UNIVERSITÄT BIELEFELD
Faculty of Technology

Programming

Object-oriented programming

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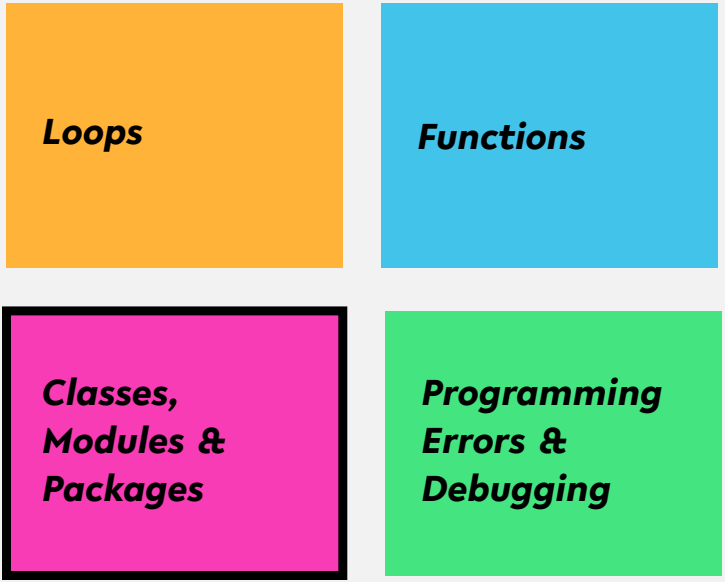
Loops
Functions
Classes, Modules & Packages
Programming Errors & Debugging

Creating new types

- A `class` defines a new type
- It can provide
  - class variables & functions
  - instance variables & functions

Classes—example of code reuse

```
1  class Library:
2      description = 'This␣is␣a␣Library'
3
4      def __init__(self, name):
5          # name the library
6          self.name = name
7          # create empty book storage on initialization
8          self.storage = list()
9
10     def addBook(self, book):
11         self.storage.append(book)
12
13     def getAllBooks(self):
14         return tuple(self.storage)
15
16 myLib = Library('Bodleian␣Library')
17 myLib.addBook('The␣Art␣of␣Computer␣Programming␣(D.␣Knuth)')
```

Modules

- Every `.py` file is a module
- Modules can host functions, variables, and classes
- Imported modules with `import` statement
- Should not have blocks of code that are immediately executed
- Explicit reference to module scope: `global`
- Name of module available as global variable `__name__`

Modules—example of code reuse

mystringutils.py

```
#
# A module for all kinds of string utils
#

def findSubstringInStrings(stringCollection,
      pattern):
    occ = list()
    for i, s in enumerate(stringCollection):
        j = s.find(pattern)
        while j != -1:
            occ.append((i, j))
            j = s.find(pattern, j+1)
    return occ
```

myscript.py

```
#!/usr/bin/env python3

import mystringutils

if __name__ == '__main__':
    myStringList = ['the␣rain␣in␣spain',
        'ain\'t␣no␣sunshine',
        'she␣was␣greeted␣with␣disdain']

    occOfAin = mystringutils.
        findSubstringInStrings(myStringList,
         'ain')
    print(occOfAin)
```

Modules—example of code reuse

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def findSubstringInStrings(stringCollection,
      pattern):
    occ = list()
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        j = s.find(pattern)
        while j != -1:
            occ.append((i, j))
            j = s.find(pattern, j+1)
    return occ
```

myscript.py

```
#!/usr/bin/env python3

import mystringutils as su

if __name__ == '__main__':
    myStringList = ['the rain in spain',
        'ain\'t no sunshine',
        'she was greeted with disdain']

    occOfAin = su.findSubstringInStrings(
        myStringList, 'ain')
    print(occOfAin)
```

Modules—example of code reuse

mystringutils.py

```
1  #
2  # A module for all kinds of string utils
3  #
4
5  def findSubstringInStrings(stringCollection,
       pattern):
6      occ = list()
7      for i, s in enumerate(stringCollection):
8          j = s.find(pattern)
9          while j != -1:
10             occ.append((i, j))
11             j = s.find(pattern, j+1)
12     return occ
```

myscript.py

```
1  #!/usr/bin/env python3
2
3  from mystringutils import
       findSubstringInStrings
4
5  if __name__ == '__main__':
6      myStringList = ['the␣rain␣in␣spain',
7          'ain\'t␣no␣sunshine',
8          'she␣was␣greeted␣with␣disdain']
9
10     occOfAin = findSubstringInStrings(
           myStringList, 'ain')
11     print(occOfAin)
```

Packages

- Way of structuring multiple modules into a directory hierarchy
- Package directories must contain a `__init__.py` file
- Can be imported the same way as modules
- Python itself offers many packages, and even more third-party packages are available through *package managers* such as `conda`

Quiz

- In Python, a class is _____ for an object.

  a nuisance an instance a blueprint a distraction

- Consider the following class:

```
1 class Dog:
2     def __init__(self, name, age):
3         self.name = name
4         self.age = age
```

What is the correct statement to instantiate a `Dog` object?

- `Dog('Rufus', 3)`
- `Dog(self, 'Rufus', 3)`
- `Dog.__init__('Rufus', 3)`

source (in part): https://realpython.com/quizzes

Quiz

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Recap

Summary

- Code reuse through
  - Classes
  - Modules & Packages

What comes next?

- Write your first classes and modules
- Due date for this week's exercises is ***Wednesday, Dec 6, 2pm, 2023***.

Next lecture: Input, file processing & text mining …