

Software development and data engineering (python)

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Introductory survey



Lecture structure

1. What is the course about?
2. What is python?
3. Why do we (not) love Python?
4. pip and others
5. IDE



WHAT IS THE COURSE ABOUT?



01

Course goals

- Get to know basic and advanced python
- GIT
- The features of modern IT infrastructure
- Get to know Docker
- Launch your own project**

Course structure

- Lectures
- Practice
- Homework



What is python?



02

What is python?

- High-level programming language
- Interpreted
- Strict dynamic typing
- Easy to write and read
- Object-oriented programming language

MicroPython

- High-level programming language
- Interpreted
- Strict dynamic typing
- Easy to write
- Object-oriented programming language

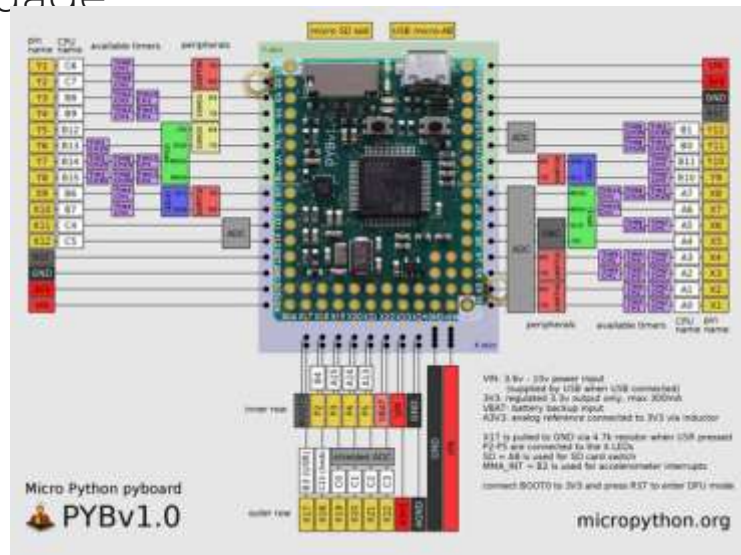
```
from machine import Pin, I2C

# creat an I2C bus
i2c = I2C(scl=Pin('X1'), sda=Pin('X2'))

# scan for list of attached devices
dev_list = i2c.scan()

# write to and read from a device
i2c.writeto(0x42, b'\x04')
data = i2c.readfrom(0x42, 4)

# memory transactions
i2c.writeto_mem(0x42, 0x12, b'\x01')
data = i2c.readfrom_mem(0x42, 0x12, 2)
```



What is python?

- ~~High-level programming language (MicroPython)~~
- ~~Interpreted (PEP 744 – JIT Compilation)~~
- Strict dynamic typing
- Easy to write and read
- Object-oriented programming language



PEP 744 – JIT Compilation

INTERPRETER VERSUS JIT COMPILER

INTERPRETER	JIT COMPILER
A software that converts the instructions written in a high-level programming or scripting language into machine language program	A component of the Java Runtime Environment (JVM is a part of JRE) that improves the performance of Java applications at runtime
Converts the source code line by line into machine code	Helps to execute bytecode faster by compiling the bytecode to machine code at runtime
Execution speed is slower	Execution speed is faster
PHP, Perl, Python, Ruby are some interpreter based languages	Used by Java
	Visit www.PEDIAA.com

What is python?

- ~~High-level programming language (MicroPython)~~
- ~~Interpreted (PEP 744 – JIT Compilation)~~
- Strict ~~dynamic~~ typing
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- Object-oriented programming language



Strict dynamic typing

```
def surface_area_of_cube(edge_length: float) -> str:  
    return f"The surface area of the cube is {6 * edge_length ** 2}."
```

```
type Vector = list[float]
```

```
def scale(scalar: float, vector: Vector) -> Vector:  
    return [scalar * num for num in vector]
```

```
# passes type checking; a list of floats qualifies as a Vector.  
new_vector = scale(2.0, [1.0, -4.2, 5.4])
```

Note: The Python runtime does not enforce function and variable type annotations. They can be used by third party tools such as [type checkers](https://docs.python.org/3/library/typing.html), IDEs, linters, etc.

Easy to write and read

There is an array with some numbers. All numbers are equal except for one. Try to find it!

```
find_uniq([ 1, 1, 1, 2, 1, 1 ]) == 2
find_uniq([ 0, 0, 0.55, 0, 0 ]) == 0.55
```

```
def find_uniq(arr):
    culprit = arr[1]

    if arr[0] == arr[2]:
        culprit = arr[0]

    for i in arr:
        if i != culprit:
            return i
```

```
def find_uniq(arr):
    return [x for x in set(arr) if arr.count(x) == 1][0]
```

with the possibility of functional programming

```
>>> seq = (1, 2, 3, 4, 5, 6, 7, 8, 9)
>>> seq2 = (5, 6, 7, 8, 9, 0, 3, 2, 1)
>>> result = [x + y for x, y in zip(seq, seq2)]
>>> result
[6, 8, 10, 12, 14, 6, 10, 10, 10]
```

```
>>> seq = (1, 2, 3, 4, 5, 6, 7, 8, 9)
>>> get_sum = lambda a, b: a + b
>>> summed_numbers = reduce(get_sum, seq)
>>> summed_numbers
45
```


What is python?

- A high-level language with the ability to work with low-level logic, with mixed strict typing and with high developer convenience.

Why do we (not) love Python?



02



Simpel

C++

```
#include <iostream>
```

```
int main() {  
    std::cout << "Hello World!";  
    return 0;  
}
```

JAVA

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

A large number of libraries

- Data work
 - numpy
 - pandas
 - pyspark
- Web
 - Scrappy
 - FastAPI
 - Django
- ML\DL
 - Sci-Kit Learn
 - TensorFlow
 - PyTorch
- Data visualization
 - Matplotlib
 - Seaborn
 - Bokeh
- Game Development
 - PyGame
 - FastAPI
 - Django
- Natural Language Processing
 - NLTK
 - NLTK
- Other

Why do we not love Python?

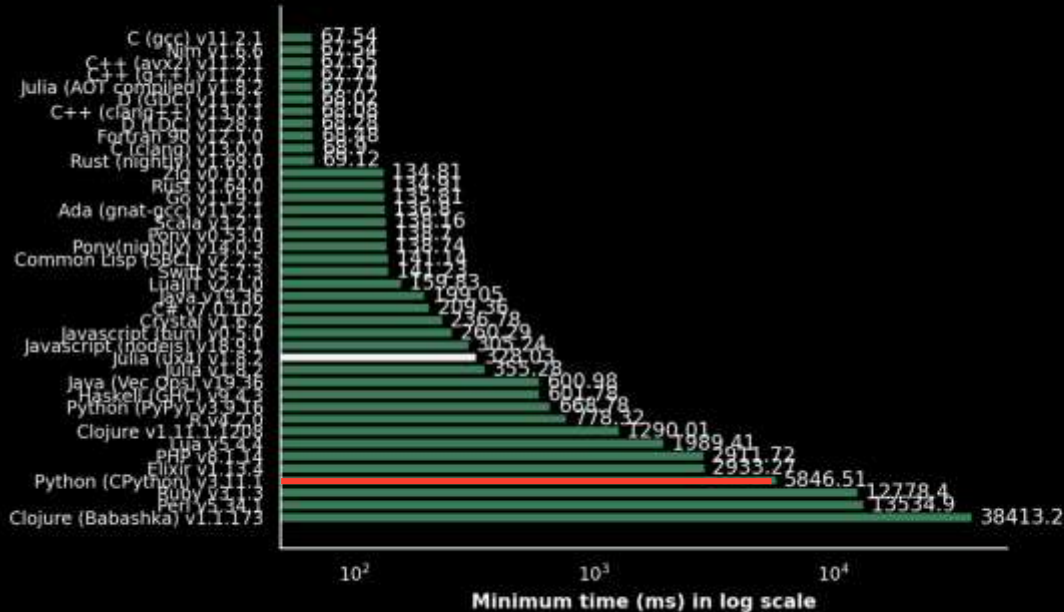
- Poorly suited for high-load systems
- Poorly suited for Mobile applications
- Poorly suited for Low-level projects



Slowness

Speed comparison of various programming languages

Method: calculating π through the Leibniz formula 100000000 times

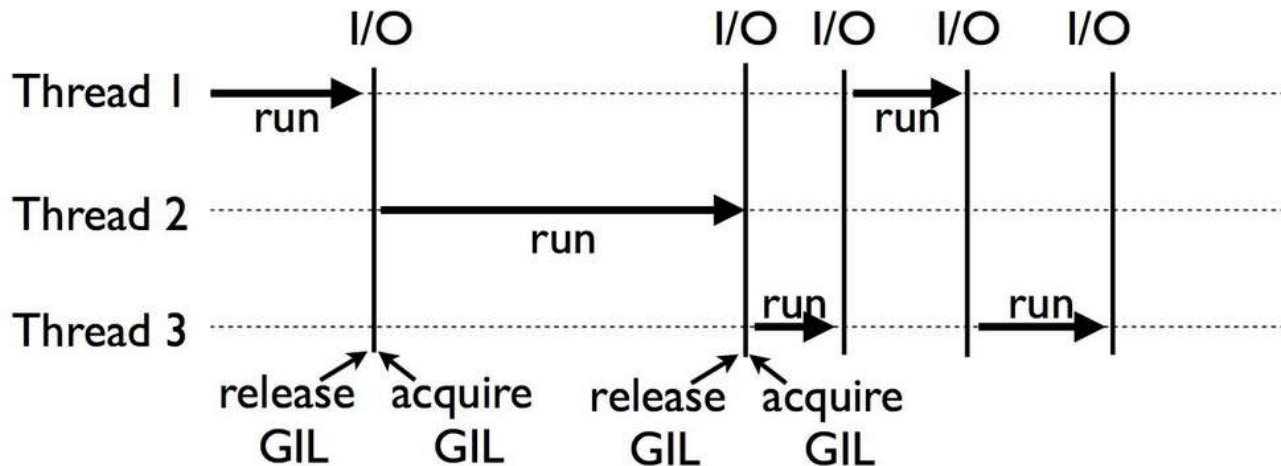


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<https://github.com/niklas-heer/speed-comparison>

GIL

- In CPython, the global interpreter lock, or GIL, is a mutex that protects access to Python objects, preventing multiple threads from executing Python bytecodes at once.



Race condition

PROCES 1 GIL	PROCES 2 GIL	Memory value	PROCES 1 no GIL	PROCES 2 no GIL	Memory value
Read Value		0	Read Value		0
Flip values		1		Read Value	0
	Read Value	1	Flip values		1
	Flip values	0		Flip values	1

pip and others

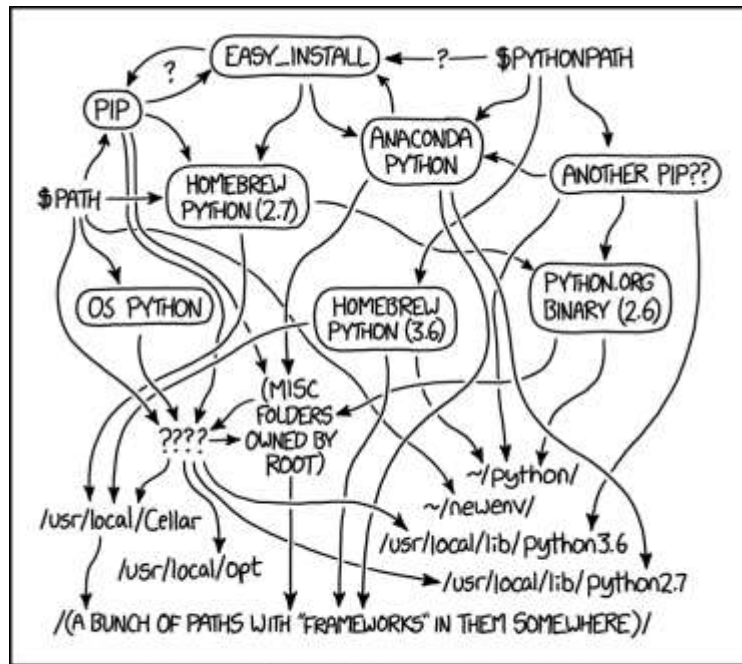


03

What is pip?

Pip is a package-management system written in Python and is used to install and manage software packages.

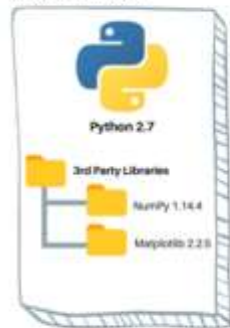
- Installing packages
- Virtual environments
- Lock files



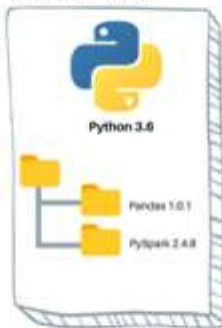
MY PYTHON ENVIRONMENT HAS BECOME SO DEGRADED
THAT MY LAPTOP HAS BEEN DECLARED A SUPERFUND SITE.

Virtual environments

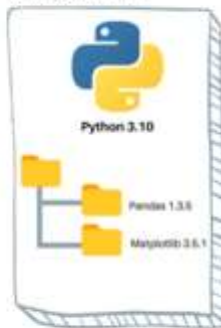
Virtual Environment 1



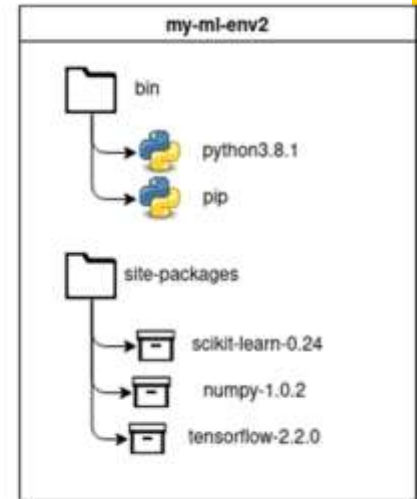
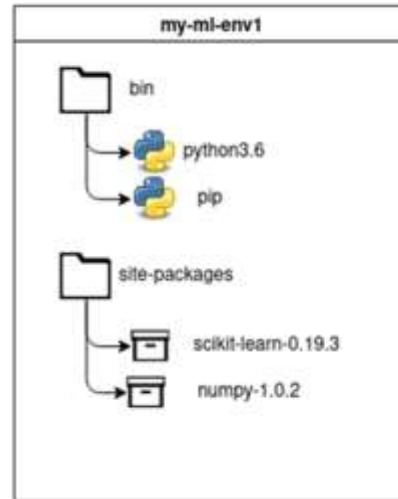
Virtual Environment 2



Virtual Environment 3



dataquest.io

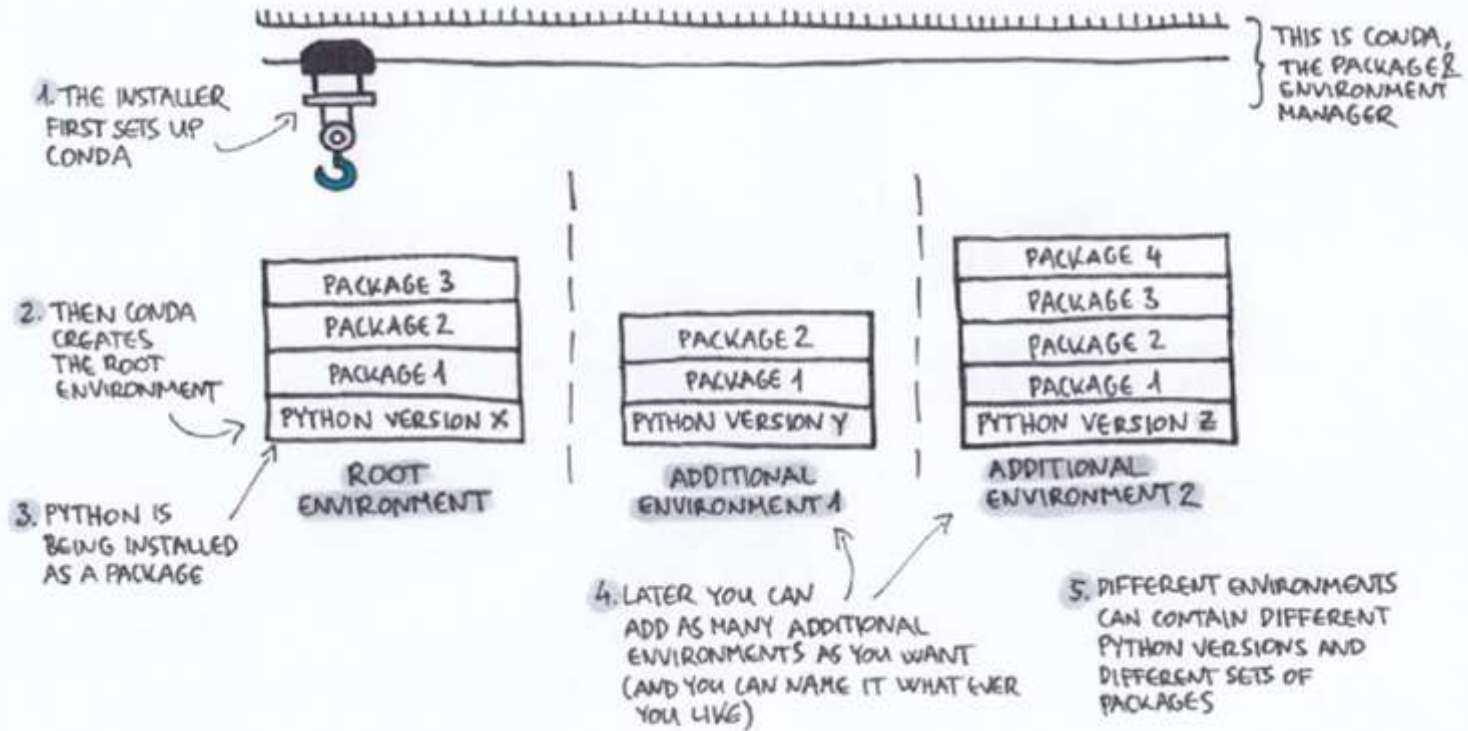


Anaconda

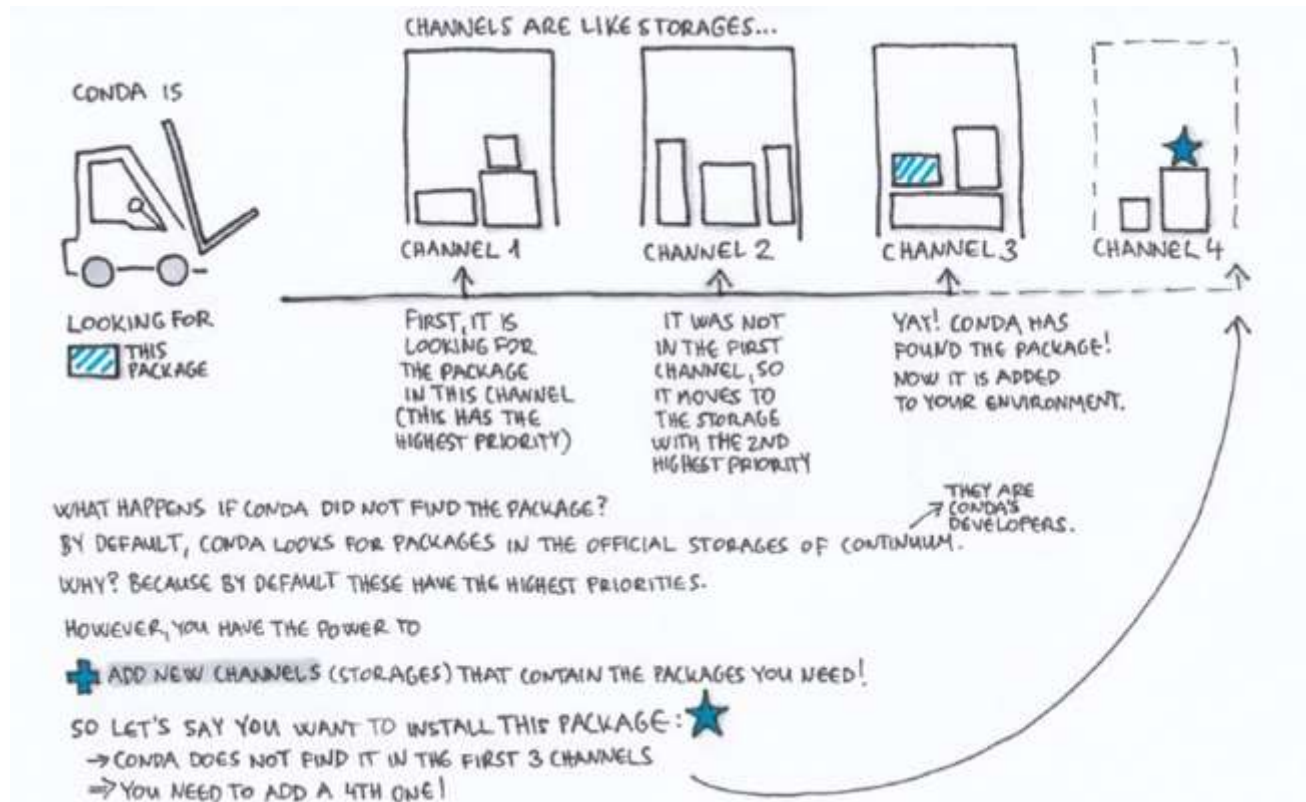


- Easy start (one button)
- Lot of prepared libraries for computer science
- A group of preparing channels
- Graphical interface

Anaconda



Anaconda



IDE



04

IDE

IDE (Integrated Development Environment) — система программных средств, используемая программистами для разработки программного обеспечения.

- Syntax highlighting
- Debugging
- Auto flooding

Popular IDEs

- Visual Studio Code*
- PyCharm
- Sublime Text 3
- Jupyter\Spyder

Thanks for your attention

Any questions?



What is python?

Write an answer in the chat

