DIS08 – Data Modeling

01 - Introduction

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Version: WS 2021

Technology
Arts Sciences
TH Köln

Information Retrieval Research Group

Prof. Dr. Philipp Schaer

- Information retrieval, evaluation of IR systems, digital libraries

Timo Breuer, M.Sc.

- Living Labs Infrastructure for Information Retrieval, project STELLA

Fabian Haak, M.Sc.

- Sentiment Analysis, Query Expansion, Policital Retrieval, project ESUPOL

Björn Engelmann, M.Sc.

- Information Extraction, Machine Learning, Scientic Journalism, project JoIE

Projects, jobs, theses: **https://ir.web.th-koeln.de**

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Some notes on language matters...

Most of the content of this course will be in English:

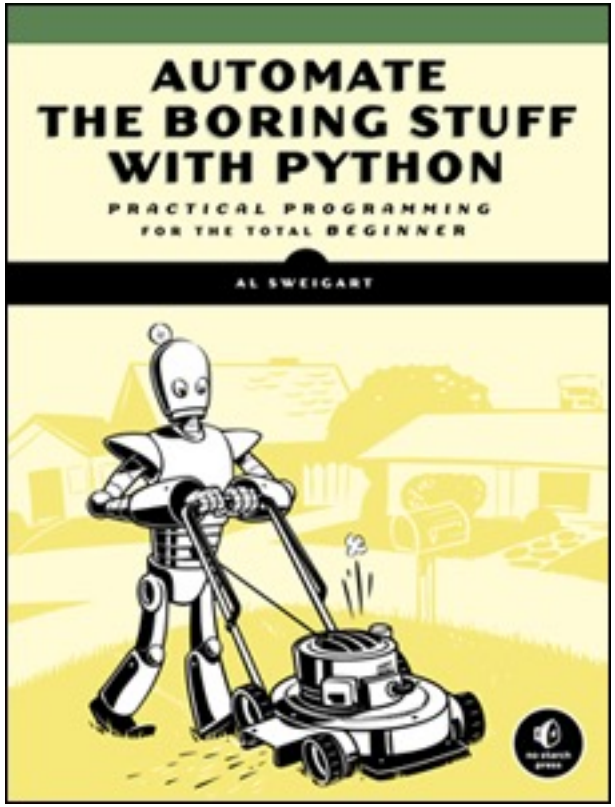
- The **slides** and **worksheets** of this course will be in English.
- The **text book** we will use, is freely available in English.
- The **additional materials** and **web resources** we point to are mostly in English.
- The **assigments** will be in English.

But:

- The **lecture itself** will be (mostly) in German!
- The **text book** is also available in German (but you have to pay).
- You can still answer the questions in the **assignments** in German.

Text book – What text book?

- This textbook covers a lot of technical stuff we will work on in the second half of the semester.
- Prof. Strahringer used the same text book in her programming course!
- Read it for free under: http://automatetheboringstuff.com
- Buy it for 20 EUR!
- For just $10 you can get access to the online video lectures: https://www.udemy.com/automate/?couponCode=FOR_LIKE_10_BUCKS



It‘s the data, stupid!

“Daten sind der Rohstoff des 21. Jahrhunderts“

Harvard Business Review

ARTWORK: TAMAR COHEN, ANDREW J BUBOLTZ, 2011, SILK SCREEN ON A PAGE FROM A HIGH SCHOOL YEARBOOK, 8.5" X 12"

DATA

Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

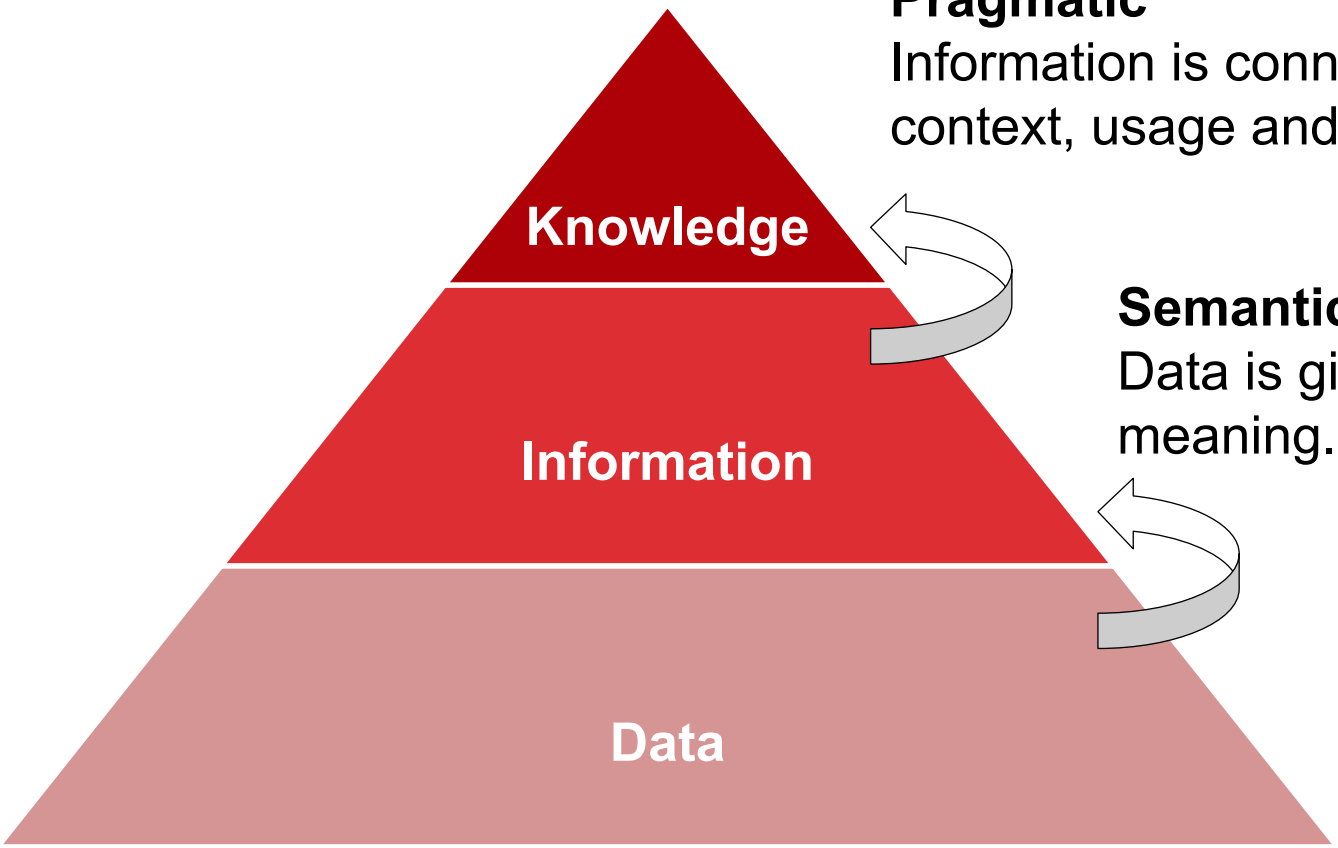
SUMMARY SAVE SHARE 13 COMMENT TEXT SIZE PRINT $8,95 BUY COPIES

WHAT TO READ NEXT

Big Data: The Management Revolution

https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century

The Knowledge Pyramid



Pragmatic
Information is connected to context, usage and experiences.

Semantic:
Data is given a meaning.

https://derwirtschaftsinformatiker.de/2012/09/12/it-management/wissenspyramide-wiki/

A transformation pipeline

1st step
- Acquire data

2nd step
- Extract information

3rd step
- Gather knowledge

4th step
- Transfer knowledge into actions

Learning outcomes

- **(WHAT)** Students learn to **process** and **structure** data and information that is available in electronic form and to convert it into common formats.

- **(HOW)** For this they use **different formats** (e.g. CSV, XML or JSON), **automated transformations** (e.g. with XSLT or on the command line) and editors (e.g. Notepad++).

- **(WHY)** This enables them to process any source data in such a way that it can be used for later applications, e.g. as input for database and retrieval systems or for data mining. They know typical procedures, tools and formats to use the results of their preparation and modelling flexibly. Furthermore, they can adapt them according to the application and requirements.

In this course...

You will learn how to

- **extract data** from various sources,
- **transform data** in different forms and formats,
- **load data** into applications to make use of it.

- This process is known as the Extract-Transform-Load (**ETL**) process often used in **database workflows**.
- We will extend this process to the **OSEMN principle** which is more related to typical **data science usecases**.

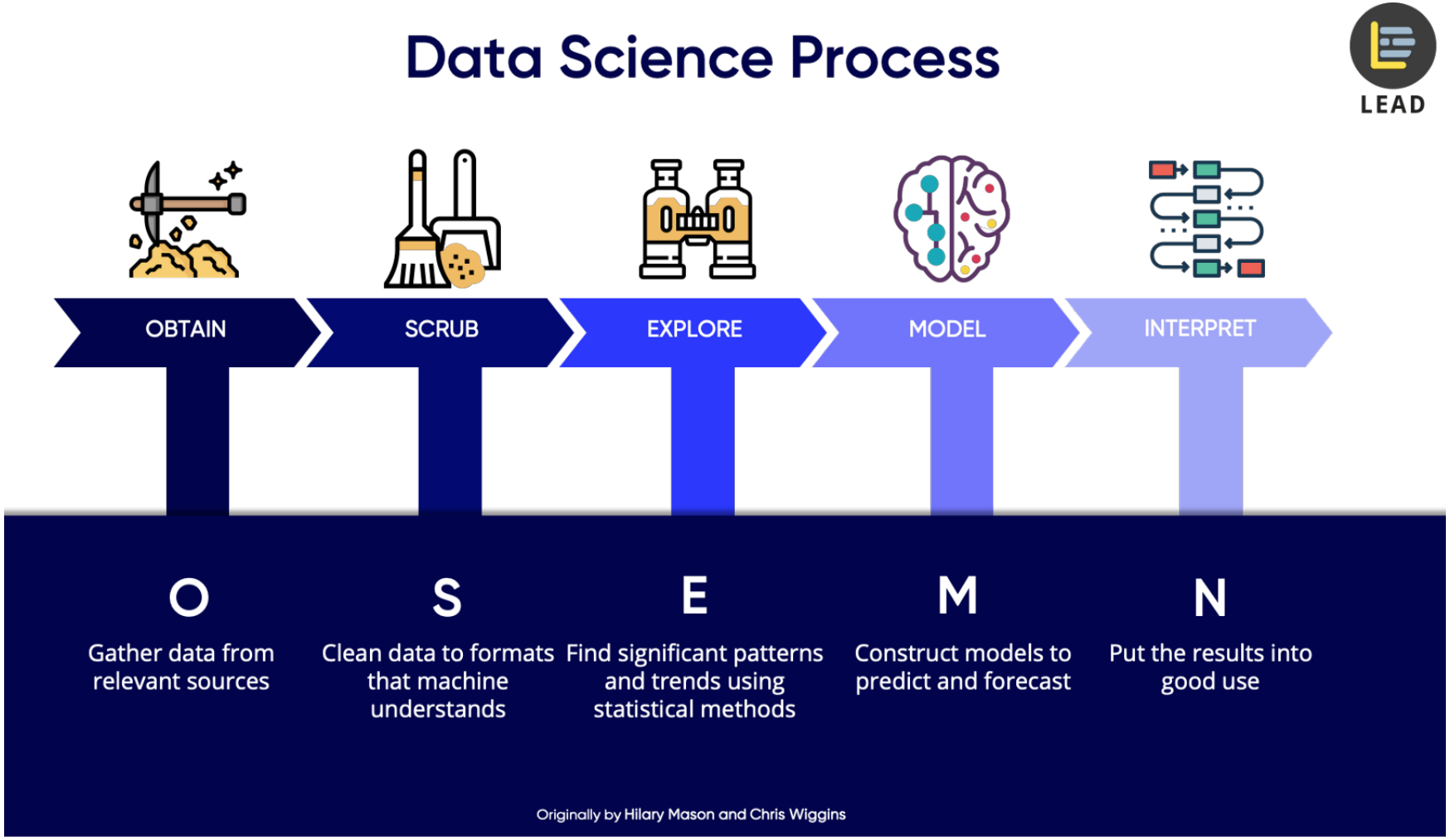


Image source: https://towardsdatascience.com/5-steps-of-a-data-science-project-lifecycle-26c50372b492å

How does it integrate into DIS?

Programmierung · Webentwicklung	Informationserschließung · Wissensorganisation	Digitale Informationsgesellschaft · Informationsethik · Berufsfelderkundung	Informationsvisualisierung	Information in Unternehmen
Programmierung · Softwareentwicklung	Informationserschließung · Strukturierte Dokumentbeschreibung	Datenmodellierung	Statistische Datenanalyse	Informationsquellen · Informationsrecherche
Informationssysteme · Content- & Dokumenten-managementsysteme	Information Retrieval	Datenbanksysteme	Data Mining	Informationsanalyse

In this course...

We will work with a **data-science-friendly tech stack** using

- **GitHub** (code repository)
- **UNIX shell / bash** (commandline interactions with the system)
- **Regular expressions** (the Swiss army knife of data processing)
- **Python** (for small scripting / programming tasks)
- Other **open-source tools** (OpenRefine, etc.)
- ...

On top of that we try to teach you about being a **hacker**!

What is Hacking?

“Hacking is a term that originated in MIT in the late 1950’s in what was then called the Tech Model Railroad Club, where the term **hack** or **hacking** was used in terms of tinkering with machines in ways that surpass the user manual. The term hacking in itself is so exciting that those really interested in solving problems and bringing new ideas to life embrace the term **hacking into** disregarding the fact whether they are judged by the two-timers that break into other peoples computers for fun. Taking things apart and fixing them for purposes of improvement or better efficiency is what Hacking is all about.”

https://medium.com/gritscience/a-hackers-mindset-9d422d990b3d

How to get a Hacker Mindset?

- Cultivating a hackers mindset is not just simple, but an **effortless endeavour**. All you have to do is be ready.
- You have to be ready to be wrong. You have to be ready to screw up. You have to be ready to get your hands dirty.
- **Get acquainted with your craft.**
- Hacking doesn't just relate to machines or electronics and computers. You can be a hacker no matter what you do.
- As long as you **obsessively try to solve problems**, and you are not afraid of failing and coming up with **innovative solutions**, you are a **hacker.**

- *The people who break into other people's computers are called **crackers.***

https://medium.com/gritscience/a-hackers-mindset-9d422d990b3d

HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?
(ACROSS FIVE YEARS)

HOW MUCH TIME YOU SHAVE OFF	HOW OFTEN YOU DO THE TASK: 50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
1 SECOND	1 DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
5 SECONDS	5 DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
30 SECONDS	4 WEEKS	3 DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
1 MINUTE	8 WEEKS	6 DAYS	1 DAY	4 HOURS	1 HOUR	5 MINUTES
5 MINUTES	9 MONTHS	4 WEEKS	6 DAYS	21 HOURS	5 HOURS	25 MINUTES
30 MINUTES		6 MONTHS	5 WEEKS	5 DAYS	1 DAY	2 HOURS
1 HOUR		10 MONTHS	2 MONTHS	10 DAYS	2 DAYS	5 HOURS
6 HOURS				2 MONTHS	2 WEEKS	1 DAY
1 DAY					8 WEEKS	5 DAYS

Example: Keyboard shortcuts

- Though we will get more computational over the course of the program, we can start our adventure into programming with very simple things like keyboard shortcuts.
- We all have our favorites that are labor saving but also allow us to use this stupid machine in the best possible way.
- You can do all the lessons without keyboard shortcuts, but note that they'll likely come up a lot.

Action	Windows	Mac	+ Keystroke
Save	Ctrl	Command	+ S
Copy	Ctrl	Command	+ C
Cut	Ctrl	Command	+ X
Paste	Ctrl	Command	+ V
Switch Applications	Alt	Command	Tab

https://librarycarpentry.org/lc-overview/05-keyboard-shortcuts/index.htm

Scoring and exams

There are two different parts of your exams

Individual assignments (50 points)

- Do it on your own!
- Includes all worksheets from the first half of the semester.

Group assignment (50 points)

- Teams of up to 4 people!
- Includes all Python programming tasks from the second half.

- You can gather a total of **100 points**
- Your finals grade is determined using this table:

<50	50	55	60	65	70	75	80	85	90	95
n.b.	4,0	3,7	3,3	3,0	2,7	2,3	2,0	1,7	1,3	1,0

Rules for this course

No email support! Ask questions online!

- There will be a discussion forum at GitHub for this course - Use it!!
- I know – Nobody wants to be the one asking “stupid” questions.
- But: Your fellow students have the same issues – Trust me!
- Ask a lot of questions and try to **help your fellows**.

Help each other! Help yourself!

- **Tutorial** sessions are **interactive** – **get the most out of it!**
- **Active helpers** will get some **extra points** at the end of the semester!

Be active on GitHub.

- We want to see **weekly commits** in your account.
- A last-minute commit for the assignment is **suspicious**… And we might come up with the idea to ask **embarrassing questions**.

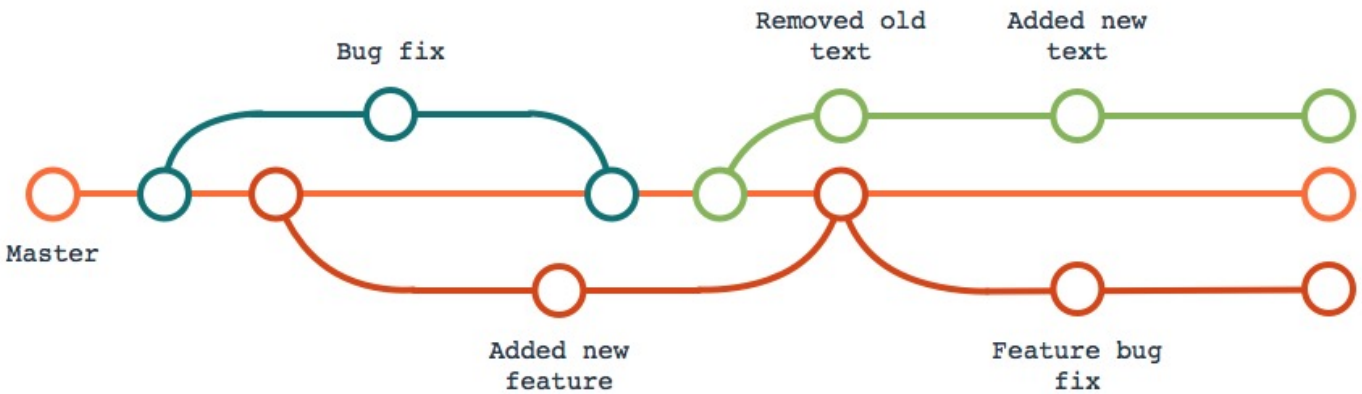
Schedule for lectures WS 2021/22

15.10.21	Introduction, Markdown		first week (no tutorial)
22.10.21	Unix Shell		Markdown and style guides
29.10.21	Versioning, Git, GitHub		Shell tutorial
05.11.21	Regular Expressions		Hands-on Git, GitHub
12.11.21	CSV, JSON, XML		Regex tutorial
19.11.21	OpenData, Tidy Data Principles		open.cologne open data
26.11.21	Project week (no lecture)		**Submit assigment 1** (no tutorial)
03.12.21	Python: Data structures		Hands-on Python
10.12.21	Python: Files, folders and more		Hands-on Python
17.12.21	Python: Pandas		Hands-on Python
24.12.21	Christmas (no lecture)		Christmas (no tutorial)
31.12.21	Christmas (no lecture)		Christmas (no tutorial)
07.01.22	Python: Structured file formats		Hands-on Python
14.01.22	Q&A - Summary		Hands-on Python
04.02.22			**Submit assigment 2**

First steps: GitHub + Markdown

GitHub – In a nutshell (more in 1-2 weeks)

- **Git** is a version control system.



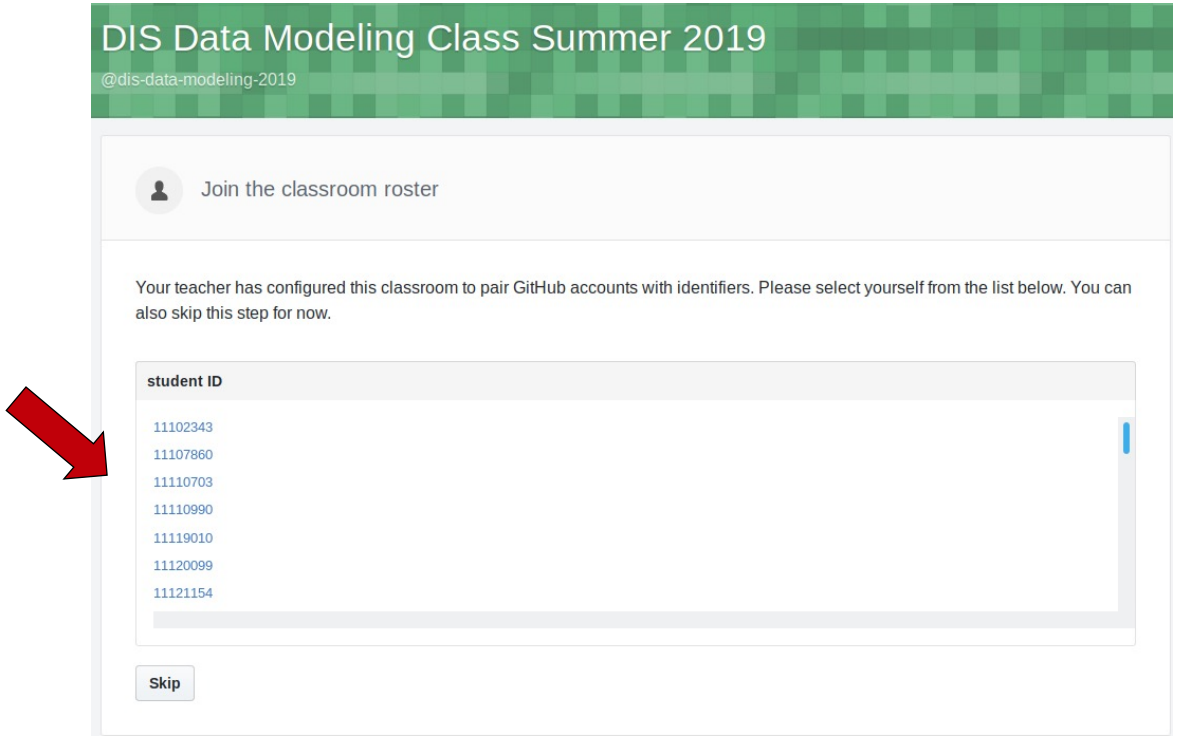
- **GitHub** is an internet platform that offers free Git access, user accounts, disk space, etc. ...

- We use GitHub in this course to see your progress, gather your assignments and to introduce you to one of the state-of-the-art systems for version control.

Image source: https://blog.cpanel.com/git-version-control-series-what-is-git/

First task: Create a GitHub account

- Create a GitHub account: https://github.com
- Join our GitHub classroom and the 1st assigment: https://classroom.github.com/a/Nshauyhh
- Select your student register number from the list.



dis-data-modeling-2019 / **assignment-1** Private

Unwatch 2 | Star 0 | Fork 0

Code | Issues 0 | Pull requests 0 | Projects 0 | Wiki | Insights | Settings

First Assignment, Submission: 16-05-2019

Edit

Manage topics

2 commits | **1** branch | **0** releases | **1** contributor

Branch: **master** | New pull request | Create new file | Upload files | Find File | Clone or download

neumannm Update part 1 instructions — Latest commit `1adbf1a` 11 minutes ago

README.md — Update part 1 instructions — 11 minutes ago

README.md

Assignment 1

Part 1

Create a new file in this repository via the web interface. Use `introduction.md` as file name.

Inside the file, first enter the following information:

- **Name**: {your name here}
- **E-Mail**: {your smail address here}

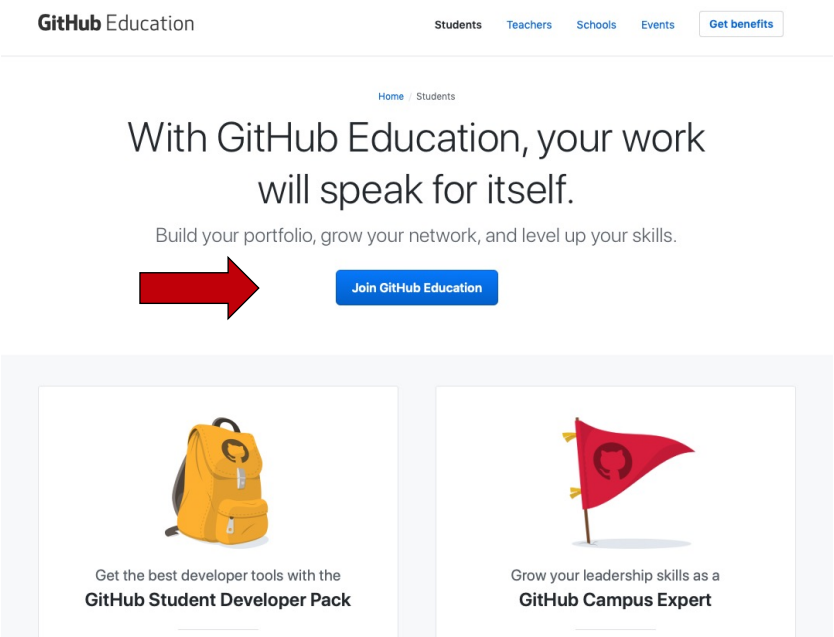
Then, answer the following questions:

1. Do you have any prior experience in the field introduced in the introductory session? If so, give a short overview on them.
2. What expectations or wishes do you have on the data modeling course?

Make use of some Markdown formatting like headings and lists when answering these questions, when appropriate

GitHub Education

- When you register with your official student mail (...@smail.th-koeln.de), you are able to join the GitHub Education program.
- Premium access to premium features...
- https://education.github.com/students



Markdown – In a nutshell

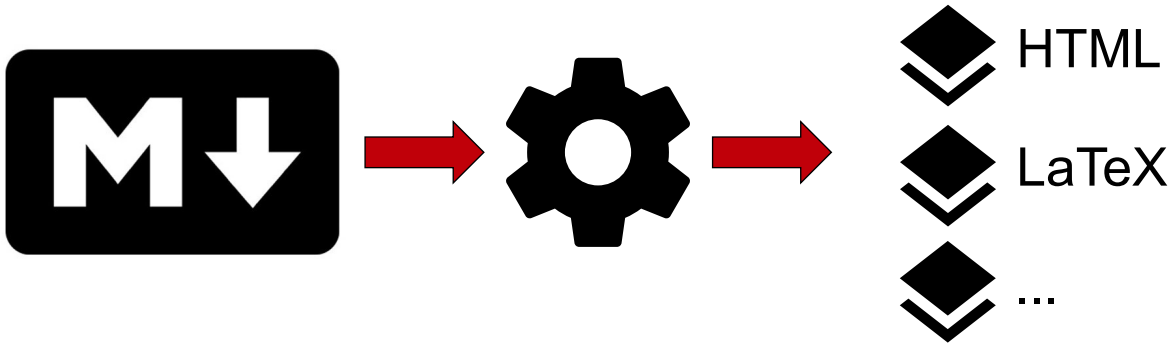
- Created by John Gruber and Aaron Swartz
- A simplified version of „markup languages“
- Allows to focus on writing opposed to formating
- Simple/intuitive formatting elements
- Easily converted to HTML or other formats
- Full specification: https://daringfireball.net/projects/markdown/

Try it out online: http://pandoc.org/try/

Image source: Daniel Curtis

Other Markdown features

- Markdown files, which use the file extension .md, are machine readable, human readable, and used in many contexts - for example.
- **Markdown is plain text**! Just use a simple text editor like Notepad++ or Atom is sufficient.
- It is a great way to create machine-readable, easily searchable documents that can be repurposed in many ways
- GitHub renders text via Markdown… ☺

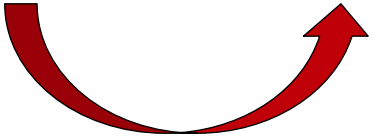


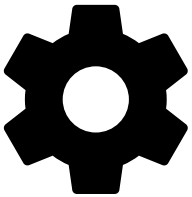
https://librarycarpentry.org/lc-data-intro/03-foundations/index.html

Markdown example

```
A First Level Header
====================

A Second Level Header
---------------------

Now is the time for all good men to come to
the aid of their country. This is just a
regular paragraph.

The quick brown fox jumped over the lazy
dog's back.

### Header 3

> This is a blockquote.
>
> This is the second paragraph in the blockquote.
>
> ## This is an H2 in a blockquote
```

```
<h1>A First Level Header</h1>

<h2>A Second Level Header</h2>

<p>Now is the time for all good men to come to
the aid of their country. This is just a
regular paragraph.</p>

<p>The quick brown fox jumped over the lazy
dog's back.</p>

<h3>Header 3</h3>

<blockquote>
    <p>This is a blockquote.</p>

    <p>This is the second paragraph in the blockquote.</p>

    <h2>This is an H2 in a blockquote</h2>
</blockquote>
```





Markdown Cheatsheet – Excerpt

- Many examples can be found in the GitHub documentation: https://help.github.com/en/articles/basic-writing-and-formatting-syntax

Styling text

You can indicate emphasis with bold, italic, or strikethrough text.

Style	Syntax	Keyboard shortcut	Example	Output
Bold	`** **` or `__ __`	command/control + b	`**This is bold text**`	**This is bold text**
Italic	`* *` or `_ _`	command/control + i	`*This text is italicized*`	*This text is italicized*
Strikethrough	`~~ ~~`		`~~This was mistaken text~~`	~~This was mistaken text~~
Bold and italic	`** **` and `_ _`		`**This text is _extremely_ important**`	**This text is *extremely* important**

Summary and next week

For this semester:

- Learn to be OSEMN!
- Learn to be a Hacker!

For this week:

- Get on GitHub.
- Join our Classroom.
- Learn to write Markdown.

Next week:

- Learn more about the hacker tool #1: The Shell