The ABC of Computational Text Analysis

#9 Introduction to Python

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Recap last Lecture

- from words to embeddings 🌈

  relational, re-contextualized word meaning

- data-driven NLP is both powerful and biased 👊 🤕
- data is never raw but depends on many decisions 💭
- Questions ❓

Outline

enter the shiny world of Python 😎

- development environment
- basic Python syntax


Python

Python is ...

a programming language

- 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

  *my goal is 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! ✌️

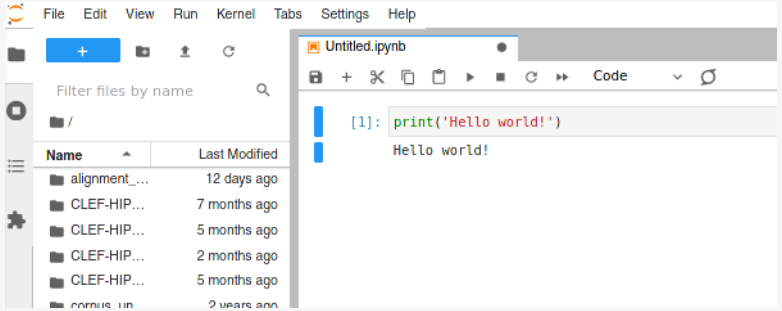
Jupyter Lab Editor

Getting started

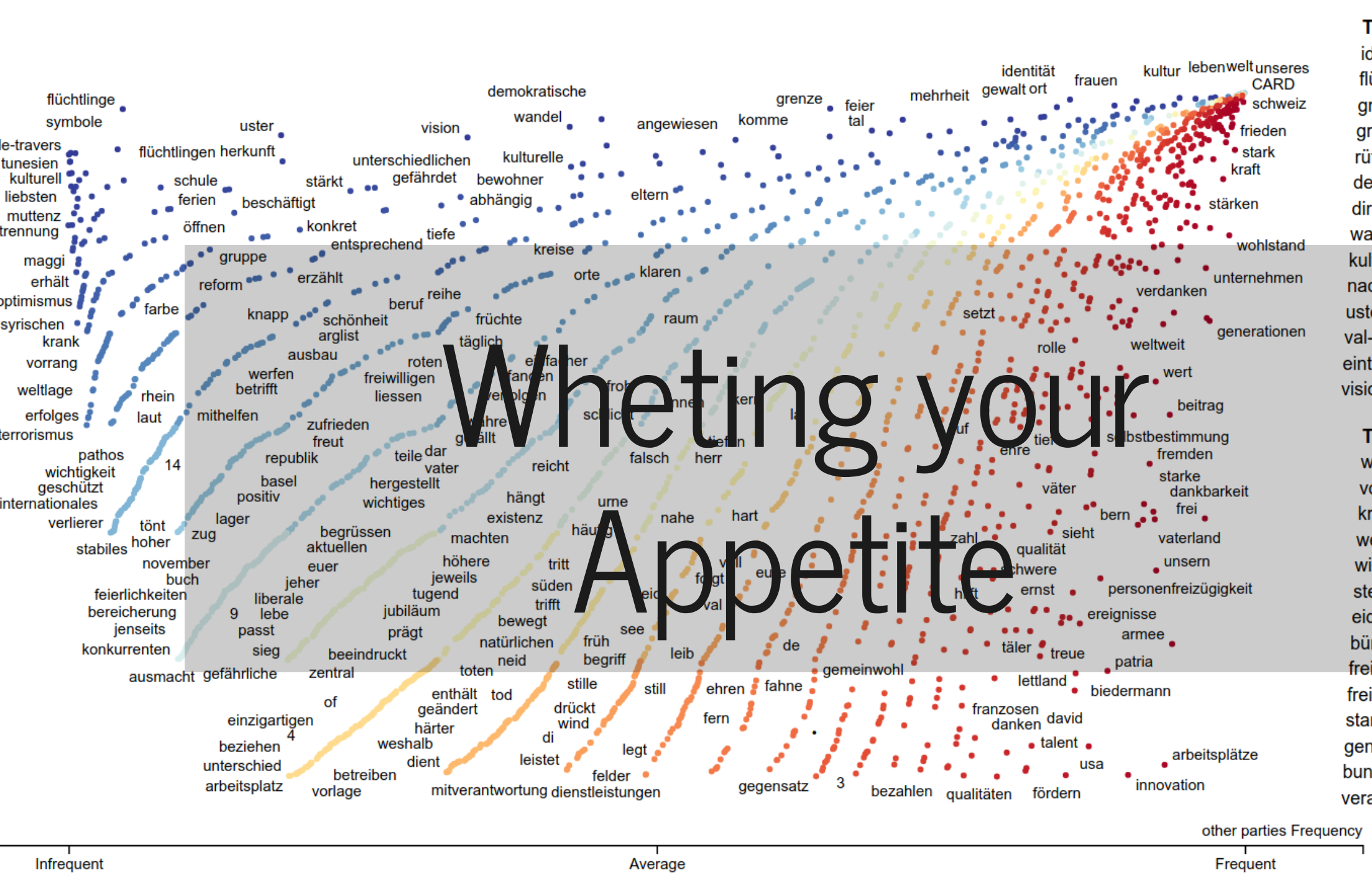
- Open Terminal/Ubuntu
- `jupyter lab --no-browser`
- Copy the link and open in your browser
- `print("Hello, World!")`

Features

- web-based editor
- interactive development
- showing code next to output and comments
- language-agnostic



Jupyter Lab Editor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verantwortung
vertrauen
werte
schweiz
vielfalt
bewusst
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zusammenhalt
feiern
generationen
bundesbrief
menschen
schliesslich
schweizerinnen
heutigen
kantone
other parties Frequency
Infrequent
Average
Frequent

Python 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

The object's 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

# include variable in a f-string
x = 3
mixed = f"x has the value: {x}"
print(mixed)
```

Confusing Equal-Sign

= vs. == contradicts the intuition

```
# 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

```
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

```
sentence = ['This', 'is', 'a', 'sentence']

if len(sentence) == 3:
    print('This sentence has exactly 3 tokens')
elif len(sentence) < 5:
    print('This sentence has less than 5 tokens')
else:
    print('This sentence is longer than 5 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

```
# 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

```
# define a new function
def word_properties(word):
    """
    Print some properties of the provided word.
    It takes any string as argument (variable word).
    """

    # print(), len() and sorted() are functions themeselves
    word_length = len(word)
    sorted_letters = sorted(word, reverse=True)
    print(f"Properties for the word '{word}':")
    print("length:", word_length, "letters:", sorted_letters)

word_properties("computer") # call function with the word "computer"
```

Indexing

Python starts counting from zero!

```
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']
```

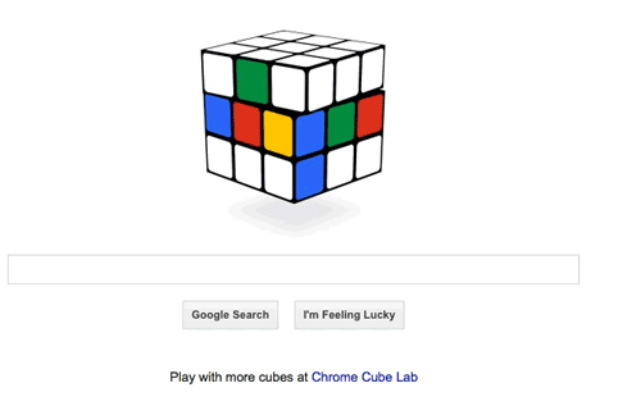
Syntax Errors

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

   script name + line number

3. paste message into Google

   check answers on stackoverflow



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

open Terminal/Ubuntu

```
# install scattertext
conda install -c conda-forge scattertext

# install language specific models for spacy
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 KED2021 is up-to-date with `git pull`. Open the Notebook with the Python Basics in Jupyter Lab: `materials/code/python_basics.ipynb`.
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 in Jupyter Lab that

   takes a 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


Questions?