28	12.07.2023		Trial Exam
29	19.07.2023	Begin of the exam period	

DataCamp



Access (upon next week):

You will receive an invitation under *firstname.lastname*@mailbox.tu-dresden.de

Account:

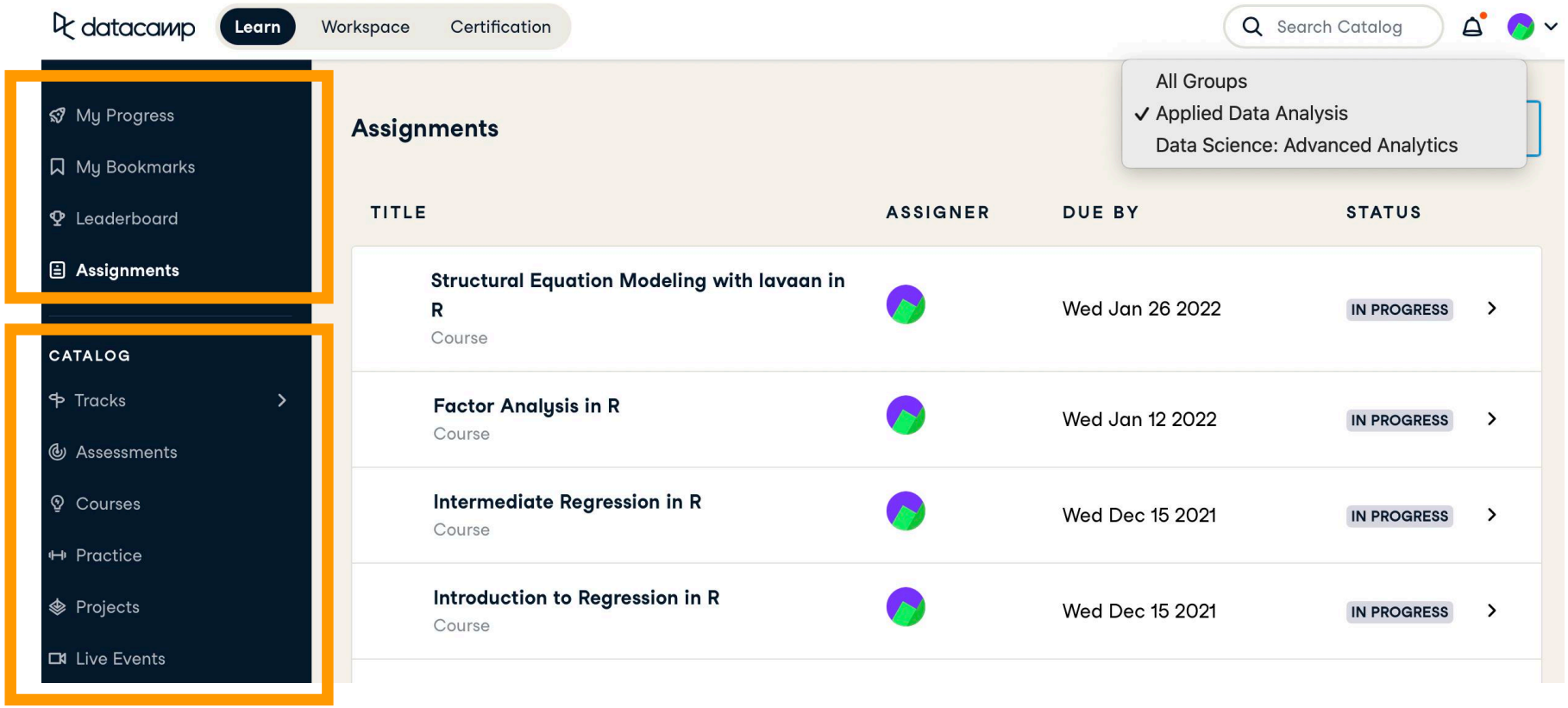
Follow the link in the mail to create an account.

If you already worked with DataCamp in prior courses, you could also sign in with your existent account.

Either way make sure to use the @mailbox.tu-dresden.de email.

DataCamp

These are the main dashboards for the course. You can view your assignments, your progress and the progress of your fellow students.



Assignments:

You can filter all your assignments for this course.

Fully completed tasks will be displayed as *completed.*

You can explore further courses and programming languages in the catalog.

TECHNISCHE UNIVERSITÄT DRESDEN

PROFESSUR FÜR WIRTSCHAFTSINFORMATIK
INSB. INTELLIGENTE SYSTEME UND DIENSTE

DRESDEN concept

Prof. Dr. Alfred Benedikt Brendel
Chair of Business Information Systems, esp. Intelligent Systems and Services

Data Science: Advanced Analytics
Introduction

It’s up to YOU!

RECOMMENDATIONS

Data Literacy for Everyone: Data and analytics skills are spreading to new corners of the job market, and the torrents of information that firms are collecting will enable workers at all levels to make better data-driven decisions. However, organizations will only benefit from their data if workers across the value chain possess at least foundational data literacy. Otherwise, potential insights and innovations will go unnoticed, or even worse, misinterpretation of data will lead to poor decisions.

To achieve widespread data literacy, next generation students must be exposed to data and its relevance and applicability early. Ideally, students graduating from high school should already have reached a baseline data literacy that they can then apply across college and university departments. For those already in post-secondary education or in the workforce, data literacy can be factored into degree programs, online learning, or employer programs.

(Source: Burning Glass Technologies & IBM, 2017)

The Image of a Data Scientist

Different Expectations…

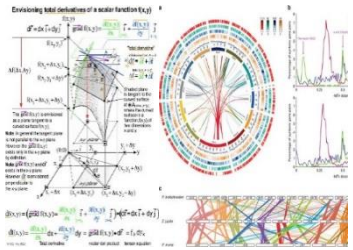
… what people think I do

What my **friends** think I do

What my **mother** thinks I do

What my **boss** thinks I do

What **society** thinks I do



What **I** think I do

What I **really** do

Some Definitions...

... collected by Chatfield et al. (2014)

Source	Definition: Data scientists are ...
Granville (2014)	"not statisticians, nor data analysts, nor computer scientists, nor software engineers, nor business analysts. They have some knowledge in **each of these areas** but also some outside of these areas."
Dhar (2013)	"requires an **integrated skill set** spanning mathematics, machine learning, artificial intelligence, statistics, databases, and optimization, along with a deep understanding of the craft of problem formulation to engineer effective solutions."
Davenport & Patil (2012)	"the people who **understand** how to fish out answers to important **business questions** from today's tsunami of unstructured information."
Mohanty et al. (2013)	"the practitioners of the analytics models solving business problems. They incorporate advanced analytical approaches using sophisticated **analytics** and data **visualization** tools to discover patterns in data. In many cases, these practitioners work with well-established analytics techniques such as **logistic regression** methods, **clustering** methods, and **classification** methods to draw insights from data. These practitioners have deep understanding of the business domain and apply that effectively to analyse data and deliver the outcomes in a business understandable intuitive manner through advanced data visualization tools."
SAS (2012)	"are hybrids of **technologists** and **quantitative analysts**."
Microsoft Website (2013)	"so companies need to do a lot with their data: gather, collate, store, transform, clean, analyse, explore, visualise, share and discover. The people who help organisations do this are data scientists. They turn data into products, insights and stories by **adding value** to raw information."

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Data Science: Advanced Analytics Content

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

Agenda

Content structure:

1. **Introduction and Terms**
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

- 1.1 Understanding Data Science
- 1.2 Principles
- 1.3 Concepts
- 1.4 Techniques
- 1.5 Technologies

Agenda

Content structure:

1. Introduction and Terms
2. **Basics of Segmentation**
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

- 2.1 Introduction to Segmentation
- 2.2 Cluster types
- 2.3 Distance measures
- 2.4 Evaluation criteria
- 2.5 Start heuristics

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. **Methods of Segmentation**
   - 3.1 Partitioned Cluster Methods
   - 3.2 Hierarchical Cluster Methods
4. Association Analysis
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. **Association Analysis**
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

- 4.1 Introduction to Association Analysis
- 4.2 Algorithm overview
- 4.3 Measure of interest
- 4.4 Taxonomies

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. **Text Mining**
6. Deep Learning
7. Anomaly Detection
8. Process Analytics

- 5.1 Introduction to Text Mining
- 5.2 Overview procedure model
- 5.3 Components of procedure model
- 5.4 Application Examples

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. **Deep Learning**
7. Anomaly Detection
8. Process Analytics

- 6.1 Interpretation problem
- 6.2 Convolutional Neural Networks
- 6.3 MNIST-Database
- 6.4 Long Short-Term Memory

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. Deep Learning
7. **Anomaly Detection**
8. Process Analytics

- 7.1 Anomaly Detection Introduction
- 7.2 Methods

Agenda

Content structure:

1. Introduction and Terms
2. Basics of Segmentation
3. Methods of Segmentation
4. Association Analysis
5. Text Mining
6. Deep Learning
7. Anomaly Detection
8. **Process Analytics**

- 8.1 Introduction
- 8.2 Process Warehouse
- 8.3 Process Discovery
- 8.4 Conformance Checking

Advertising

IS&S

Digital Work Research Group

TECHNISCHE UNIVERSITÄT DRESDEN

Tutoren für Lehrveranstaltungen am Lehrstuhls IS&D

- Aufbereitung von Lehrinhalten
- Betreuung von Studierenden
- Pflege der Opalkurs

- Erfahrenes Team
- Einblicke in Forschung & Lehre
- 5-10h/Monat

Bewerbungen an:
shk-isd@tu-dresden.de

Fireside Chat

- Unique opportunity to chat with Prof. Brendel in a relaxed atmosphere
- A „Ask me anything“ sit in and interactive exchange

- Participation: We will send invitations to top students of the department (SHK, exam, term papers) at the end of semester

Projektarbeit mit Unternehmen

Entwickle Lösungen für reale Herausforderungen in der Wirtschaft. Verknüpfe Dein Hochschulwissen mit der Praxis!

Einblick: https://youtu.be/YyAsOeONZ74
Website: https://www.paul-consultants.de/

QM	Strategie	Marketing	Data Science	Personal	Nachhaltigkeit	Controlling	IT

Prof. Dr. Alfred Benedikt Brendel
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Thank you for your attention