Artificial Intelligence

Algorithms and Applications with Python

Syllabus

TECHNISCHE UNIVERSITÄT DARMSTADT

WIRTSCHAFTS INFORMATIK

AIAA 1 + 2

Dr. Dominik Jung
dominik.jung42@gmail.com

python

</> course material: ↗ https://github.com/dominikjung42 | syllabus: ↗ www.is.tu-darmstadt.de

Syllabus

Introduction into Artificial Intelligence

Problem-Solving Agents

Introduction into AI-Programming with Python

Data and Knowledge Engineering

Knowledge Reasoning Fundamental Algorithms & Concepts

Machine Learning Fundamental Algorithms & Concepts

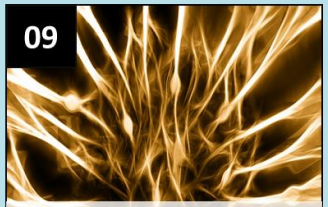
Workbook Exercises

Code Lectorial
Python

Workbook & Coding Exercises

Model Optimization and Selection

Artifical Intelligence on Big Data



Artifical Neural Networks and Deep Learning

Stochastic Modeling and Optimization

Building Productive AI-based Information Systems

TU Darmstadt:

Live Coding Sessions

Consultation Hours

Capstone

Workbook & Coding Exercises

Image sources: ↗ Pixabay (2019) / ↗ CC0

Exam Structure (preliminary!)

1/3	**BASIC CONCEPTS AND THEORETICAL BACKGROUND** ▪ You will have to answer multiple questions related to basic definitions and concepts of the lecture.
1/3	**APPLYING THEORY TO PRACTICE** ▪ You will have to show that you understand the algorithms and concepts and that you can use them to solve a business problem.
1/3	**PROGRAMMING** ▪ You will have to write, read and understand code examples in the context of business analytics problems. ▪ Use the exercises and the code examples to prepare!

Note: It may be possible that the point distribution differs in the final exam

Which Content is Relevant for the Exam?

Outline

2 Artificial Intelligence and Information Systems

- 2.1 Artificial Intelligence Project Management
- 2.2 Artificial Intelligence Project Lifecycle
- 2.3 Skills and Roles in Artificial Intelligence Projects
- 2.4 Types of Artificial Intelligence based Information Systems

▶ **What we will learn:**

- How typical AI projects are implemented, and how their life cycle and phases look like
- What skills are needed to implement an AI project
- Why the industry needs AI specialists, and how typical AI jobs look like
- Which types of AI based information systems exists and how they can be used to solve real-world problems

Image source: ↗ Pixabay (2019) / ↗ CC0

▶ **Duration:**

- 120 min

▶ **Relevant for Exam:**

- 2.1-2.4

Artifical Intelligence: Building AI-Based Information Systems with Python - Dr. Dominik Jung

Note: „the relevant for the exam“ information covers only the slides not the reffered literature!

Exam relevant

- Lecture slides and exercises
- All literature downloads available in GIT (folder literature)
- The referred literature for the business cases in literature
- Teaching material accompanying this lecture (e.g. code, guest lectures etc.)

About Me

EXPERIENCE

Today	Data Scientist, After-Sales, *Porsche AG*
2016-2019	Research Assistant, *Institute of Information Systems and Marketing (IISM) and Karlsruhe Decision & Design Lab (KD2 Lab), Karlsruhe*

EDUCATION

2016-2018	Dr. rer. pol., Business Informatics, *Karlsruhe Institute of Technology (KIT)*
2015-2018	M.Sc., Practical Computer Science, *University of Hagen*
2013-2015	M.Sc., Information Management and Engineering, *Karlsruhe Institute of Technology (KIT)*
2009-2013	B.Sc., Media Economics & B.A., Applied Media and Communication Studies, *Ilmenau University of Technology*

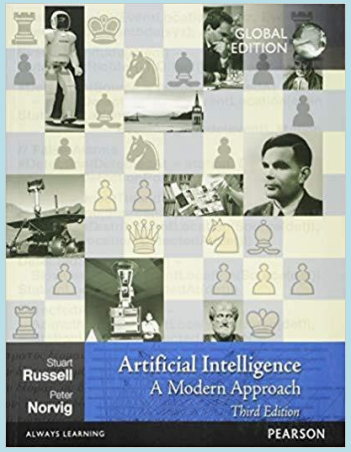
RESEARCH INTERESTS

- Decision Support Systems (*e.g. Robo-Advisors, BPM, Dashboards*)
- Modeling and Analyzing User Behavior with R / Python

Further Questions?

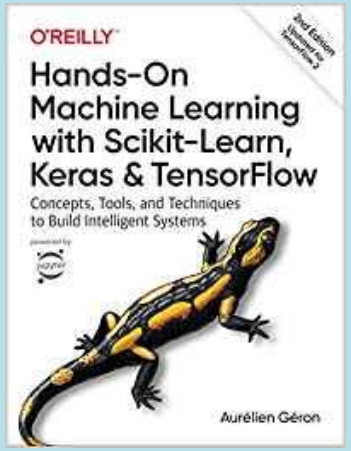
Please send me an email at
dominik.jung42@gmail.com

Literature Recommendations



Rusell, S., & Norvig, P. (2016). *Artificial Intelligence: A Modern Approach.* Global Edition.

- Availability: ↗University Library Darmstadt | ↗Amazon



Géron, A. (2017). *Hands-on machine learning with Scikit-Learn and TensorFlow: concepts, tools, and techniques to build intelligent systems.*

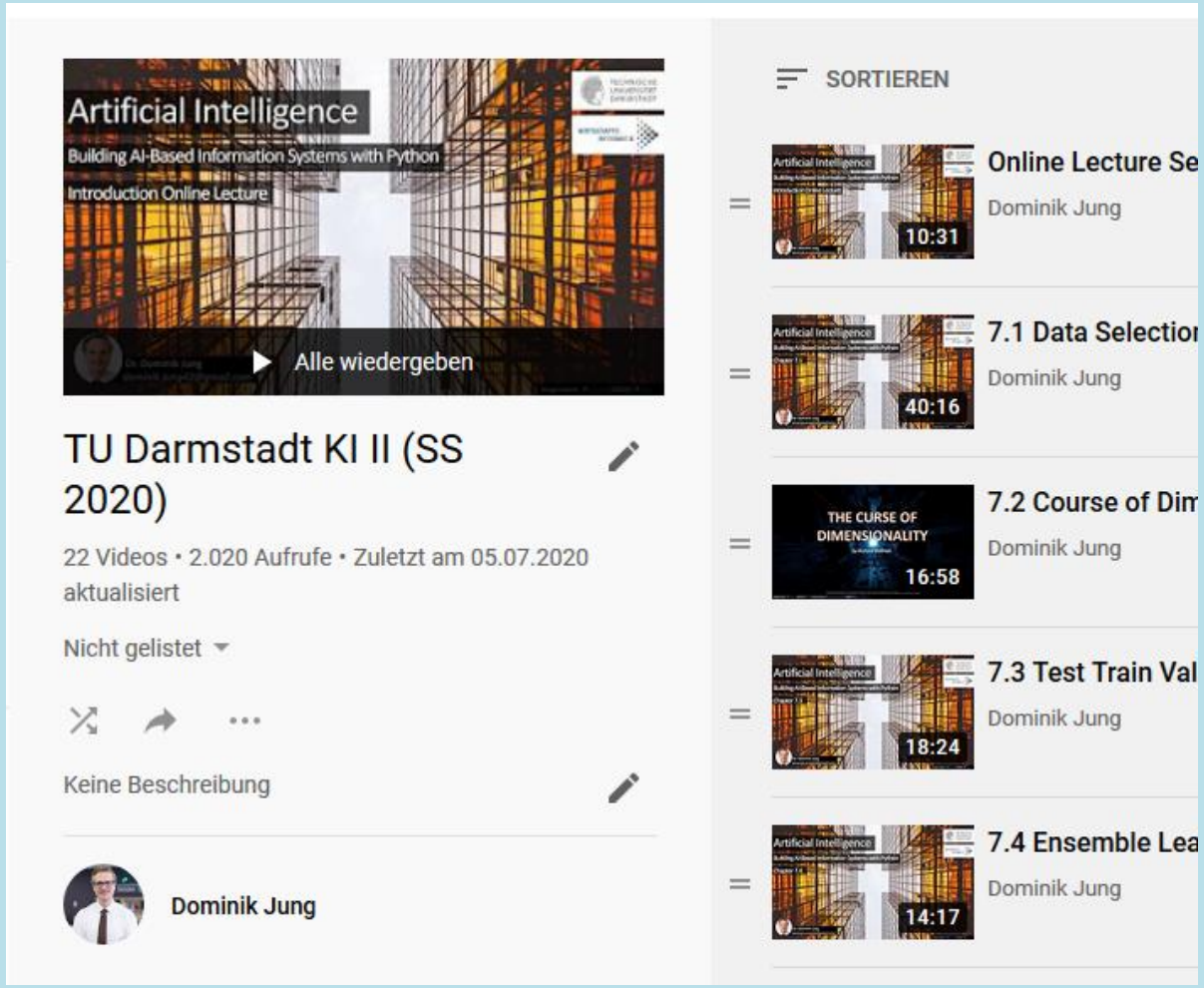
- Availability: ↗University Library Darmstadt | ↗Amazon

Grading (PRELIMINARY)

Contact	Description	Distribution
Exam *Dr. Dominik Jung*	There will be a 60 minutes closed-book/closed-notes exam consisting of short-answer, and analytical questions covering all course material! One third will be general questions, one third related to tools, and the last third will be an overarching case.	80 %
Capstone Project *Timo Sturm*	Each participant is expected to join a team of max. 4 students to analyze and work on a capstone project. Results should be delivered in a document. Further information will be presented at the capstone introduction.	20 %

- Both elements need to be passed (grade 4.0 or better): Failing (i.e., grade 5.0) the (1) Exam, or the (2) Case Study, or (3) the Exam and the Case Study, results in failing the entire course.
- There is no retake possibility for the Capstone project. Thus, if you fail the Capstone project, you need to retake the course next year!

Course Recordings

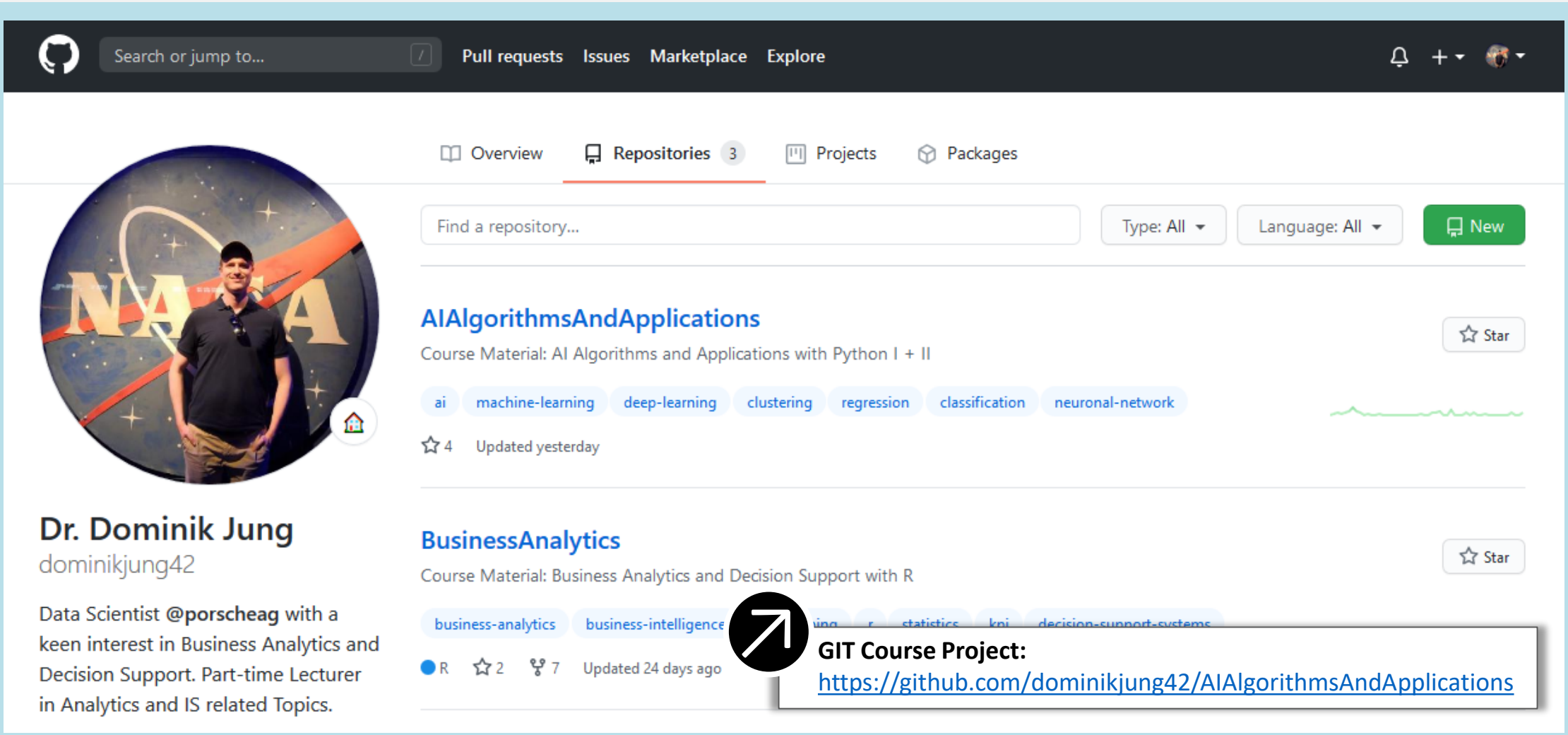


COVID19 Online Lecture Setup

- Lecture slides and exercises will be online available at Youtube
- Teaching material accompanying this lecture and all literature downloads and course material will be available in GIT
- Please feel free to comment the videos to solve the class room tasks

Youtube: TU Darmstadt KI I+II (WS 2020, SS 2021)

Course Material



Todos until next Lecture!

Please install

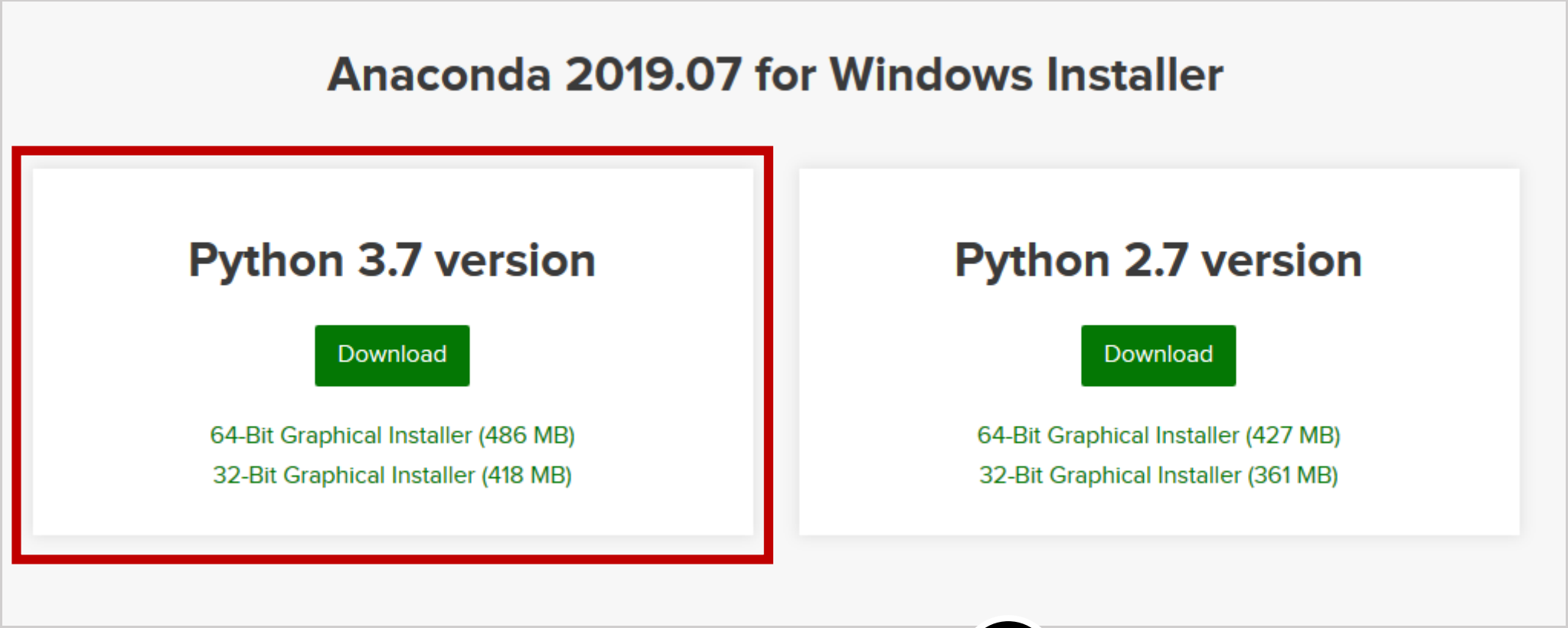
- Anaconda: https://www.anaconda.com/distribution
- GIT: https://git-scm.com/downloads | https://gitforwindows.org

until **next** lecture.

You will need them to solve the exercises in this course!

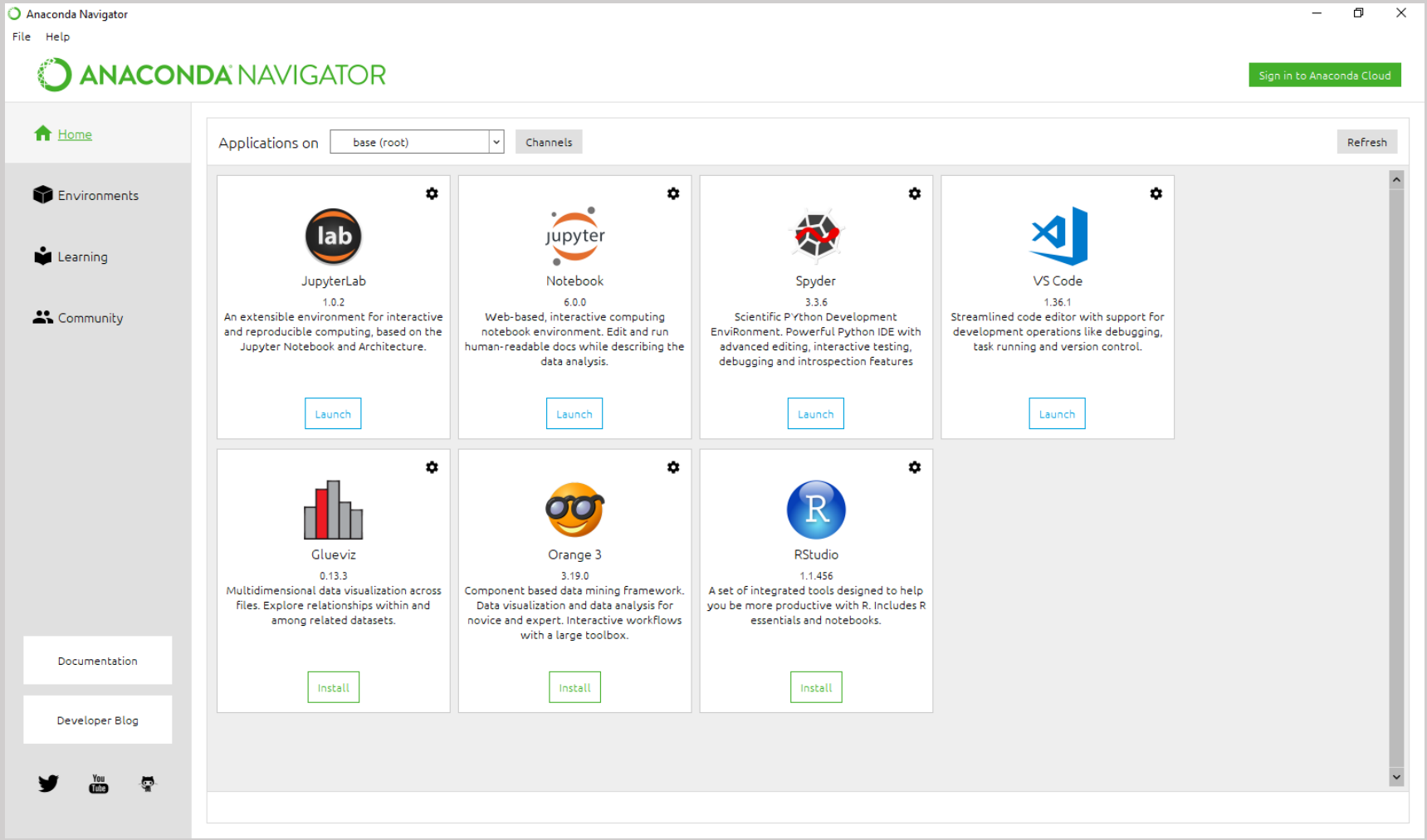
All tools of this course are available for Linux, Windows and Apple!

Download Anaconda

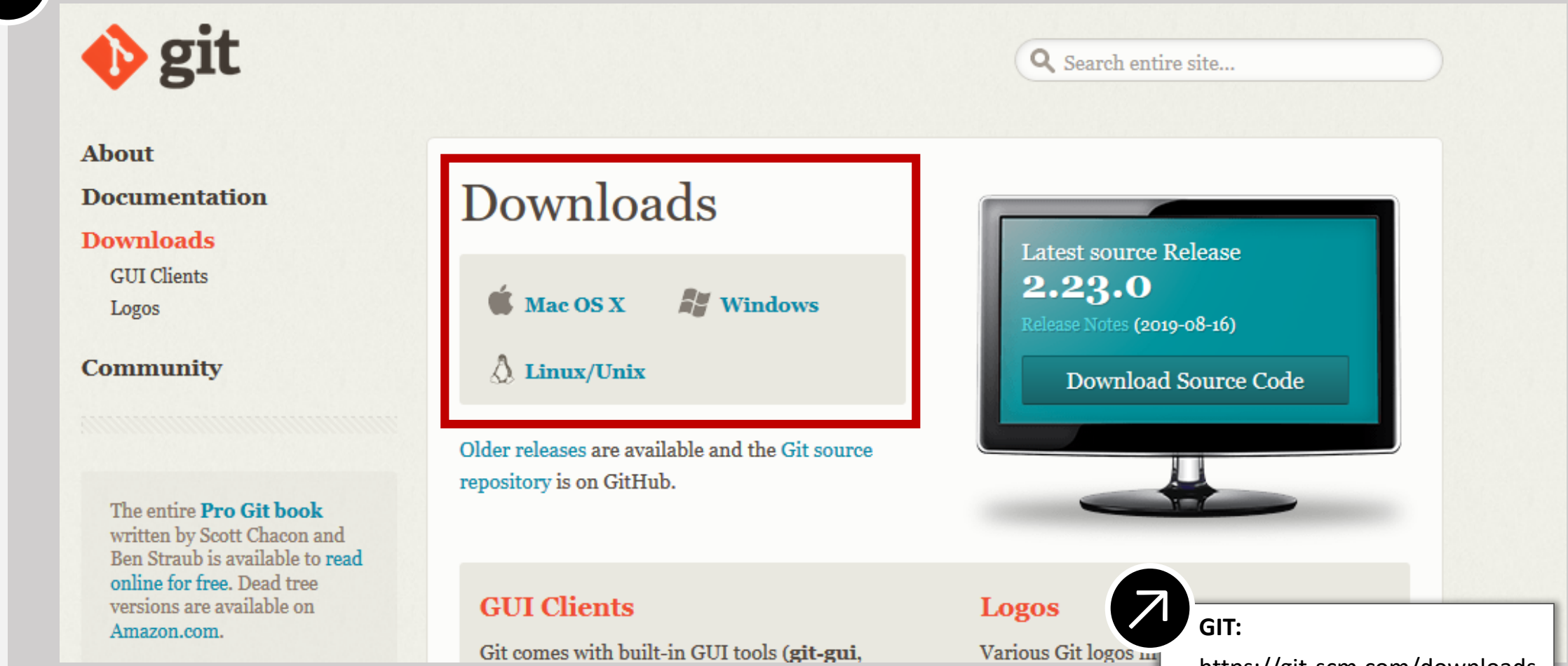


Anaconda Platform:
https://www.anaconda.com/distribution

Setup Anaconda



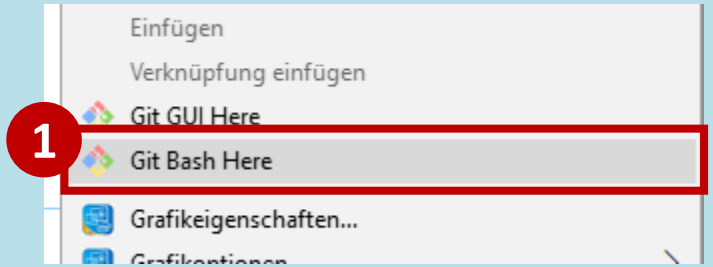
Download GIT



Setup GIT - Download the Course Material

Console

- Register @git
- Make a new folder and make a right-click, choose "Git Bash here"



No reason to panic! If you have trouble contact me, I will help you to setup your repository!

- Run the following lines of code in your Git Bash to setup your repository

```
git init
git config --global user.name "YOUR NAME"
git config --global user.email "YOUR EMAIL"
git clone "https://github.com/dominikjung42/AIAlgorithmsAndApplications.git"
```

- During the course, run the following lines of code to update your repository

```
git pull origin master
```

Teaching Material Icons

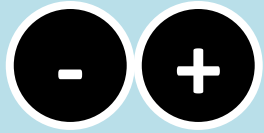

Important note


Classroom question or task


Definition


Problem / Solution


Referenced package/library


Pro / Contra


Referenced handout


Weblink or external ressource

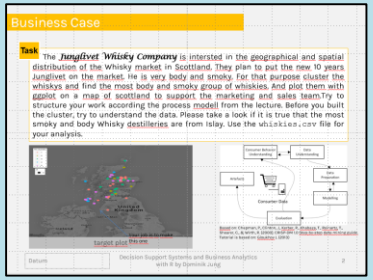

Information about self-studying or other lectures (not explicitly exam relevant if not said otherwise)

Types of Tasks and Exercises

Classroom Task

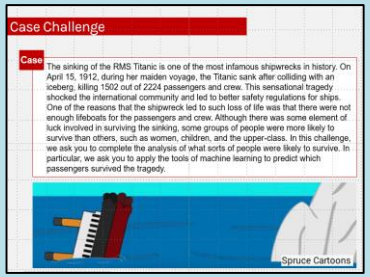
- Short tasks, workload should be about 5 minutes
- Solved during lecture
- Use it for exam preparation

Classroom Case



- Simplified, real-world business-problems and cases
- Workload between 30-60 minutes
- Read and Discuss
- Use it to deepen your applied skills

Challenge



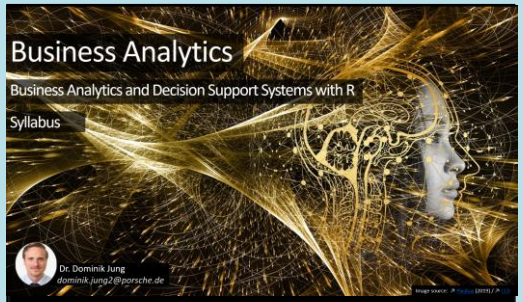
- General task with a wide focus on the different topics of the course
- Workload to pass is about 6-8 hours

Business Case

- Typical business case
- Discussed together

Outlook

Data Science Lectures



Business Analytics and Decision Support Systems with R

Modelling and Analyzing User-Behaviour with R

AI Applications and Algorithms with Python (I + II)

Data Science Seminars

Web and Media Analytics with Python and R

Data Design and Visualization with R and Inkscape

Check out my git repository for course material and more information!

References

Main literature

1. Rusell, S., & Norvig, P. (2016). *Artificial Intelligence: A Modern Approach.* Global Edition
2. Géron, A. (2017). *Hands-on machine learning with Scikit-Learn and TensorFlow: concepts, tools, and techniques to build intelligent systems.*

Further reading

- I strongly recommend to take a look at the free available online version of the *Pro Git book*, written by Scott Chacon and Ben Straub and published by Apress, it is available online as pdf, epub and mobi (↗ git-scm.com)
- *Rogerdudler Git Tutorial* (↗ https://rogerdudler.github.io/git-guide/) gives an excellent introduction for getting started with git and no deep shit ;)
- I also can recommend to take a look at the GIT guide from *kbroman* (↗ kbroman.org)