Course overview

Data Science Tools and Methods

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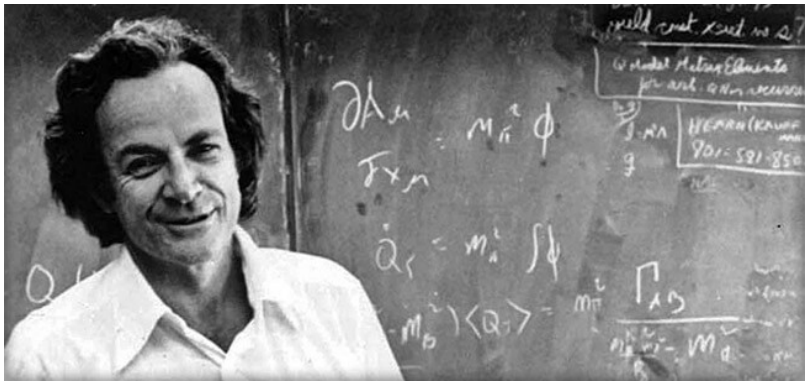
What're you going to learn today?

- Who is your lecturer?
- Who are you and what do you want?
- Which topics will we cover?
- How will we do it?
- What do you have to do to pass?
- What's next?

Who am I?

Science



- Development of WWW
- PhD theoretical particle physics
- 60 research publications
- Assoc. Ed. Int. J. of Data Science
- Ed. Board Int. J. of Big Data Mgmt.
- Scientific member d-cube@Berlin

Industry

- Executive at Accenture & Shell
- Coach and consultant
- Certified psychotherapist
- Startup mentor

Teaching

- Business informatics @HWR Berlin
- Visiting professor of data science @Lyon
- Adviser for CPU @LA
- Internship supervision

Pleasure

- Playing: Assassin's Creed Valhalla (2020)
- Reading: Waugh, Sword of Honour (1952-1961)
- Watching: The Middle (2009-2018)

What are your expectations?

- What do you want to learn here?
- What would you like to avoid?
- What did you take away from another course?
- What did you really not like in another course?

Which topics will we cover?

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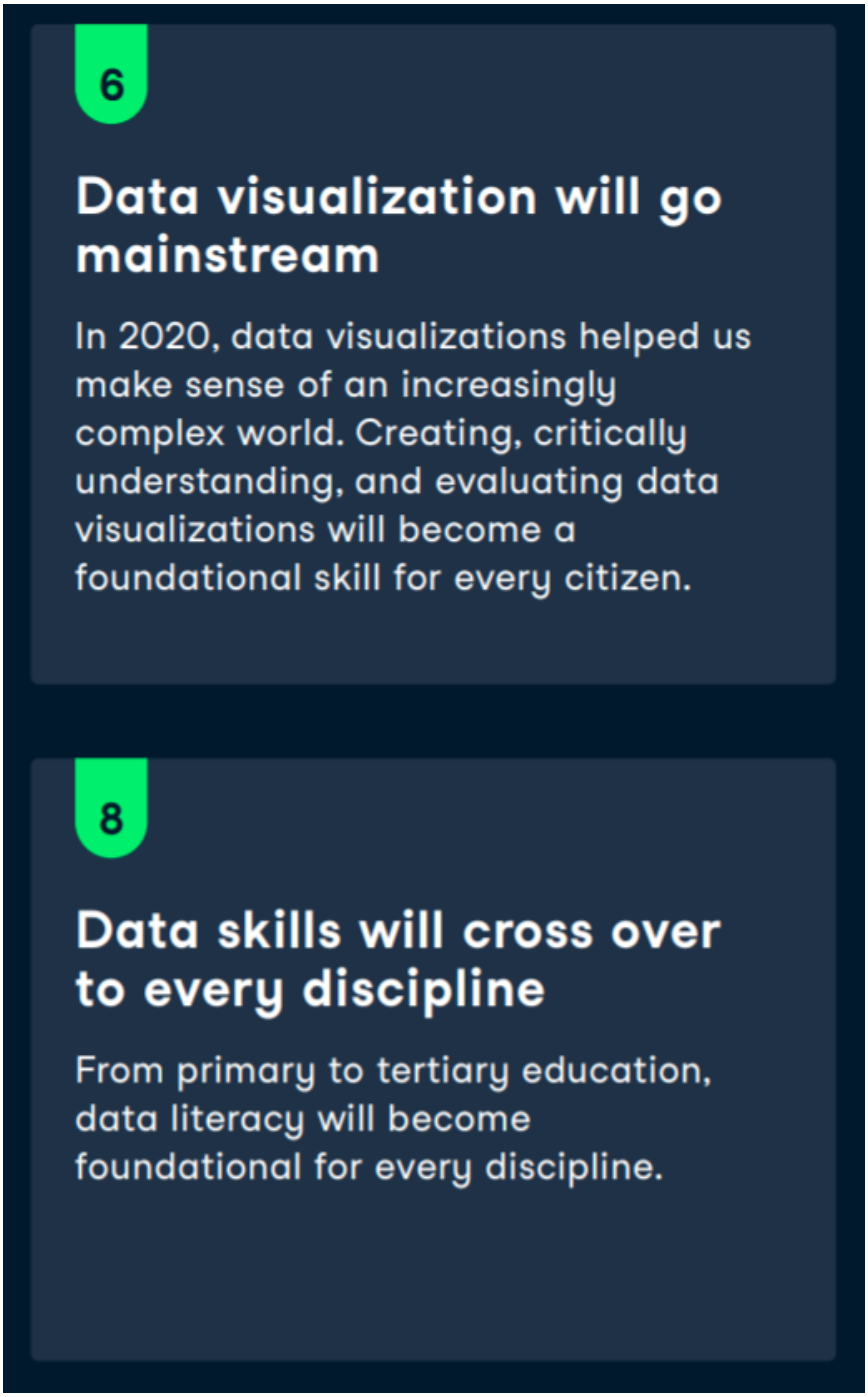
6
Data visualization will go mainstream
In 2020, data visualizations helped us make sense of an increasingly complex world. Creating, critically understanding, and evaluating data visualizations will become a foundational skill for every citizen.
8
Data skills will cross over to every discipline
From primary to tertiary education, data literacy will become foundational for every discipline.

Source: datacamp.com

Introduction to R programming

Source: RStudio

Visualization using R

`./img/gapminder.gif`
Source: Thomas Lin Pedersen

FasteR approach

- Focus on data exploration (EDA)
- Stay close to base R
- Use real data sets
- Compute interactively
- Prepare for DSC201 (ML)

Image source: unsplash

Schedule (see Syllabus)

No	Date	Lectures[1]	DataCamp[2]	Tests/Quiz[3]	fasteR[4]
1	17-Aug	Overview	Introduction to R:		Overview and Getting Started
2	19-Aug	On the R Shell	- Intro to basics	Test 1	Installing R and first steps
3	24-Aug	Vectors in R	- Vectors	Test 2	More on Vectors
4	26-Aug	Data frames in R	- Matrices	Test 3	On to Data Frames!
5	31-Aug	Factors in R	- Factors	Test 4	R Factor Class
6	2-Sep	`apply` functions	- Data		The `tapply` Function
7	7-Sep	Cleaning data	- Lists		Data Cleaning
8	9-Sep	Lists in R	Intermediate R:	Test 7	R List Class
9	14-Sep	`Nile` exploration	- Conditionals	Test 8	Another Look at the Nile Data
10	16-Sep	Visualization	- Loops	Test 9	Introduction to Base R Graphics
11	21-Sep	Base R graphics	- Functions	Test 10	More on Base Graphics
12	23-Sep	Writing functions	- The `apply` family	Test 11	Writing Your Own Functions
13	28-Sep	Iteration I	- Utilities	Test 12	`for` Loops
14	30-Sep	Fibonacci series		Test 13	Functions with Blocks
15	5-Oct	Literate Programmin	Data Visualization:	Test 14	IDEs: Text Editing, Saving, Executing
16	7-Oct	Conditions	- Base R graphics	Test 15	`If`, `Else`, `Ifelse`: Conditions
17	12-Oct	EDA example I	- Different plot types	Test 16	Do Pro Athletes Keep Fit?
18	14-Oct	Linear regressio			Regression Analysis, I
19	19-Oct	Object-orientati			isses
20	21-Oct	EDA example II	- Plot customization	Test 19	Baseball Player Analysis (cont'd)
21	26-Oct	Packages		Test 20	R Packages, CRAN, Etc.
22	28-Oct	Grammar of Graphics	Regression in R:	Test 21	A First Look at `ggplot2`
23	2-Nov	Functional Programm	- Simple linear regression	Test 22	Should You Use Functional Programmin ?
24	4-Nov	Text mining I	- Predictions and models	Test 23	Simple Text Processing I
25	9-Nov	Text mining II	- Assessing model fit	Test 24	Simple Text Processing II
26	11-Nov	Linear regression II			r Regression Analysis, II
27	16-Nov	Dates and times			ng with the R Date Class
28	18-Nov	Coding style	Text mining (Bag-of-Words)	Test 27	Tips on R Coding Style and Strategy
29	23-Nov	Logistic regression	- Basics of Bag-of-Words	Test 28	The Logistic Model
30	25-Nov	Version control	- Word clouds and visuals	Test 29	Files and Directories
31	30-Nov	Iteration II	- Text mining techniques	Test 30	R `while` loops
32	2-Dec	Summary and outlook	- Text mining case study		Summary and Outlook
33	TBD			Final exam	

BASICS

VISUALIZATION

APPLICATIONS

How will we do it?

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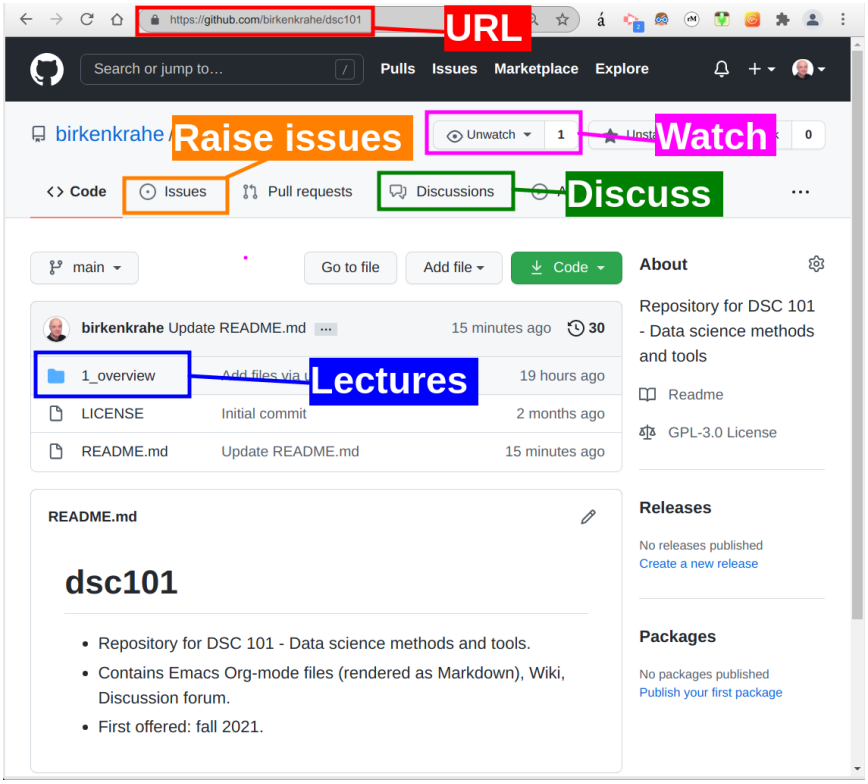
Classroom sessions

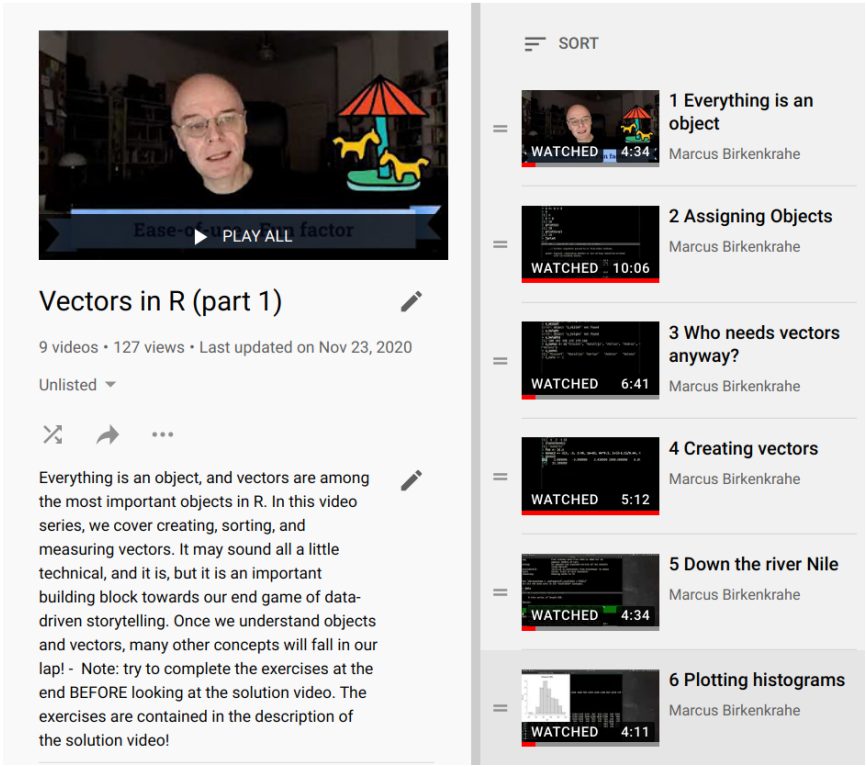
Lecture scripts with exercises (GitHub)



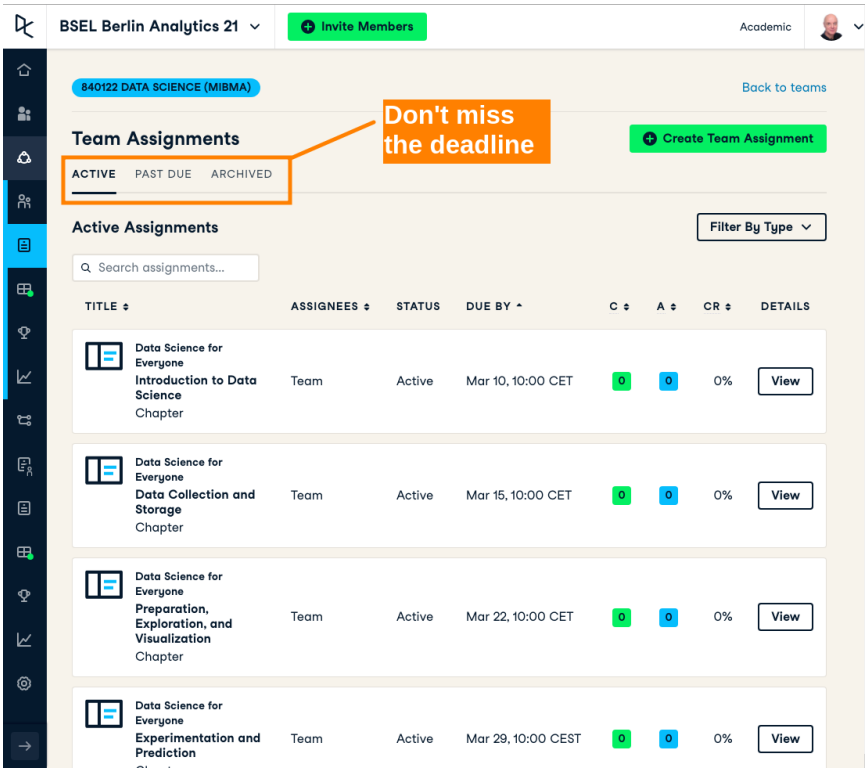
Reading suggestions

- Matloff: fasteR: Fast Lane to Learning R! (2021)
- Matloff: The Art of R Programming (2011)
- Matloff TARP available for free from the Internet Archive
- Davies, The Book of R, NoStarch Press (2016)
- Irizarry, Introduction to Data Science (2020)

Video lectures (YouTube)

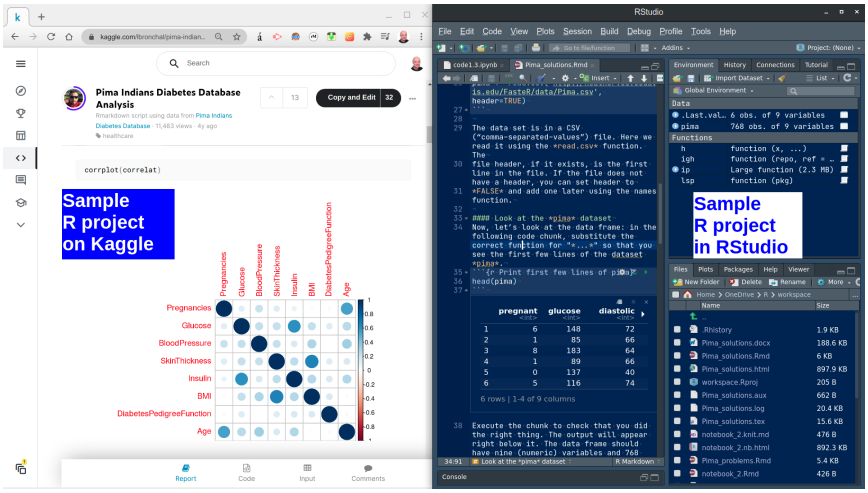


Online assignments (DataCamp)



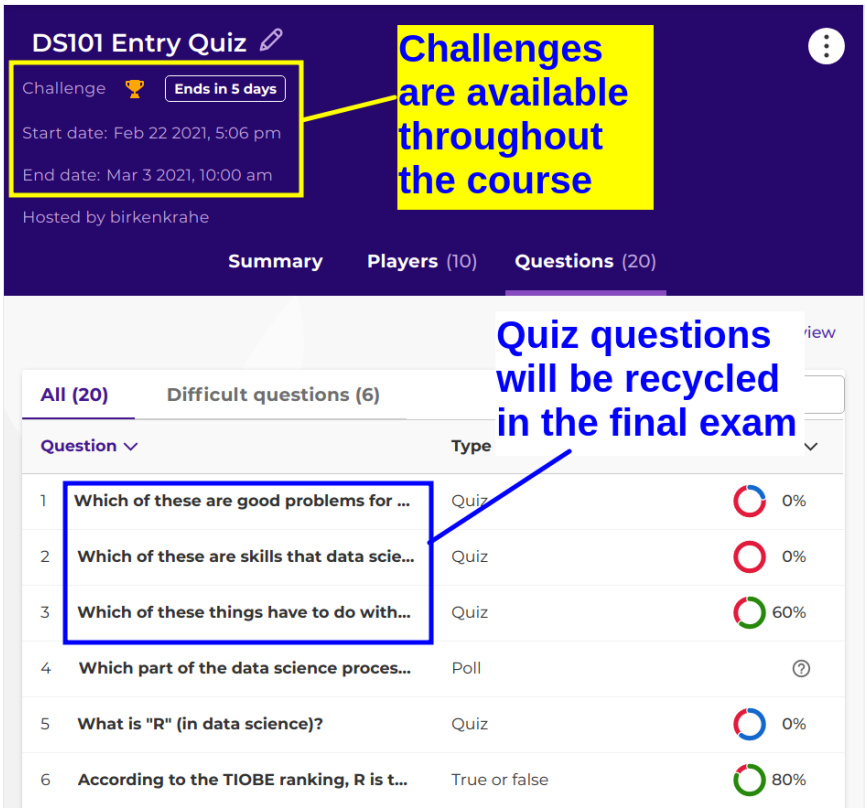
- Register at DataCamp today!

Team EDA project

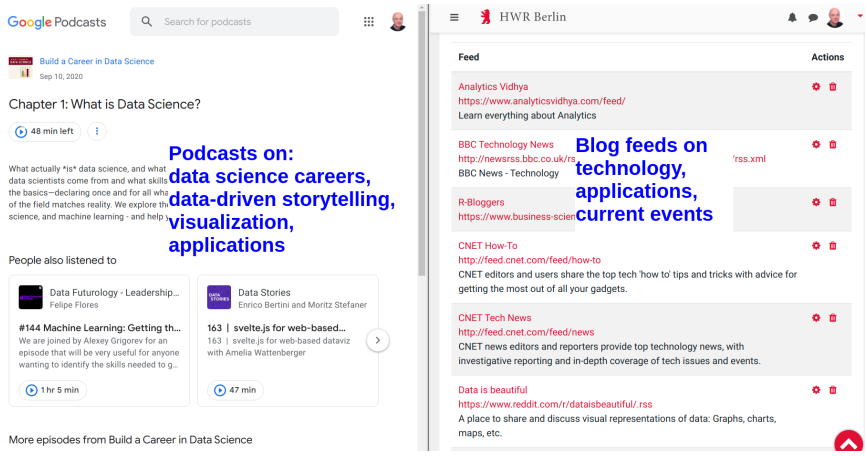


Agile project management

Tests and final exam



Podcasts and feeds



Shared via GitHub / Schoology

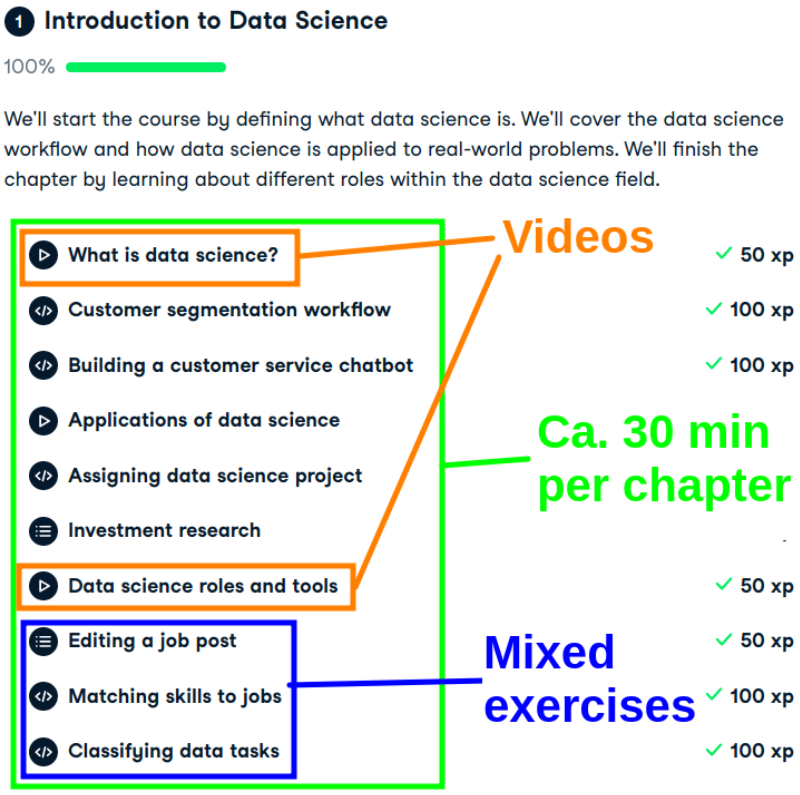
Summary of course activities

- Twice weekly classroom meetings
- Lecture scripts (GitHub)
- Reading assignments (Online)
- Video lectures (YouTube)
- **Online assignments** (DataCamp)
- **Team EDA projects** (Sprints)
- **Tests and final exam**
- Podcasts and feeds

What do you have to do to pass?

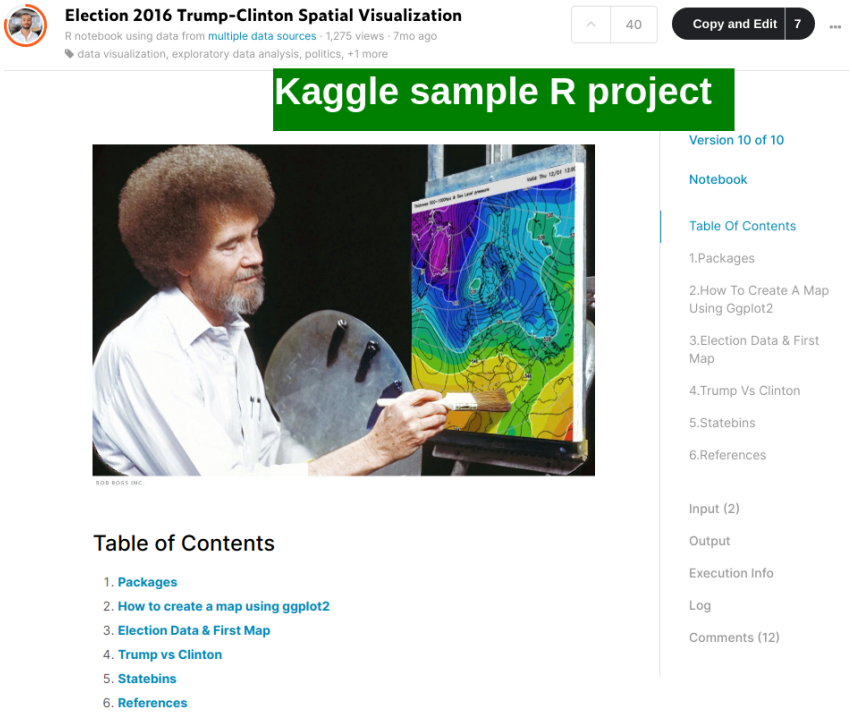
`./img/oceanrock.gif`

DataCamp assignments ($> 50\%$)



Complete at least 8 of 15 assignments

Team project ($> 50\%$)



Present on Nov 30 or Dec 2

What is a team project?

- Description of the dataset
- Introduction of the problem statement
- Description of the methods used
- Visualization of the data (plots!)
- Analysis of the plots
- Limitations of own analysis
- References

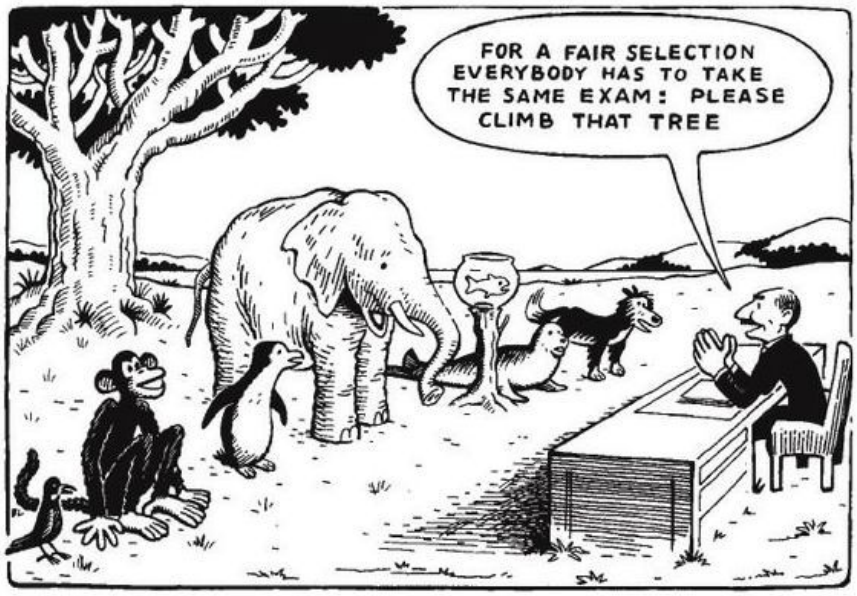
Do you have project examples?

- Examples on Kaggle (example)
- Examples on data science blogs (example)
- Translate from Python to R (example)
- Extend someone else's EDA (example)
- Document an R package (example)
- Use your own data (example)

Can I do a project as an absolute beginner?

- Keep It Simply Scientific (IMRaD)
- Look at examples (e.g. in my bookmarks)
- Create data set (e.g. your productivity)
- Researchers are beginners

Final exam ($> 50\%$)



Final exam: date TBD

What's next?

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In the course

- Intro to Data science (Lecture)
- Intro to DataCamp (Practice)
- Intro to GitHub (Productivity)
- Intro to R (Language)

Your challenges

What?	When?
Register at DataCamp	Today
Register at GitHub	Today
Complete test challenge	Aug 24
Complete DataCamp assignment	Aug 24
Set up team project (2-3 ppl)	Sep 2
Check FAQs x 2 in GitHub	n.d.
Ask questions (class/GitHub)	n.d.

**) do this every week until December*

Any questions?

`./img/stonehenge.gif`

A copy of this presentation is available.