Multimedia-Programmierung
Übung 1

Ludwig-Maximilians-Universität München

Sommersemester 2017

Good to Know

- Ansprechpartner:
  - Bitte erst mal die Tutoren ansprechen.
  - Wenn das Problem/die Frage nicht geklärt werden konnte bitte an Renate Häuslschmid wenden.
  - Professor Hußmann ist in diesem Semester im Sabbatical, also bitte nur im Ausnahmefall ansprechen.

- Weitere Hilfe:
  - Informatiker Forum http://www.die-informatiker.net/
  - Mimuc Twitter Account (inoffiziell) http://twitter.com/mimuc
  - Medieninformatik LMU Facebook Gruppe (inoffiziell) https://www.facebook.com/groups/36775131102/

Übungsbetrieb

- Informationen zu den Übungen:
  http://www.medien.ifi.lmu.de/mmp
- Anmeldung über UniWorX
  https://uniworx.ifi.lmu.de/?action=uniworxCourseWelcome&id=694
- Zwei Stunden pro Woche
- Praktische Anwendungen zum Gebiet Multimediaprogrammierung
- Vorbereitung auf die Übungsblätter
- Wöchentliche Übungsblätter
- Spieleprojekt zum Abschluss

Bonuspunkte und Klausur

Bewertung:

- Klausur
- Keine Klausurvoraussetzungen, keine Bonuspunkte für Übungsblätter
- Bonuspunkte für Klausur durch Abschlussprojekt gegen Ende der Übungen (10% Bonus für Klausur)

MMP im Nebenfach (bspw. KuM):

- Angepasste Bewertung bei der Klausur
- Angepasste Projektaufgabe (für Bonuspunkt)

Plagiate

Das Abschlussprojekt wird auf Plagiate geprüft
Plagiat führt zum Verlust der Bonuspunkte

Zudem sind weitere Konsequenzen auf Grund des Betrugsversuchs möglich.

Overview

…Events, Animations, Physics Simulations, Sound…

Final Project: Erstes eigenes Spiel!

Vorläufige Agenda

Woche ab…	Thema
01.05.2017	Allgemeine Einführung & in Python
08.05.2017	Einführung in PyGame /SDL
15.05.2017	Einführung in C++
22.05.2017	Einführung in Cocos2D-X
29.05.2017	Animationen in PyGame / Cocos
05.06.2017	Sprites in PyGame / Cocos & Spritebuilder
12.06.2017	Physics in Cocos / Start Final Project
19.06.2017	Sound in PyGame / Cocos
Bei Bedarf	Klausurvorbereitung

Today

What is Python?

- Programming language
- Supports object oriented as well as functional programming
- Fully dynamic type system
- Runs on all major operating systems

- Goal: create a **simple**, **efficient** and **easy-to-learn** programming language

"Wer hat's erfunden?"
"Die Holländer!"

Guido van Rossum. Programmer of Python.
Source: Doc Searls

For this lecture

- Python 3.5.1 (oder 2.7.6 für Linux) http://www.python.org/download/
- Pygame 1.9.2 (oder 1.9.1) http://www.pygame.org/download.shtml

- Recommended IDEs:
  - Netbeans 8.0 or higher (incl. JDK 8)
  - Eclipse 3.5 or higher
  - Atom

- Up-to-date installation recommendations: http://kidscancode.org/blog/2015/09/pygame_install/

Installation of Python (3.5.1) and Pygame (1.9.2)

Example: Windows

Python:

✓Download Python version, e.g. 2.7.6 oder 3.5.1, from: https://www.python.org/downloads/
✓Run the file and select „Add Python 3.5 to PATH“.
✓Click „Customize Installation” und select every checkbox for “Optional Features“.
✓You do not need to make changes on the „Advanced Options. Run the installation.

Pygame installieren:

✓Download a suitable insaller from www.lfd.uci.edu/~gohlke/pythonlibs/#pygame
✓Start the command line (e.g. by Win Key + R → input cmd and press return) and enter
✓`C:\Users\name\> cd Downloads`
✓`C:\Users\name\Downloads> pip install pygame-1.9.2a0-cp35-none-win_amd64.whl`
✓Test the installation with the following command:

```
C:\Users\name\Downloads> python
```

And run pygame

```
>>> import pygame
```

✓If you did not receive an error message, the installation worked.

Python Integration into Eclipse (3.5 or higher)

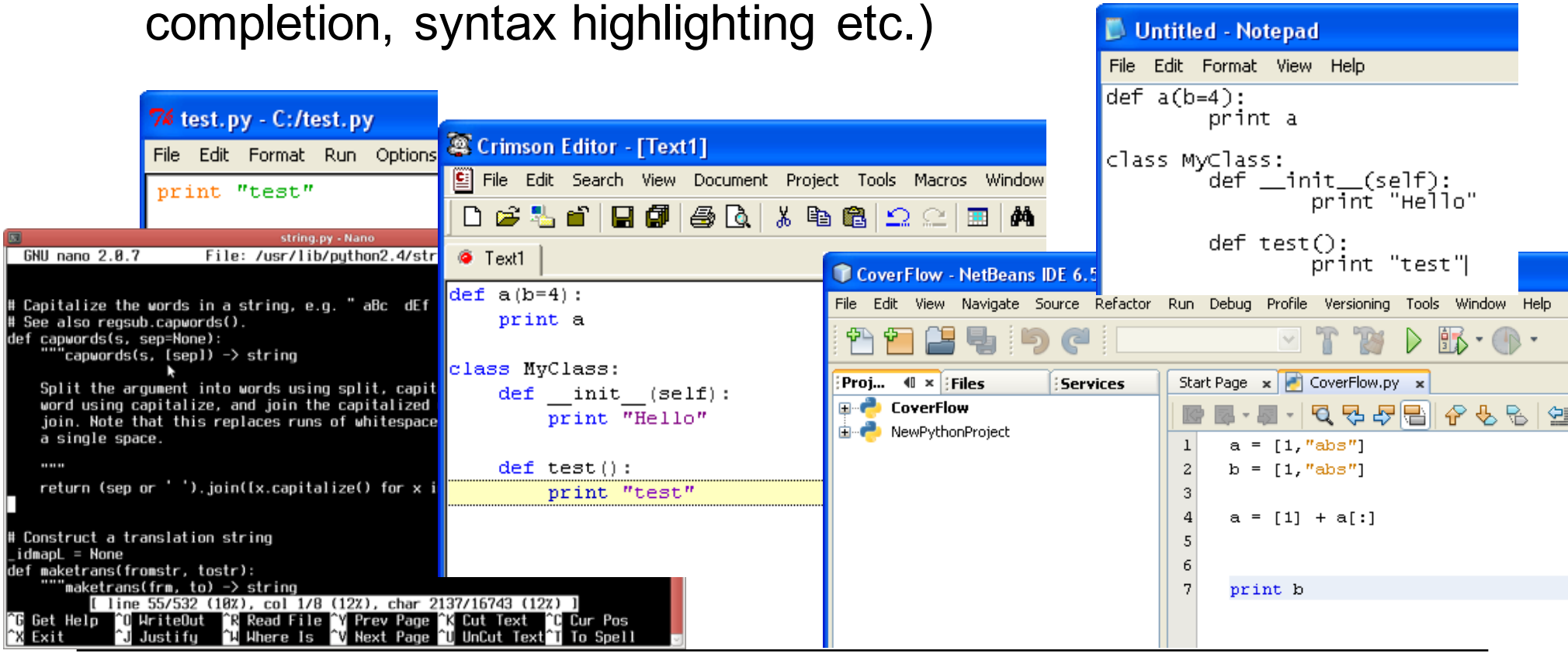
- More detailed installation manual: http://www.pydev.org/manual_101_install.html
- Click Help → Install New Software...
- Click Add and enter:

  Name: Pydev and Pydev Extensions

  Location: http://pydev.org/updates
- „Pydev“ and „Pydev Mylyn Extension“ should appear now → check „Pydev“ and go on (2x).
- Deselect „Contact all update sites during install to find required software“ and go on.
- Accept the Licence Agreement and go on.
- Restart Eclipse.

Writing Python Code

- Python scripts are **text files**
- Thus they can be written using **any text editor**
- **IDEs** provide additional support (debugging, code completion, syntax highlighting etc.)



Python – which version should I use? (Probably 3.x)

Aspect	Python 2	Python 3
Print function	**print** 'Hello, World!'	**print**('Hello, World!')
Integer division	3 / 2 = 1	3 / 2 = 1.5
Exceptions	**raise** IOError, "file error"	**raise** IOError("file error")
Error handling	**except** NameError, err:	**except** NameError **as** err:
Next function	next(my_generator) my_generator.next()	next(my_generator)

Further improvements:

- for-loop variables don't leak into the global namespace
- Unicode by default
- input() stores strings by default

Sources:

- http://sebastianraschka.com/Articles/2014_python_2_3_key_diff.html
- https://blog.appdynamics.com/devops/the-key-differences-between-python-2-and-python-3/
- https://wiki.python.org/moin/Python2orPython3

Python code is compact


```
public class Hello {

    public static void main (String args[]) {
        System.out.println("Hello World!");
    }

}
```


```
print “Hello World!“
```

v. 2.x

```
print (“Hello World!“)
```

v. 3.x

Python code is intuitive


```
String[] a = [“test1“];
String[] b = [“test2“];

String[] c = ArrayUtils.addAll(a, b);

or

String[] a = [“test1“];
String[] b = [“test2“];
String[] c = new String[a.length+b.length];
System.arraycopy(a, 0, c, 0, a.length);
System.arraycopy(b, 0, c, a.length,
b.length);
```


```
a = [“test1“]

b = [“test2“]


c = a + b
```

Python code is fun


```
String a = “test“;

String b = ““;

for(int i = 0; i<5; i++) {
    b = b + a;
}
```

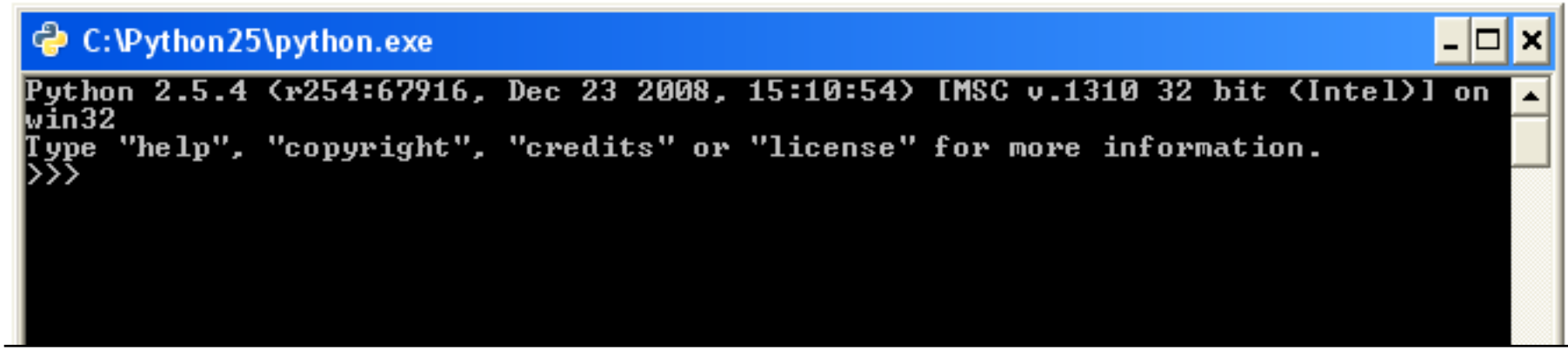

```
a = “test“

b = a * 5
```

Executing Python Code

Interactive Mode

- Lines of Python code can be directly interpreted by the Python interpreter
- Results are immediately visible

- Comes with all standard Python installations
- Mac OS X/Linux: type “python” in the command shell/Terminal
- Windows: e.g. start python.exe from your Python folder



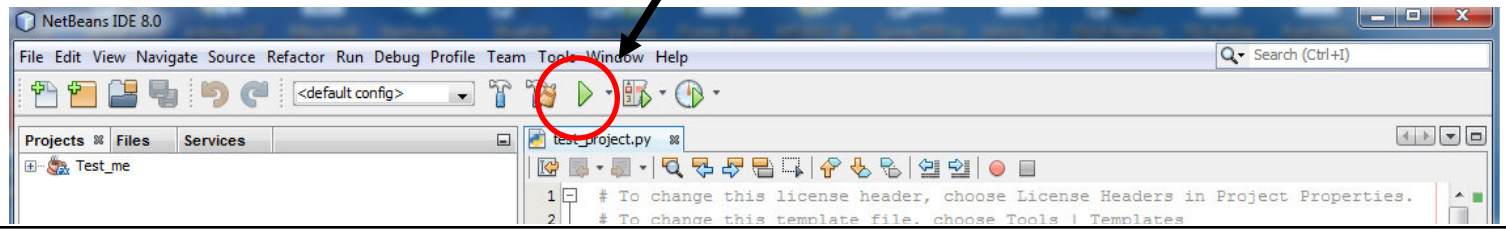
Executing Python Code

Python Scripts

- Python programs are usually called scripts
- Script files end on .py, sometimes .pyw in Windows
- To execute a script use the python interpreter followed by the location of the script

- For example: `python helloworld.py`

- In Netbeans just click the “run” button



Where the %$& § are my delimiters?

- Python does not use special characters as delimiters (e.g. ‘{‘ and ‘}’ in Java)
- Blocks are delimited by indentations/whitespaces

```
a = 1
b = 2

if a > b:
    a = 10
    print a
else:
    a = 100
    print a
```

- editor support recommended
- forces the programmer to write clean and readable code
- a line of code cannot exceed several lines

allowed:

```
a = 1 + 2
```

forbidden:

```
a = 1
+ 2
```

allowed:

```
a = 1 \
+ 2
```

Everything's an Object

with Consequences

Define:

```
def b():
    x = 0
    print x

b()
b = 4
b()
```

Output:

```
0
…
TypeError: 'int' object is not callable
```

id() returns the identifier of the object

is can be used to check whether two objects are the same

Everything's an Object

Types

Define:

```
def b():
    x = 0
    print x

print type(b)
b = 4
print type(b)

print isinstance(b,int)
```

Output:

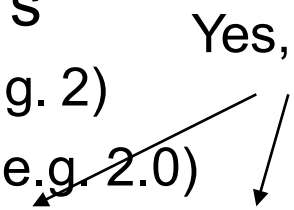
```
<type 'function'>
<type 'int'>
True
```

type() can be used to get the type of an object

isinstance() returns true if an object has a specific type

Types - Examples

- None
  - None
- Numbers
  - int (e.g. 2)
  - float (e.g. 2.0)
  - bool (True and False)
- Sequences
  - str (e.g. “zwei”)
  - tuple (e.g. (1,2))
  - List (e.g. [1,2])
- Callable types
  - functions
  - methods



and many many more …

Comments

or: Being a Good Programmer

```
print "Who stole my Monkey?“ # weird but I‘ll let it in
a = 1
b = 2
print a + b # I hope it‘ll output 3

# print "bye“
```

NebeansTip:

str+shift+c comments the whole selection

Output:

```
Who stole my Monkey?
3
```

Documentation

or: Being a Good Programmer 2

```
def a():
    """This is function a"""
    return 1
print a.__doc__
```

Output:

```
This is function a
```

Functions

Define:

```
def a():
    print "I am function a“

def b(text):
    return "I don‘t like "+text
```

Use:

```
a()
print b("function a")
```

Output:

```
I am function a
I don‘t like function a
```

Functions

Default Parameters

Define:

```
def test(a=1,b=2,c=3):
    print a+b+c

test(1)
test(2,2)
test(c=2)
```

Output:

```
6
7
5
```

Keyword arguments can be used to manipulate specific parameters only.

Namespaces

Local and Global Variables I

Define:

```
def b():
   x = 0
   print x

x = 2

b()
print x
```

Output:

```
0
2
```

Namespaces

Local and Global Variables II

Define:

```
def b():
    global x
    x = 0
    print x

x = 2

b()
print x
```

Output:

```
0
0
```

Namespaces

Local and Global Variables - Episode III

Define:

```
def b():
    x = 0
    print locals()

b()
```

Output:

```
{'x': 0}
```

The functions locals() and globals() can help to get an overview.

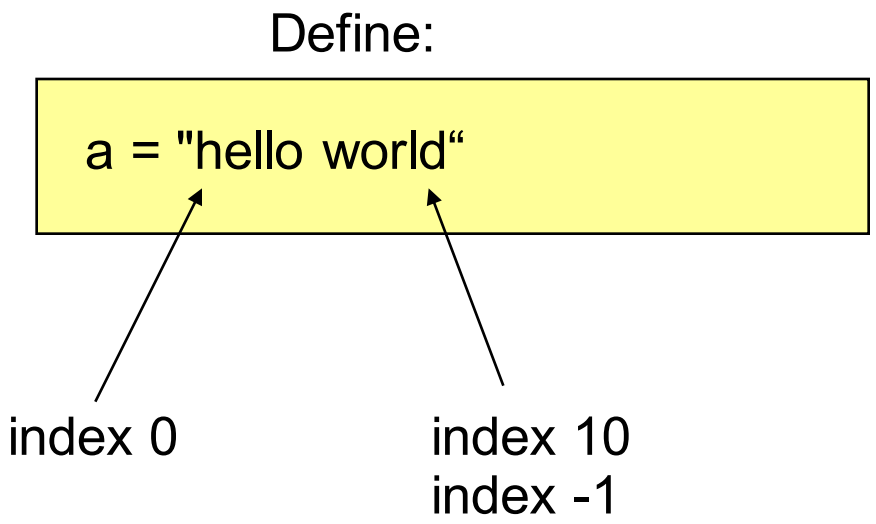
Strings

Range Slice

The range slice notation can be used to access substrings.

string_name[x:y]
x: “from” index starting from 0 (included)

y: “to” index starting from 0 (excluded)



Strings

Examples

Define:

```
a = "hello"
print a[0]
print a[0:]
print a[0:2]
print a[0:len(a)]
print a[2:]
print a[:2]
print a[2:4]
print a[-1]
```

Output:

```
h
hello
he
hello
llo
he
ll
o
```

Attention: strings are immutable!

```
a[2] = "c"
```

```
...
TypeError: 'str' object does
not support item assignment
```

Strings

Formatted Text

Define:

```
print """lalala
test:
        aha"""
```

Output:

```
lalala
test:
        aha
```

Formatted strings are defined using """.

Strings

raw Strings

Define:

```
print "lalala\ntest"
```

Output:

```
lalala
test
```

```
print r"lalala\ntest"
```

```
lalala\ntest
```

Adding an “r” to the string creates a raw string.

Lists a.k.a. Arrays

Define:

```
a = [1,3,"a","b"]
print a
print a[0]

a[0] = 2
print a

print 2 * a
```

Output:

```
[1, 3, 'a', 'b']
1
[2, 3, 'a', 'b']
[2, 3, 'a', 'b',2, 3, 'a', 'b']
```

Lists can contain any types (even mixed).

Dictionaries

Define:

```
priceDict = {'mehl': 99, 'butter': 78}

print priceDict['mehl']
print priceDict.keys()

priceDict['oel'] = 112

print 'oel' in priceDict
```

Output:

```
99
['butter', 'mehl']
True
```

Dictionaries store key-value-pairs.

IF-Statement

Define:

```
a = 0
if a > 0:
    print "a>0"
elif a == 0:
    print "a=0"
else:
    print "none"
```

Output:

```
a=0
```

if...elif...else

Loops

Define:

```
a = [1,3,"a","b"]

for x in a:
    print x

while True:
    print "This will never end. :-s"
```

Don‘t try this at home!

Output:

```
1
3
a
b
This will never end. :-s
...
```

break stops a loop

continue skips to the next part of the loop

Classes

Constructor and Methods

Define:

```
class HelloWorld:
    def __init__(self):
        print "Hello World"

    def test(self):
        print “test"
```

Use:

```
a = HelloWorld()
a.test()
```

Output:

```
Hello World
test
```

Modules

File test.py:

```
def a():
    print "there we are"

def b():
    print "function b"
```

Use:

```
import test

test.a()
```

Or:

```
from test import a

a()
```

Output:

```
there we are
```

Random Module

- The module random contains functions to create random numbers, lists etc.
- randint(a,b) creates a random number of the interval [a,b]
- random() creates a random float of the interval [0.0,1.0]
- shuffle(list) randomly shuffles a list
- Etc.
- Object Random() contains all those functions as well

```
import random

test = random.Random()
print test.random()
print random.randint(0,3)
```

Working with Files

Reading Lines

example.txt:

```
line1
line2
cheese cake
cat
```

Open File:

```
file = open("example.txt", "r")
print file.readline()
print file.readline()
file.close()
```

Output:

```
line1
line2
```

open(filename,mode)

mode: ‘r’ for read, ‘w’ for write

‘a’ for append

Working with Files

Iterating all Lines

example.txt:

```
line1
line2
cheese cake
cat
```

Open File:

```
file = open("example.txt", "r")
for line in file:
print line
```

Output:

```
line1
line2
cheese cake
cat
```

Command Line Arguments

Console:

```
python test.py argument1
```

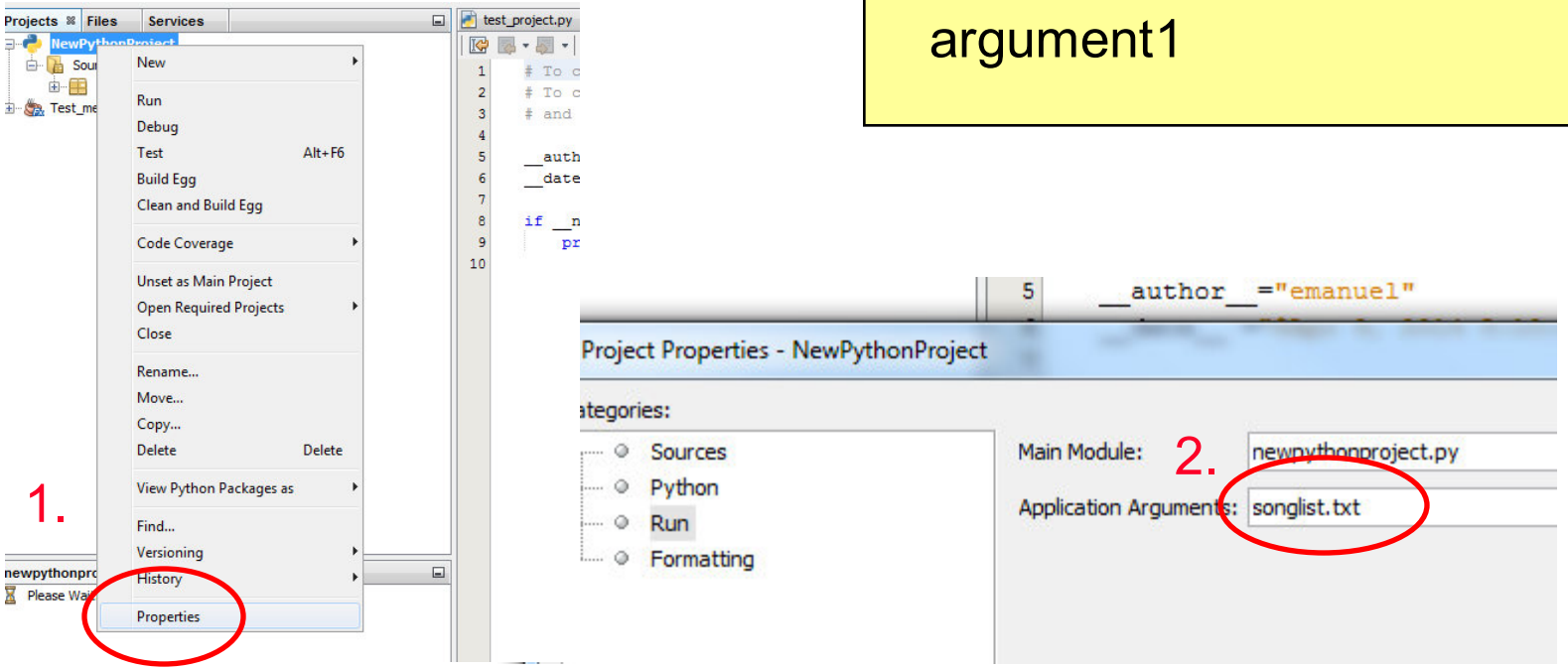
Use:

```
import sys
print sys.argv[1]
```

Output:

```
argument1
```

Netbeans:



Reading Input from the Command Line

Console:

```
a = raw_input("Name:")
```

Output:

```
Name:
```

Waits for user input. If necessary it waits forever. ;-)

input(prompt) is used to get input that is already converted to a type (e.g. an integer)

Exceptions

- Baseclass BaseException
- Own exceptions should be extended from class Exception
- Exceptions can be raised:

```
raise NameError("unknown name")
```

- try ... except to handle exceptions

```
try:
    test = open("test.txt", "r")
except IOError:
    print  "file doesn‘t exist"
```

Useful Links

- Python:
  - http://docs.python.org/
  - https://docs.python.org/2.7/

- Tutorials
  - http://www.learnpython.org
  - https://docs.python.org/3/tutorial/
  - https://docs.python.org/2/tutorial/