AI1072: Machine Learning, exercise sheet 2b

Generally, you should use a separate .py file for each exercise. From the command line, you can execute these files (that you create with any editor, e.g. gedit) by invoking:

python3 <filename>

When executing files in this way, Python prints nothing except when you tell it to, with print(). So be sure to print out each results explicitly.

1 Python functions

Create a function fak(x) that computes $x!$ recursively by observing that $0! = 1$ and $x! = x(x-1)!$. Call that function with arguments from 1 to 6.

2 Python list creation

Create lists with the following properties, choose names like $ex1\_1, 2, 3$ for them:

1. numbers from 0 to 10 that are even
2. numbers from 0 to 100 that can be divided by 15 (use %, the modulus operator and list comprehension)
3. odd numbers from 15 to 1
4. the string "xx", repeated 5 times
5. the string "stringX" repeated 10 times, where X goes from 5 to 14. Use the builtin function str() to convert numbers to strings and the fact that strings can be concatenated using the "+" operator
6. a list with the items "1", 2, 3.0, 4
7. all the numbers from 0 to 99 that contain the cypher "3". You may use the method find() that all strings possess to look for a substring. If it is found, the start index is returned, otherwise -1.

3 Python list manipulation and slicing

Create a list with numbers from 0 to 49 and...

1. create and call a function that returns its first element and the remaining list
2. create and call a function that returns the sum, difference and modulus of the first and last element

3. create and call a function that sums up the list and returns the result!
4. create and call a function that returns the list elements at odd index positions
5. create and call a function that copies out the list elements from the last element to the second one (excluding the fist, ie the one at index 0)
6. create and call a function that returns an inverted list, i.e., that starts at the end and includes all elements including the first
7. create and call a function that returns a list, of the same length as the argument, that has 1 wherever the argument is odd, and 0 elsewhere. Hint: use list comprehension!

4 Python dictionary creation and manipulation

First, create an empty dictionary D.

1. Fill D with key-value pairs of the form 1:"1", 2:"2", ... up until 10:"10". Use a for loop for this!
2. Dictionaries keys can be iterated over using the .keys() method. Loop over all keys and print out those that are even!
3. Dictionaries values can be iterated over using the .values() method. Loop over all values and print them out!
4. Dictionaries key/value pairs can be iterated over using the .items() method. Loop over all key/value pairs and print them out!

5 Bonus: Python iteration

Create a function $pr(x, i)$ that prints out the first i elements of an iterable x. Test this function with a tuple, a list, a string, a dictionary and an iterator given by range() as examples of iterables. What happens when i is larger than the number of elements in the iterable?