

BIOS6642

Introduction to Python Programming

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Outline

- Class information
- Introduction to Python programming
 - What is a program and Python?
 - What will we learn in this class?
 - The first Python program

Class information

- **BIOS 6642:** Introduction to Python Programming
- **Instructor:** Fuyong Xing
- **Term:** Spring 2020
- **Class time:** Tuesdays and Thursdays, 10:30-11:20AM
- **Location:** Education 2 North, Room 2201DE
- **Office hours:** Thursdays, 2:30-3:30PM or email appointment
- **Office:** Q20 (Building 500), W4133
- **Academic calendar:** Colorado School of Public Health in CU Anschutz Medical Campus

Class information

- **Description:** Introduction to the basics of Python 3, including control flow (e.g., conditional execution and iteration), data structures (e.g., lists and dictionaries), class design, etc.
- **Prerequisites or Co-requisites:** BIOS 6611, BIOS 6612, or permission of instructor.
- **Software required:** Python programming environment
 - <https://www.python.org/>
- **Course website:** Canvas
- **Textbook:** *Think Python: How to Think Like a Computer Scientist*, 2nd edition, 2015, by Allen Downey

Class information

- **Recommended readings (books)**

- *Python Cookbook*, 3rd edition, by David Beazley and Brian K. Jones, 2013
- *Python for Data Analysis*, 2nd edition, by Wes McKinney, 2018
- *Fundamentals of Python Programming*, by Richard L. Halterman

- **Assignments:**

- Individual work
- Need to submit source codes and results

- **Final project**

- Individual work
- Need to submit source codes and results

Class information

■ Evaluation

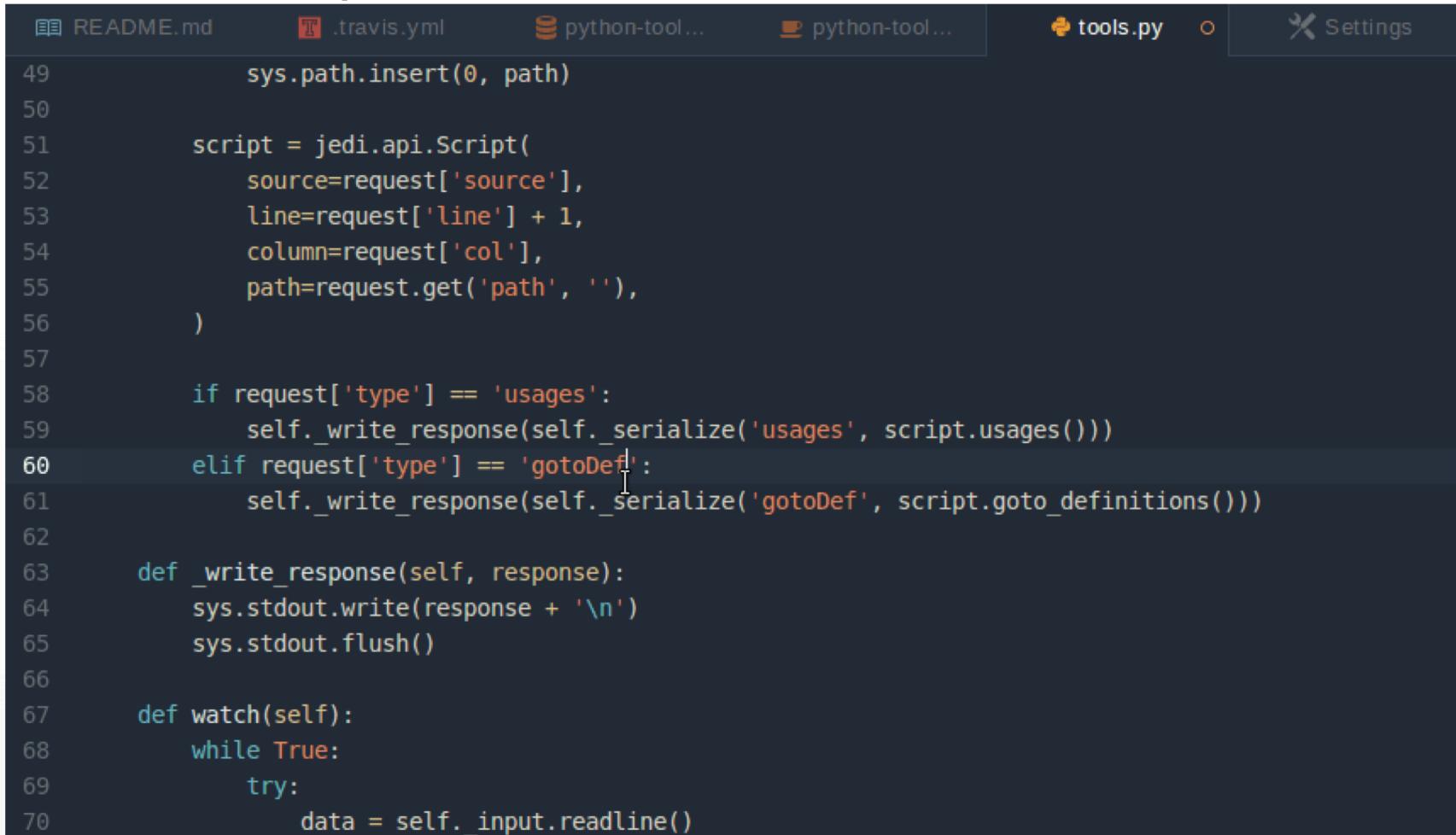
- Homework assignments: 40%
- In-class assignments: 30%
- Participation: 10%
- Final project: 20%

Introduction to Python programming

- Class information
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 - **What is a program and Python?**
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What is a program and Python?

- A program is a sequence of instructions that specifies how to perform a computation.



The screenshot shows the Atom code editor interface with a dark theme. The top navigation bar includes tabs for 'README.md', '.travis.yml', 'python-tool...', 'python-tool...', 'tools.py' (which is the active tab), and 'Settings'. The main code area displays a Python script with the following content:

```
49         sys.path.insert(0, path)
50
51     script = jedi.api.Script(
52         source=request['source'],
53         line=request['line'] + 1,
54         column=request['col'],
55         path=request.get('path', ''),
56     )
57
58     if request['type'] == 'usages':
59         self._write_response(self._serialize('usages', script.usages()))
60     elif request['type'] == 'gotoDef':
61         self._write_response(self._serialize('gotoDef', script.goto_definitions()))
62
63     def _write_response(self, response):
64         sys.stdout.write(response + '\n')
65         sys.stdout.flush()
66
67     def watch(self):
68         while True:
69             try:
70                 data = self._input.readline()
```

What is a program and Python?

- Python is a high-level programming language.
- Created by Guido van Rossum
- First released in 1991
- It can run in different operating systems, such as Windows, Linux, and macOS.



python



■ History of Python

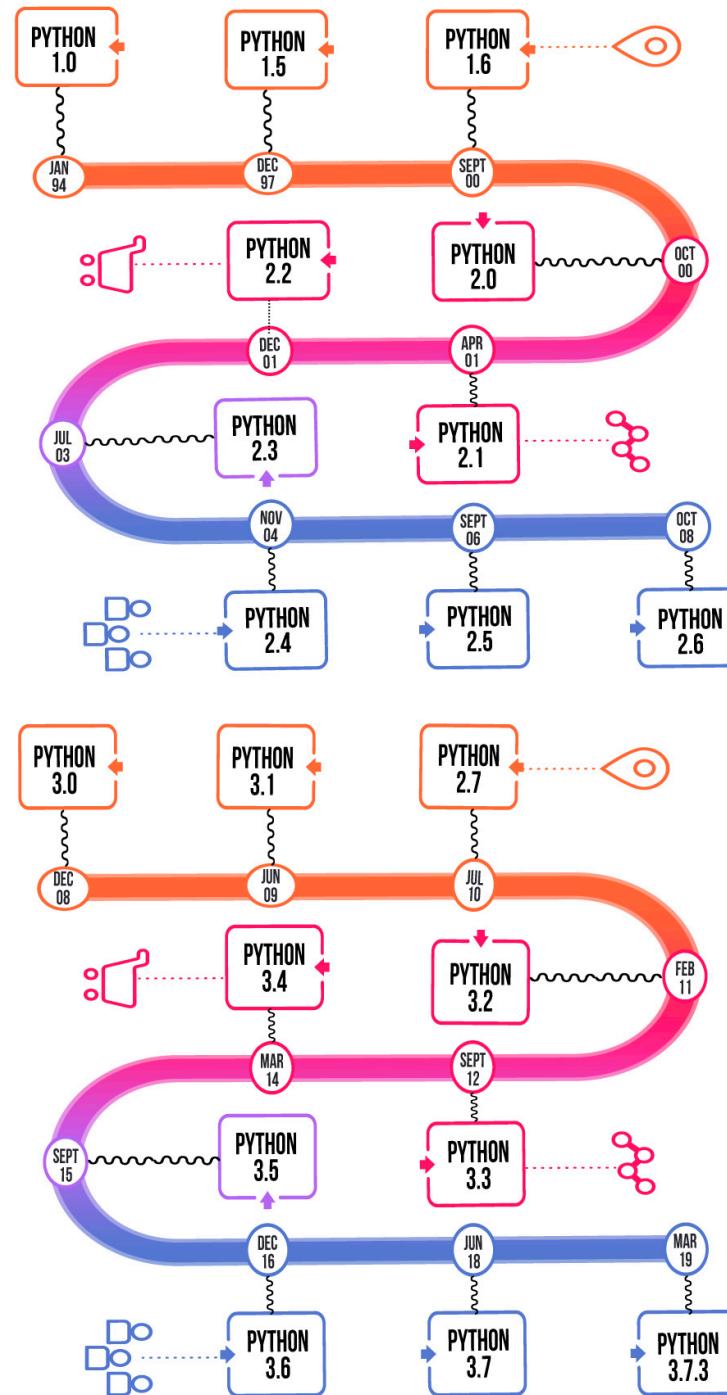
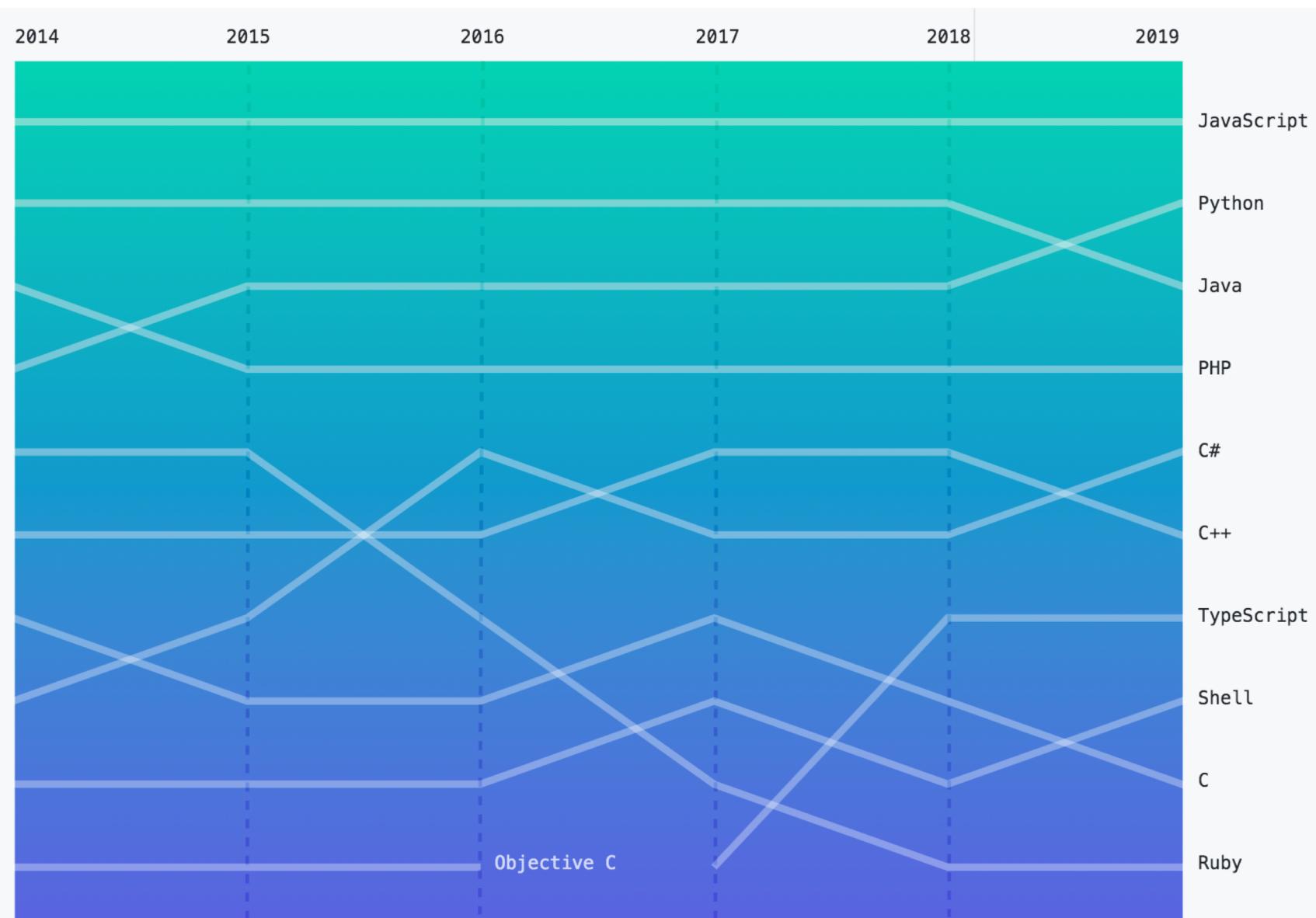


Figure source: <https://www.geeksforgeeks.org/history-of-python/>

What is a program and Python?

- Top programming languages in GitHub.

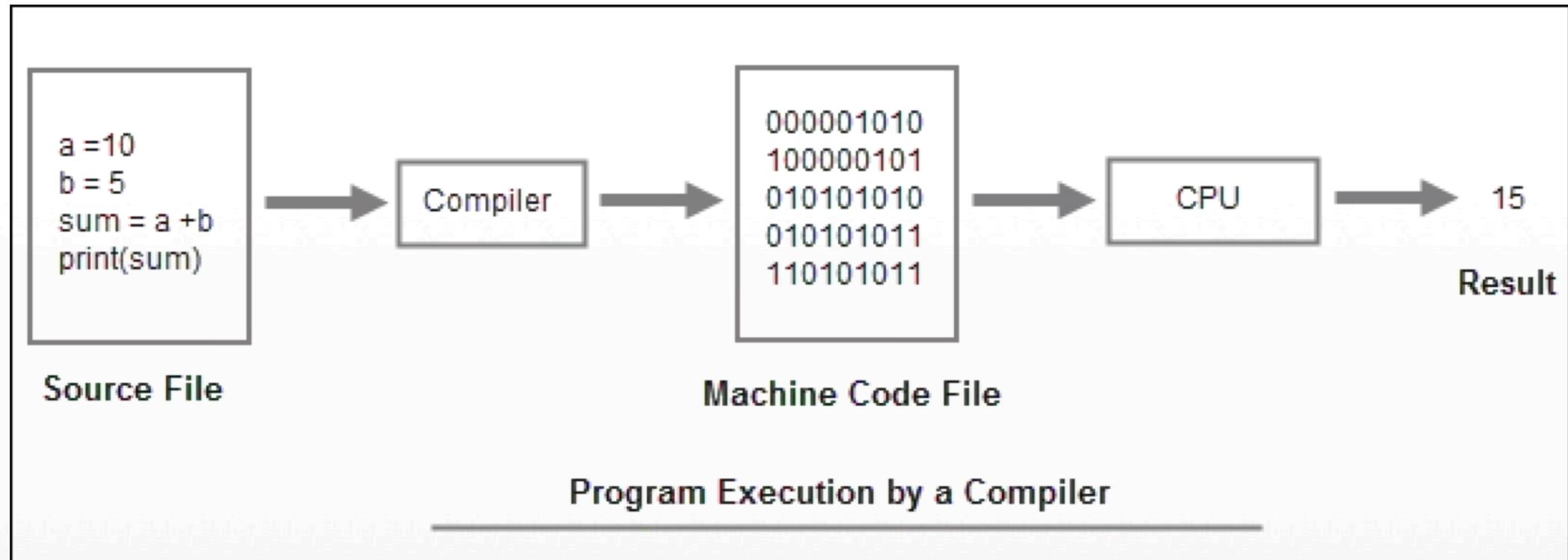


What is a program and Python?

- Computers can not run high-level language program directly, but need to translate high-level language codes into machine codes and then execute them.
- The translation is done by a compiler or an interpreter.
- Python is an interpreted language, unlike C, C++ or Java that are complied languages.

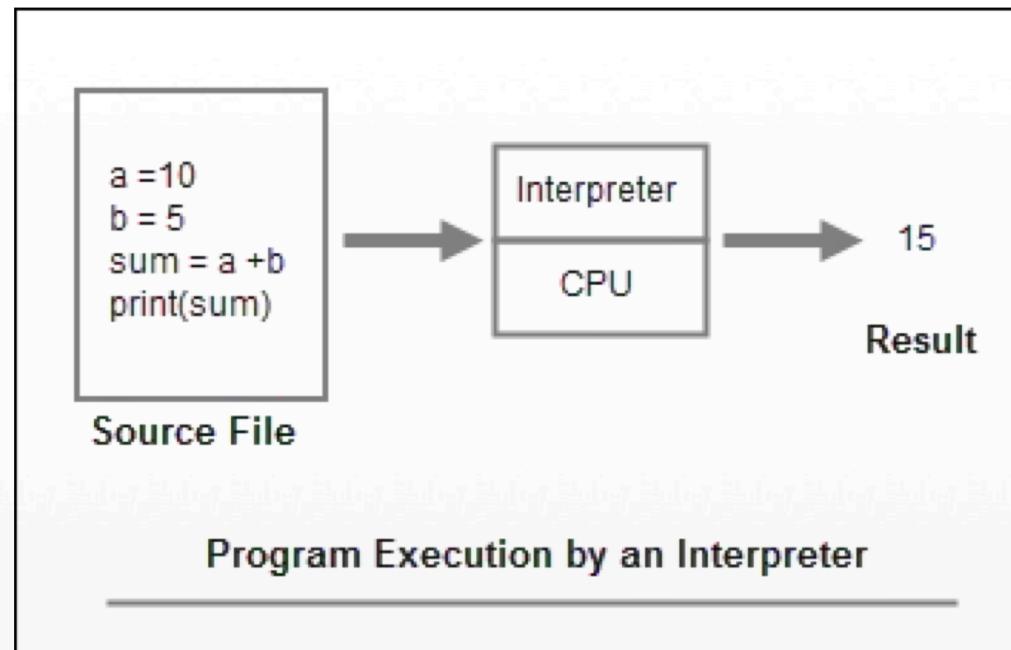
What is a program and Python?

- A compiler translates the entire source code into machine language in one go, the machine language is then executed.



What is a program and Python?

- An interpreter translates high-level language into machine language line by line.
- Python interpreter starts at the top of the file, translates the first line into machine language and then executes it.
- This process repeats until the end of the program.



What is a program and Python?

- Installation of Python
 - <https://www.python.org/about/gettingstarted/>
 - <https://overiq.com/python-101/installing-python/>
- Alternative way: Anaconda installation
 - <https://www.anaconda.com/>

What is a program and Python?

- Python shell: interactive mode

```
Python 3.4.0 (default, Jun 19 2015, 14:20:21)
```

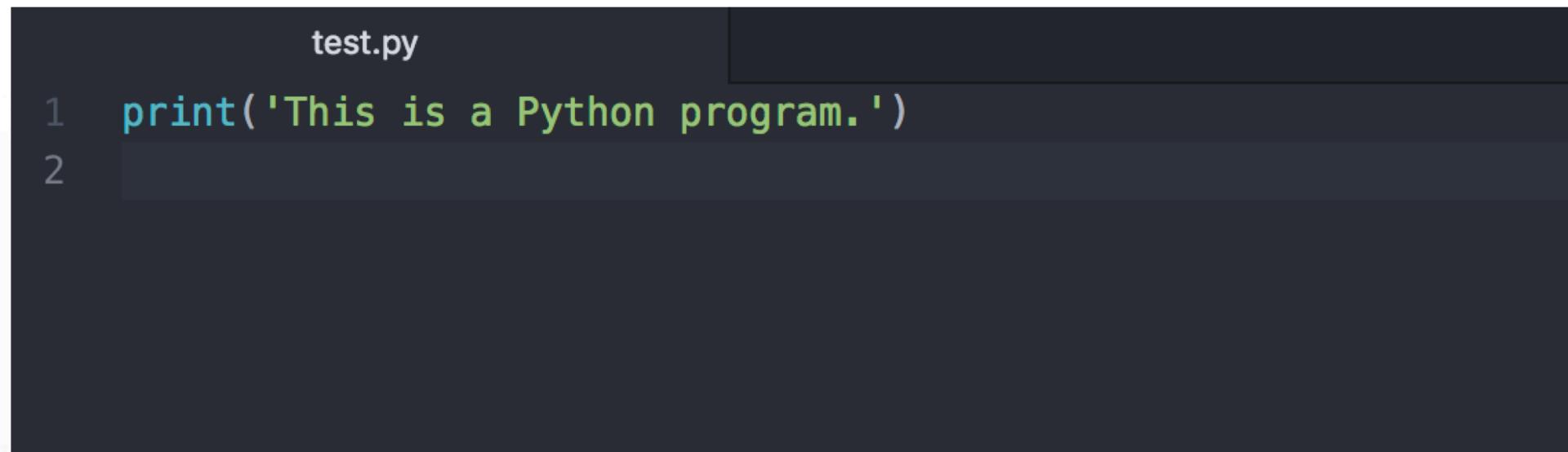
```
[GCC 4.8.2] on linux
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>>
```

What is a program and Python?

- Script mode: use an editor to write the program source code, save it to files and execute it.
- Atom
 - <https://atom.io/>



A screenshot of the Atom code editor interface. The title bar shows 'test.py'. The code editor window contains the following Python code:

```
1 print('This is a Python program.')
2
```

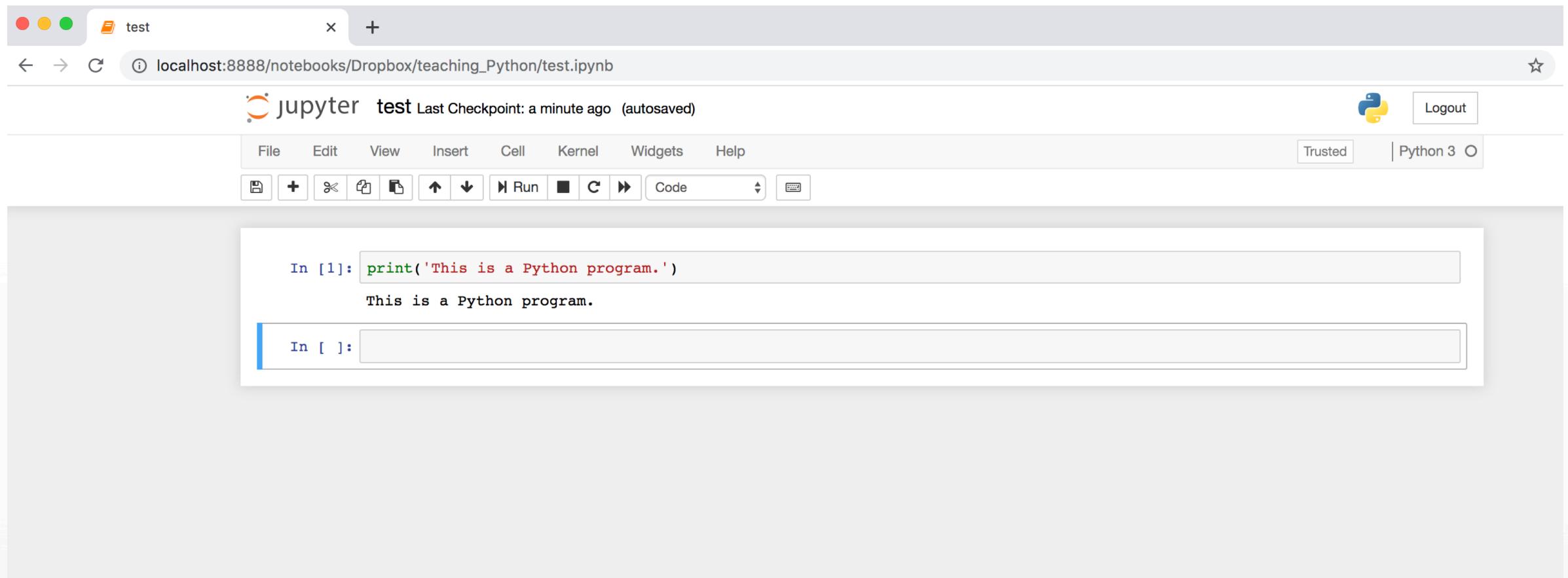
- Sublime Text
 - <https://www.sublimetext.com/>

What is a program and Python?

- Jupyter
 - <https://jupyter.org/>
 - Jupyter provides a productive environment for interactive and exploratory computing.
 - Encourage an execute-explore workflow instead of the typical edit-compile-run workflow
 - Jupyter notebook supports Python and many other programming languages

What is a program and Python?

- Jupyter notebook



What will we learning in this class?

- Class information
- Introduction to Python programming
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 - **What will we learn in this class?**
 - The first Python program

What will we learning in this class?

- Basics concepts such as data types, expressions, assignments, etc.
- Conditional execution and iteration
- Functions, lambda expression, modules, etc.
- Data structures such as lists, tuples, dictionaries, etc.
- Object-oriented programming: class, methods, class inheritance, etc.
- Exception handling
- More ...

The first Python program

- The first program (by convention): “Hello, World!”

Codes

```
# The first Python program.  
print('Hello, World!')
```

Output

```
Hello, World!
```

The first Python program

- The first program (by convention): “Hello, World!”



The first Python program

- The *print* statement is a function: it prints **objects** to the text stream **file**, separated by **sep** and followed by **end**.

```
print(*objects, sep=' ', end='\n', file=sys.stdout, flush=False)
```

- All non-keyword arguments are converted to strings and written to the stream, separated by **sep** and followed by **end**.
- The default values of **sep**, **end**, **file** and **flush** are space, new line character (i.e., '\n'), *sys.stdout*, and *False*, respectively.

The first Python program

- The *print* statement is a function: it prints **objects** to the text stream **file**, separated by **sep** and followed by **end**.

Codes

```
# A simple python program
print('A', 'simple', 'Python', 'program')
```

Output

```
A simple Python program
```

Codes

```
# A simple python program
print('A', 'simple', 'Python', 'program', sep='**')
```

Output

```
A**simple**Python**program
```

The first Python program

- Get an input from the user

Codes

```
# Get an input from the user.  
print('Please enter some text: ')  
x = input()  
print('Text entered:', x)
```

Output

```
Please enter some text:  
This is a Python course.  
Text entered: This is a Python course.
```

The first Python program

- Get an input from the user

Codes

```
# Get an input from the user.  
x = input('Please enter some text: ')  
print('Text entered:', x)
```

Output

```
Please enter some text:This is a Python course.  
Text entered: This is a Python course.
```

The first Python program

- Get an input from the user

Codes

```
# Get an input from the user.  
x = input('Please enter some text: ')  
print('Hello, ', x)
```

Output

```
Please enter some text: World  
Hello, World
```

More examples?

- Please come to the class and we will explore together.

Readings

- Think Python, chapter 1