UNIVERSITY OF COPENHAGEN

# Second exercise class

Class 5

Introduction to numerical programming and analysis

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Spring 2021

# Plan

1. Key takeaways from each DataCamp-course

2. Git example

3. DataCamp exercises

# Key takeaways from each DataCamp-course

# Introduction to Python

- The atomic types: integers, floats, strings, boolean (True/False) (2)
- Lists, including slicing and the difference between copying and referencing objects (2)
- Basic mathematical operators, including the ** -operator (exponentiation), the % -operator (called the modulus or modolu -operator, not to be mistaken with the absolute value of a number, which is just *abs()*), and the // -operator (floor division) (2)
- Using functions with keyword (default) arguments, and importing packages with further functions (2)
- Some experience with numpy arrays and why they are powerful (3)

*The lectures where these topics are covered are in parenthesis*

# Intermediate Python

- Plotting using Matplotlib, line plots and customization options can be found in lecture (3), while histograms are in lecture (4)
- Dictionaries (2)
- Pandas DataFrame and referencing the using loc and iloc (7)
- Creating Boolean types using conditions and if/elif/else-statements (2)
- While- and for- loops, and the *enumerate()* - function (2)
- Drawing random numbers using numpy (4)

*The lectures where these topics are covered are in parenthesis*

# Python Data Science Toolbox (Part 1)

- Creating your own Python functions and understanding the difference between global and local variables, variable-length arguments (*args) and variable-length keyword arguments (**kwargs) (2)
- Tuples, and how they differ from lists (2)
- Preventative error handling including *try-except* and *raise* (2 and 5)
- More DataFrame experience and how to combine them with functions (7)

*The lectures where these topics are covered are in parenthesis*

# Python Data Science Toolbox (Part 2)

- Iterators and the *zip()* -function (2)
- List and dict comprehension (using iterables to create new lists and dicts conveniently) (2, although dict comprehension is not mentioned in the lecture the concept is the same as with lists)
- Using *open()* -function to open files saved on your computer (2)
- Generators, how they differ from comprehensions and creating a generator function by replacing *return* with *yield* (not mentioned until lecture 12, as its main advantage is that it lessens memory use, so unless you have performance problems you can stick to comprehensions)
- Even more DataFrame experience and how to read csv files (7)

*The lectures where these topics are covered are in parenthesis*

# Extra

**Two important things which Christian has covered in lecture 2 but you will not encounter in DataCamp**

- Floats not being exact but approximations (they are 'floating') - can be important when creating conditions which should hold analytically but might not hold numerically (the *numpy.isclose()* -function can be useful in such cases)
- The *itertools.product()* -function, can be very useful to avoid having to create loops inside of loops

# Git example

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Guide for cloning a repository

**What I'll do:**

I'll show you how to fork and git-clone the Exercises
And how to commit and sync changes

If you're having trouble with cloning the lecture notebooks, it might be because your computer has a limit on the length of file paths. Open the program 'Git Bash' as administrator -> type in 'git config –system core.longpaths true' -> close the program (it doesn't react when you do this), and try again. (see here)

# DataCamp exercises

# DataCamp exercises

**Now it's time for DataCamp exercises**

- If you get stuck somewhere or have trouble understanding a concept, write in the 'General'-chat. If it's complicated or about installation we can also talk about it in the 'Talk channel'.
- You're in charge of taking breaks
- If you have a group, write the group name and name of the members in the chat, I'll then make a channel for you.
- I'll call you all back to recap here at around 16:55
- If you've finished DataCamp, but do not feel ready for the problems sets you can look through this notebook, which I made last year