The ABC of computational Text Analysis

09: Introduction to Python

Alex Flückiger
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Recap last Lecture

- converting any kind of data to `.txt`
- data is never raw but depends on many decisions

  You better think about it!

Outline

- enter the shiny world of Python 😎

  development environment
  basic syntax

Python

Programming Language

Python is

- general-purpose

  not specific to any domain

- interpreted

  no compiling

- standard language in data science

How to learn programming?

three inconvenient truths 😰

- programming cannot be learnt in a course

  I try to make the start as easy as possible!
- frustration is normal

  fight your way!
- the Python ecosystem is huge

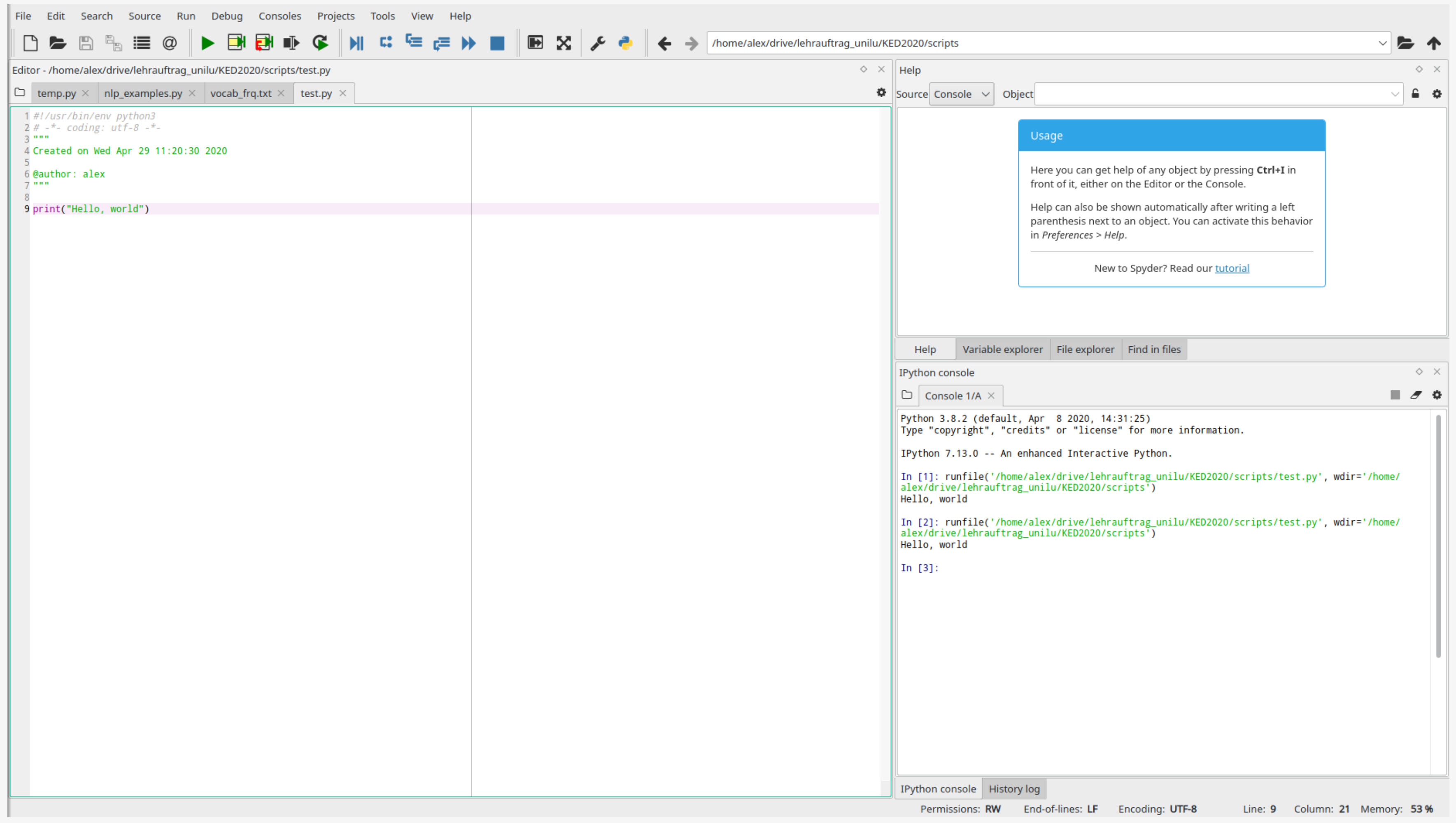
  grow skills by step-by-step

Programming can be absolutely captivating! ✌️

Development Editor

Spyder IDE

- integrated development environment (IDE)
  - *interactive development*
  - *similar to RStudio*
- views
  - *scripting*
  - *variable explorer*
  - *python console*



```python
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
Created on Wed Apr 29 11:20:30 2020

@author: alex
"""

print("Hello, world")
```

Usage

Here you can get help of any object by pressing **Ctrl+I** in front of it, either on the Editor or the Console.

Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in *Preferences > Help*.

New to Spyder? Read our tutorial

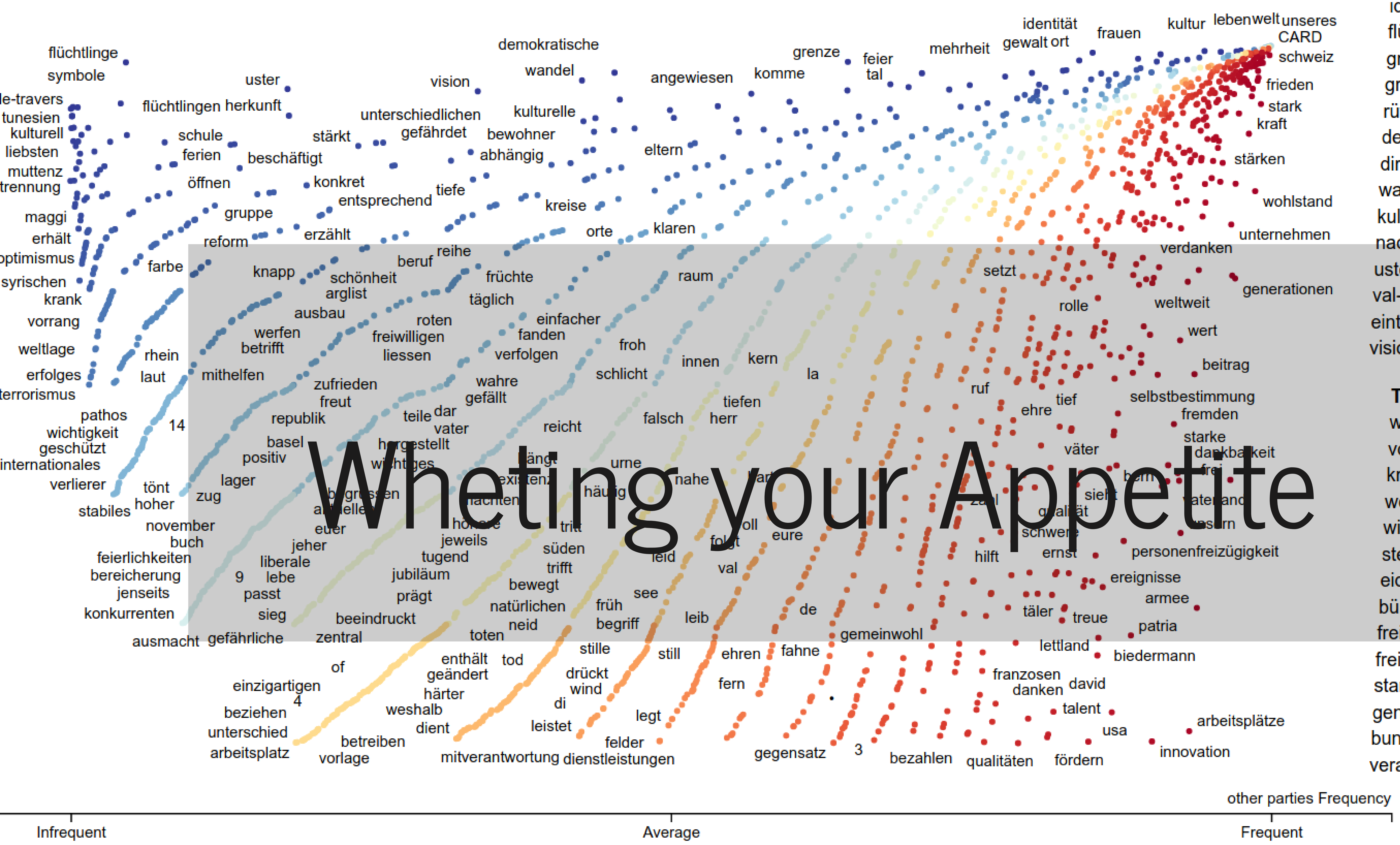
```
Python 3.8.2 (default, Apr  8 2020, 14:31:25)
Type "copyright", "credits" or "license" for more information.

IPython 7.13.0 -- An enhanced Interactive Python.

In [1]: runfile('/home/alex/drive/lehrauftrag_unilu/KED2020/scripts/test.py', wdir='/home/
alex/drive/lehrauftrag_unilu/KED2020/scripts')
Hello, world

In [2]: runfile('/home/alex/drive/lehrauftrag_unilu/KED2020/scripts/test.py', wdir='/home/
alex/drive/lehrauftrag_unilu/KED2020/scripts')
Hello, world

In [3]:
```

First Steps in Python

How to start?

1. open the program `Spyder`
2. set working directory
3. save your script
4. write code `print("Hello, World!")`
5. run code + debug
6. run saved script in shell `python your_script.py`

Wheting your Appetite



Top SP

identität
flüchtlinge
grenze
grenzen
rütli
demokratische
direkte
wandel
kultur
nachbarn
uster
val-de-travers
eint
vision

Top other parties

wohlstand
volk
kraft
werte
wirtschaft
steht
eidgenossen
bürger
freiheit
frei
stark
generationen
bundesbrief
verantwortung

Characteris

CARD
unseres
freiheit
demokratie
eidgenossen
wohlstand
zukunft
unserem
eidgenossen
unseren
verantwortung
gemeinsam
politischen
bundesrat
nationalfeierta
vertrauen
werte
schweiz
vielfalt
bewusst
wirtschaftlichen
zusammenhalt
feiern
generationen
bundesbrief
menschen
schliesslich
schweizerinnen
heutigen
kantone

Syntax

Variables

variables are kind of storage boxes

```
# define variables
x = "at your service"
y = 2
z = ", most of the time."

# combine variables
int_combo = y * y       # for numbers any mathematical operation
str_combo = x + z       # for text only concatenation with +

# show content of variable
print(str_combo)
```

Data Types

type is implicit (dynamic)

Name	What for?	Type	Examples
String	Text	str	`"Hi!"`
Integer, Float	Numbers	int, float	`20`, `4.5`
List	Lists (ordered, mutable)	list	`["Good", "Afternoon", "Everybody"]`
Boolean	Truth values	bool	`True`, `False`
⋮	⋮	⋮	⋮
Tuple	Lists (ordered, immutable)	tuple	`(1, 2)`
Dictionary	Relations (unordered, mutable)	dict	`{"a":1, "b": 2, "c": 3}`

Data Type Conversion

combine variables of the same type only

```
# check the type
type(YOUR_VARIABLE)

# convert types (similar for other types)
int('100')  # convert to integer
str(100)    # convert to string

# combine two types
x = 3
mixed = "x has the value: " + str(x)
print(mixed)
```

Equal-Sign: = vs. ==

= contradicts the intuition

```python
# assign a value to a variable
x = 1
word = "Test"
# compare two values if they are identical
1 == 2          # False
word == "Test"      # True
```

Comments

- comments ~ lines ignored by Python
- do it, it helps you …

  to learn initially

  to understand later

```
# single line comment

"""
comment across
multiple
lines
"""
```

Iterations

for-loop

do something with each element of a collection

```python
sentence = ['This', 'is', 'a', 'sentence']
# iterate over each element
for token in sentence:
    # do something with the element
    print(token)
```

Conditionals

if-else statement

condition action on variable content

```python
sentence = ['This', 'is', 'a', 'sentence']
if len(sentence) < 3:
    print('This sentence is shorter than 3 tokens')
elif len(sentence) == 3:
    print('This sentence has 3 tokens')
else:
    print('This sentence is longer than 3 tokens')
```

Indentation

indentation matters!

- intend code within code blocks

  loops, if-statements etc.

- press tab to intend

✅

```
if 5 > 2:
    print('5 is greater than 2')
```

❌

```
if 5 > 2:
print('5 is greater than 2')
```

Methods

```python
# split at whitespace
tokens = 'This is a sentence'.split(' ')

# check the variable
print(tokens, type(tokens))
# add something to a list
tokens.append('.')
# join elements to string
tokens = ' '.join(tokens)
print(tokens, type(tokens))
```

Functions and Arguments

- functions have the form

  `function_name(arg1, arg2)`

- functions may have arguments

```python
# define a new function
def word_properties(word):
    """
    My first function to print word properties.
    It takes any string as argument (variable word).
    """

    # print(), len() and sorted() work also as functions
    length = len(word)
    sorted_letters = sorted(word, reverse=True)
    print(word, 'length:', length, 'letters:', sorted_letters)
word_properties('computer') # call function with any word
```

Indexing

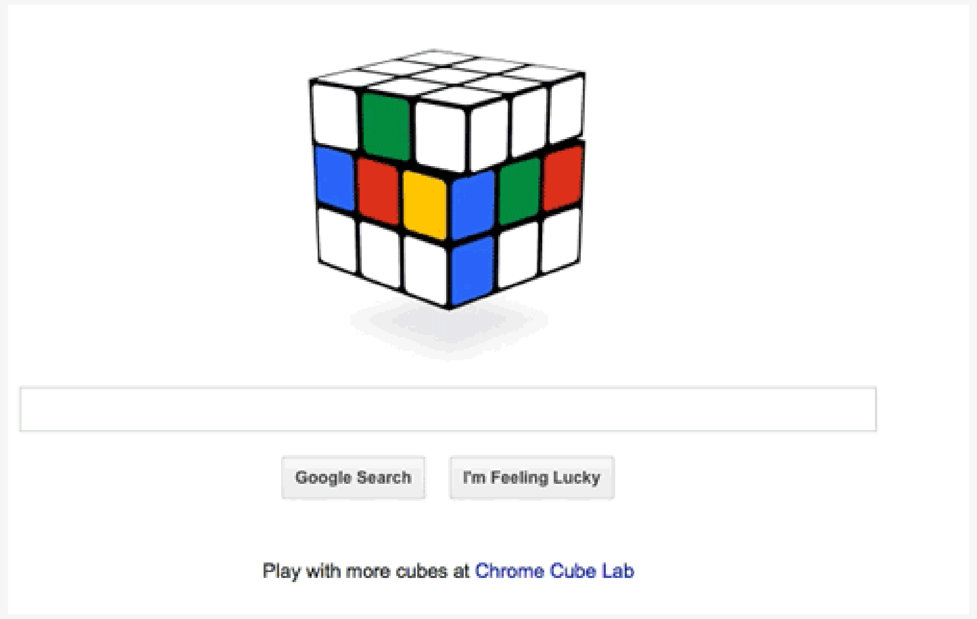
python starts counting from zero!

```python
sentence = ['This', 'is', 'a', 'sentence']
# element at position X
first_tok = sentence[0]     # 'This'
# elements of subsequence [start:end]
sub_seq = sentence[0:3]     # ['This', 'is', 'a']
# elements of subsequence backwards
sub_seq_back = sentence[-2:]        # ['a', 'sentence']
```

Syntax Errors

1. read the message
2. find the source of the error

   script name + line number
3. paste message into Google



Learning by doing, doing by googling

Modules/Packages

- modules provide functionalities
- no programming from scratch 🎉

NLP Packages

- spaCy

  industrial-strength Natural Language Processing (NLP)

- textaCy

  NLP, before and after spaCy

- scattertext

  beautiful visualizations of how language differs across corpora

In-class: Install Packages for next week

```
# Windows users
# open a Anaconda Prompt and install the following
pip install spacy
conda install -c conda-forge pyemd
pip install textacy
pip install scattertext

# Mac users
# open a Terminal and install after replacing the username
/Users/<Your username>/anaconda3/bin/python -m pip install spacy
/Users/<Your username>/anaconda3/bin/python -m pip install textacy
/Users/<Your username>/anaconda3/bin/python -m pip install scattertext

# All users: install language specific models
python -m spacy download de_core_news_sm
python -m spacy download en_core_web_sm
```

In-class: Exercises I

1. Make sure that your local copy of the Github repository KED2020 is up-to-date with `git pull`. Check out the script with the basics of Python: `scripts/python_basics.py`.
2. Try to understand and run the commands line-wise. Modify them to see how the output changes. Initially, the try-and-error is good strategy to learn.

In-class: Exercises II

1. Write a Python script that

    takes text (a string)
    splits it into words (a list)
    iterates over all the tokens and print all tokens that are longer than 5 characters
    Bonus: wrap your code in a function.

2. Go to the next slide. Start with some of the great interactive exercises out there in the web.

Resources

learn basics interactively

- Python Principles
- LearnPython

official Python introduction

- Python introduction