

**Big Data Management and Analytics**  
WS 2016/17

**Tutorial 1: Introduction to Python**

**Assignment 1-1**     *Installing Python*

Visit the website <https://www.continuum.io/downloads> and download the Anaconda distribution for the Python 3.5 version. Make yourself familiar with the jupyter Python notebook which is included in the anaconda installation. If preferred, install also an IDE/editor of your choice.

**Assignment 1-2**     *Lists, List comprehension*

Create a list which contains all numbers from 0 to  $n$  squared by using list comprehensions.

**Assignment 1-3**     *Loops and conditionals*

Using the created list from assignment 1-2, return each element of the created list separately if it is an odd number, by using a loop and conditionals. Try using different type of loops.

**Assignment 1-4**     *Functions*

Based on assignment 1-3, write a function which takes an integer  $n$  and returns a list of squared numbers which are odd.

**Assignment 1-5**     *Assignments*

Given a list  $a = ['I', 'like', 'cookies']$  and another list  $b = a$ . Replace in the list  $b$  the word *'cookies'* with *'apples'*. Finally print both lists ( $a$  and  $b$ ). What do you observe? What leads to the observed behavior?

**Assignment 1-6**     *Shallow Copy I*

Given a list  $a = ['I', 'like', 'cookies']$  and another list which takes a shallow copy of  $a$ ,  $b = a[:]$ . Like in the previous assignment 1-5, replace in the list  $b$  the word *'cookies'* with *'apples'*. Finally print both lists ( $a$  and  $b$ ). What do you observe now?

**Assignment 1-7**     *Shallow Copy II*

Now we are given a list  $a = ['I', 'like', 'chocolate', 'cookies']$  and another list which takes a shallow copy of  $a$ ,  $b = a[:]$ . Change now the word *'cookies'* with *'apples'* in  $b$ . Now print again both lists ( $a$  and  $b$ ). What do you observe? What leads to the observed behavior?

### Assignment 1-8 *Deep Copy*

Like in the previous assignment, we are given a list  $a = ['I', 'like', ['chocolate', 'cookies']]$ . Another list  $b = \text{deepcopy}(a)$  takes this time a deep copy from  $a$ . Change now the word 'cookies' with 'apples' in  $b$ . Print both lists ( $a$  and  $b$ ). What do you observe now?

*Hint: For deep copy, first type: **from copy import deepcopy**.*

### Assignment 1-9 *Dictionaries I*

Create a dictionary with  $n$  entries, where the keys are enumerated from 0 to  $n - 1$  and the values are their corresponding keys squared. Use list comprehensions.

Example for expected result:  $n = 7$ ;  $\{0 : 0, 1 : 1, 2 : 4, 3 : 9, 4 : 16, 5 : 25, 6 : 36\}$

### Assignment 1-10 *Dictionaries II*

Use the dictionary from the previous assignment. Write a list comprehension to get a list of all the keys of the dictionary.

### Assignment 1-11 *Lambda functions*

Write a list comprehension which takes a number  $n$  and returns a list with even numbers, using a lambda function.

### Assignment 1-12 *map*

First write a function which takes a length in inch and returns a length in cm. Given a list  $l$  with lengths in inches:

$l = [4, 4.5, 5, 5.5, 6, 7]$

Write a list comprehension which takes  $l$  and returns a list with all values converted to cm using *map*.

### Assignment 1-13 *filter*

Write a list comprehension which filters the list  $l$  from the assignment above by returning only sizes between 4 and 6 inches.

### Assignment 1-14 *reduce*

Write a list comprehension which reduces the list  $l$  by summing up all lengths.

*Hint: for using the reduce function, you need to import it first by: **from functools import reduce***

### Assignment 1-15 *numpy/scipy*

Given two 3D vectors:  $a = [2, 3, 1]$ ,  $b = [4, 6, 2]$

Write a function which takes two vectors  $x$  and  $y$  and returns the angle between the two vectors. Use the numpy functions *np.dot* and *np.linalg.norm(v)*.

*Hint: numpy is already provided by the anaconda installation. For this assignment you need to import numpy first with: **import numpy as np***

Literature:

Mark Pilgrim - Dive into python: <http://www.diveintopython3.net/>