Lecture 6: Dictionaries

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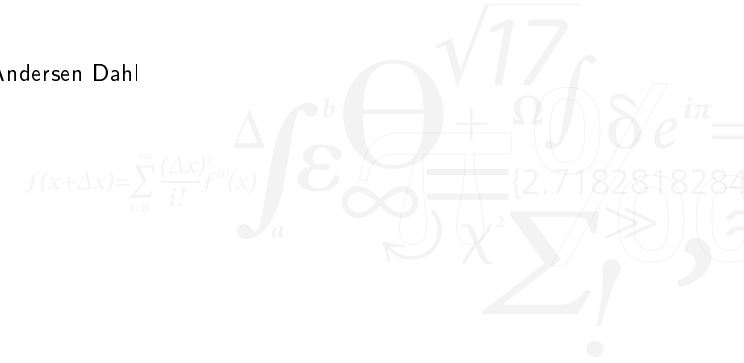

Today's lecture

1. Dictionaries (ca. 30 min)
2. Coding example (ca. 30 min)

Python Installation Support

Do you have problems getting Python to work?

Check https://pythonsupport.dtu.dk for changes on opening hours

Office hours	Monday	Tuesday	Wednesday	Thursday	Friday
10-12:30	302.A92	302.A92	302.A92	302.A92	302.A92
12:30-16		302.A92	302.A92	358.002	302.A92
18-22	Online	Online	Online	Online	Online

Online Help

pythonsupport@dtu.dk

https://pythonsupport.dtu.dk

Dictionaries: creation

```
my_dictionary = {'name': 'Sasha', 'age': 14, 'class': '8b'}
another_dictionary = {1: 'one', 303: 'three o three'}
third_dictionary = {'aqua': 101, 'audit': 27}
yal = {'seg': [1, 2, 3], 'dct': my_dictionary}
empty_dictionary = {}
```

- Look back at lists: a sequence of values indexed by integers starting with 0, i.e. index-value pairs.
- Dictionary – a sequence of key-value pairs.
- Word `dict` is a built-in type, don't use it as a variable name.

Dictionaries: accessing values

```
my_dict = {'a': 'apple',
           'b': 'banana',
           'c': 'cucumber',
           'd': 'durian'}
print('apple' in my_dict)
print('a' in my_dict)
for k in my_dict:
    print(k)
keys = my_dict.keys()
values = my_dict.values()
items = my_dict.items()
```

- Keyword `in` checks for dictionary keys
- When using `in` with `for` loop, the dictionary keys are traversed

Dictionaries: adding and changing

```
my_dict = {'a': 'apple', 'b': 'banana',
           'd': 'durian', 'g': 'grapes',
           'j':'jackfruit', 'p':'pear'}

keys = my_dict.keys()
values = my_dict.values()

my_dict['d'] = 'date'
my_dict['m'] = 'mango'

print(keys)
print(values)
```

- Dictionary keys and values are mutable like lists

Dictionaries: use

```
person = {
  "first_name": "John",
  "last_name": "Smith",
  "age": 27,
  "address": {
    "street_address": "21 2nd Street",
    "city": "New York",
  },
  "phone_numbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
  ],
  "children": [
    "Catherine",
    "Thomas",
    "Trevor"
  ],
  "spouse": None
}
```

- Setting for larger projects
- Collection of unstructured information

Dictionaries use

```
names = ["John", "Bob", "Alice"]
ages = [23, 45, 67]

print(ages[names.index("Bob")])

# This is a bad idea.
# It's better to use a dictionary.

name_to_age = {"John": 23, "Bob": 45, "Alice": 67}
print(name_to_age["Bob"])

```

- Can accomplish the same as lists... but with much faster and cleaner syntax

Example 1

Write a function that takes a string. The function should return a dictionary where the keys are letters. The value for each key is a list of all the words from the string starting with that letter.

Solve the problem in two different ways:

- By creating a dictionary that contains 26 keys, one for each letter of the (English) alphabet.
- By creating a dictionary that contains only keys needed for storing the words that occur in the string.

Coding example

`alpha2phone.py`, (slightly modified) exam from May 2016.

Alpha to phone

On a phone keypad, each letter of the alphabet is assigned to one of the digits 2-9. This makes it possible to write alpha-numeric phone numbers using a mix of letters and digits (by replacing digits in the phone number by the corresponding letters).

Problem formulation

Create a function `alpha2phone` that takes as input an alpha-numeric (letters and digits) phone number as a string, and returns the corresponding numeric (only digits) phone number as a string. You may assume that all letters in the input are given as upper case.

Consider the alpha-numeric phone number 4525DTU1. Converted to a numeric phone number, it should be 45253881.

Code used for coding examples

Example 1

```
text = "hej med dig der xylophon"

# Solution with dict having all letters as keys
alphabet = 'qwertyuiopasdfghjklzxcvbnm'
word_dict1 = {}
for letter in alphabet:
    word_dict1[letter] = []
for word in text.split():
    word_dict1[word[0]].append(word)
print(word_dict1)

# Solution with dict having only keys for letters that are in the text
word_dict2 = {}
for word in text.split():
    if word[0] not in word_dict2:
        word_dict2[word[0]] = []
    word_dict2[word[0]].append(word)
print(word_dict2)
```

alpha2phone

```
phone_dict = {'A': 2, 'B': 2, 'C': 2,
        'D': 3, 'E': 3, 'F': 3,
        'G': 4, 'H': 4, 'I': 4,
        'J': 5, 'K': 5, 'L': 5,
        'M': 6, 'N': 6, 'O': 6,
        'P': 7, 'Q': 7, 'R': 7, 'S': 7,
        'T': 8, 'U': 8, 'V': 8,
        'W': 9, 'X': 9, 'Y': 9, 'Z': 9}

def alpha2phone(phone_input):
    phone_output = ""
    for character in phone_input:
        if character in phone_dict:
            phone_output += str(phone_dict[character])
        else:
            phone_output += character
    return phone_output

print(alpha2phone("4525DTU1"))
```