



Лекция 2: Язык Python

Евгений Борисов

Python: реализации языка



IronPython



Cpython

Cythone

Jython (Java)

IronPython (.NET)

PyPy (compiler)



Python: дистрибутивы



CPython

Anaconda (Miniconda)



Python: IDE

iPython / Jupyter

PyCharm

Visual Studio Code

Eclipse + PyDev

Vim

Apache Zeppelin



IP[y]:

 **VS Code**



 **eclipse**



Apache Zeppelin

Python: про версии

CPython — стандарт де-факто

2.7 vs 3.7

**PEP (Python Enhancement Proposals)
предложения по улучшению Python**

PEP 8: руководство по написанию кода

Python: что почитать?

SoloLearn : Python

Python Help : Tutorial

Sebastian Raschka Python Machine Learning

Python: типы данных

Логические

Списки

Числовые

Множества

Строки

Словари

None

Python: тип данных логический

Boolean Type:

True

False

Python: типы данных числовые

Numeric Type:

int – целое число

7

float – число с плавающей точкой

7.5, 75e-1

Python: тип данных строки

Text Sequence Type

'привет'

"медвед"

**'''превед
Медвед'''**

Python: типы данных списки

Sequence Type:

list – список

[1, 2, 'a', [4,'a', 5,] ,]

tuple – кортеж

(1, 2, 'a',)

Python: типы данных множества

Set Types:

set – множество

set([1,2,2,3,4,2,3,4]) → {1,2,3,4}

frozenset – неизменяемое множество

Python: типы данных словарь

Mapping Types:

dict – словарь

{'a':1, 'b':2, 'zzz':7,}

Python: изменяемые типы данных

всё есть объекты

присваивание создаёт новый объект

immutable:

int float bool string tuple frozenset

mutable:

list dict set

Python: операции

**Операции с данными:
арифметические, логические,
строковые, битовые**

управление

ЦИКЛЫ

ВВОД / ВЫВОД

Python: операции с данными

присваивание, арифметика и сравнения

```
a,b = 1,2  
a,b = b,a  
a = 10  
a += 7
```

```
a / b  
a // 3  
a % 3  
a - b  
a + b  
a * b  
a ** 2
```

```
a < 10  
b <= 7  
a > 2  
a != b  
a == 1
```


Python: операции с данными

логические

```
a = True  
b = False
```

```
a or b  
a and b  
not b
```

Python: операции с данными

битовые

```
a = 255  
b = 7
```

```
a^b  
a&b  
a|b  
a>>3
```

Python: операции с данными

строковые

`s = 'abc'`

`s*3 → 'abccabccabc'`

`s + 'dmr' → 'abcdmr'`

Python: операции управления

```
if not x:  
    print('x')  
elif y:  
    print('y')  
else:  
    print('z')
```

Python: цикл while

```
i=0
while i<5:
    print(i)
    i+=1
```

```
i=0
while i<5:
    i+=1
    if i<3:
        continue
    print(i)
```

```
i=0
while True:
    print(i)
    i+=1
    if i>5:
        break
```

Python: цикл for

```
for x in [1,2,3,4]:  
    print(x)
```

Python: списки (list)

```
s=[1,7,3,4,['a','b']]
```

```
s.append(9)
```

```
s=[1,5,3,4,]
```

```
s.insert(5,'a')
```

```
len(s)    sorted(s)
```

```
s.index(2)
```

```
s[2]  s[2:]  s[2:4]
```

```
2 in s
```

```
s = list(range(10))
```

```
s = [ i/2 for i in range(10) if i!=3 ]
```

Python: кортежи (tuple)

```
c = (1,2,3,5)
```


Python: словари (dict)

```
d = { 'a':1, 'b':44, 'c':45, 'cvc':-1, }
```

```
d['c']→ 45
```

```
d.keys()    d.values()
```

Python: множества (set)

```
s = set([1,2,3,1,3,4,5])
```

```
{1,2,3,4,5}
```

```
s[2] → error
```

операции: & | -

Python: менеджер контекстов (with)

```
with open('temp.txt','r') as f:  
    x = f.read()
```

```
with open('temp.txt','r') as f:  
    x = [ s for s in f.read().split('\n') if s ]
```

Python: функции

```
def myfunc(x,y=1):  
    print(x)  
    return x+1,y/2
```

```
a,b = myfunc(y=5,x=-1)
```

Python: итераторы

объект перечислитель

реализует навигацию по элементам другого объекта

выдаёт следующий элемент `__next__()`

если элементов больше нет
то бросает исключение

```
s='abcdef'
it_s = iter(s)
it_s.__next__()
for c in it_s:
    print(c)
```

```
s='abcdef'
for c in s:
    print(c)
```

Python: генераторы

генерирует последовательность

```
def ones(n):  
    while n > 0:  
        n -= 1  
        yield 1
```

```
for o in ones(4):  
    print(o)
```

Python: функциональное программирование

```
squares = map(lambda x: x * x, [0, 1, 2, 3, 4])
```

```
sum = reduce(lambda a, x: a + x, [0, 1, 2, 3, 4])
```

Python: OOP

```
class Animal:
```

```
    def __init__(self, name, color):  
        self.name = name  
        self.color = color
```

```
class Dog(Wolf):
```

```
    def bark(self):  
        super().bark()  
        print("Woof!")  
    def __repr__(self):  
        return "Dog({})".format(self.name)
```

```
class Wolf(Animal):
```

```
    def bark(self):  
        print("Grr...!")
```


Python: ООП декораторы

```
class Rectangle:
    def __init__(self, width, height):
        self.width = width
        self.height = height
        self._allowed = False
```

```
def calculate_area(self):
    return self.width * self.height
```

@classmethod

```
def new_square(cls, side_length):
    return cls(side_length, side_length)
```

@staticmethod

```
def square(a):
    return a**2
```

@property

```
def allowed(self):
    return self._allowed
```

@allowed.setter

```
def allowed(self, value):
    self._allowed = not(value)
```

```
sq = Rectangle.new_square(5)
```

```
print(sq.calculate_area())
```

```
# 25
```

```
sq.allowed=0
```

```
print(sq.allowed)
```

```
# True
```

```
print(Rectangle.square(4))
```

```
# 16
```

Python: модули

```
import numpy as np
```

```
help(np)
```

```
np.__name__
```

```
np.__version__
```

```
from numpy.random import rand
```

Python: менеджер пакетов pip

```
# pip search pep8
```

```
# pip install autopep8
```

```
# pip list
```

```
# pip uninstall autopep8
```

Python: утилиты

показывает места нарушения стиля
pep8 --first main.py

определяет и исправляет нарушения стиля
autopep8 ./ --recursive --in-place -a

форматирует комментарии
docformatter --in-place example.py

универсальная утилита приведения кода к PEP
pyformat

Python: Google Colab

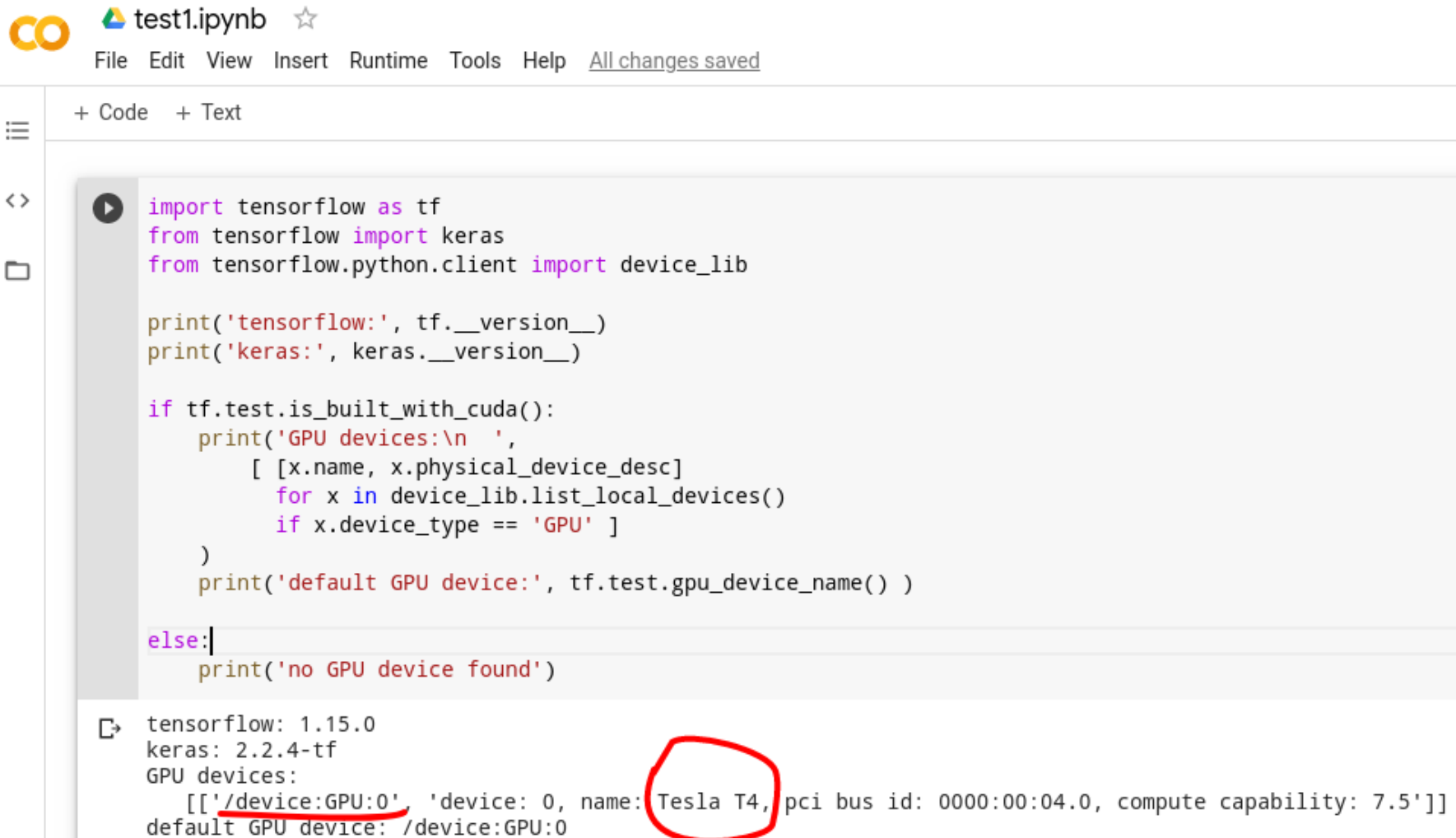
<https://colab.research.google.com/>

The screenshot shows the Google Colaboratory (Colab) interface. At the top, there's a header with the Colab logo and the text "Welcome To Colaboratory". Below this is a menu bar with options: File, Edit, View, Insert, Runtime, Tools, and Help. On the right side of the header, there are icons for Share, a user profile, settings, and a green circle with a white 'E'. Below the header, there's a sidebar on the left with a "Table of contents" section. The main content area is titled "What is Colaboratory?". It explains that Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with features like zero configuration required, free access to GPUs, and easy sharing. It then provides a "Getting started" section, explaining that the document is an interactive environment called a "Colab notebook". It shows an example of a code cell with a Python script that calculates the number of seconds in a day (24 * 60 * 60), resulting in 86400. It also shows a second code cell that calculates the number of seconds in a week (7 * seconds_in_a_day), resulting in 604800. The interface includes a "Connect" button and an "Editing" mode indicator.

Colab notebooks allow you to combine **executable code** and **rich text** in a single document, along with **images**, **HTML**, **LaTeX** and more. When you create your own Colab notebooks, they are stored in your Google Drive account. You can easily share your Colab notebooks with co-workers or friends, allowing them to comment on your notebooks or even edit them. To learn more, see [Overview of Colab](#). To create a new Colab notebook you can use the File menu above, or use the following link: [create a new Colab notebook](#).

Python: Google Colab

<https://colab.research.google.com/>



The image shows a Google Colab notebook interface. At the top, there's a green header with the text "Python: Google Colab". Below it, the URL "https://colab.research.google.com/" is displayed. The notebook itself has a title "test1.ipynb" and a star icon. The menu bar includes "File", "Edit", "View", "Insert", "Runtime", "Tools", and "Help", with a status "All changes saved". On the left, there are icons for a file explorer, a code editor, and a text editor. The code editor shows a code cell with the following Python code:

```
import tensorflow as tf
from tensorflow import keras
from tensorflow.python.client import device_lib

print('tensorflow:', tf.__version__)
print('keras:', keras.__version__)

if tf.test.is_built_with_cuda():
    print('GPU devices:\n ',
          [ [x.name, x.physical_device_desc]
            for x in device_lib.list_local_devices()
            if x.device_type == 'GPU' ]
          )
    print('default GPU device:', tf.test.gpu_device_name() )
else:
    print('no GPU device found')
```

The output of the code cell is displayed below the code:

```
tensorflow: 1.15.0
keras: 2.2.4-tf
GPU devices:
[['/device:GPU:0', 'device: 0, name: Tesla T4, pci bus id: 0000:00:04.0, compute capability: 7.5']]
default GPU device: /device:GPU:0
```

In the output, the text "/device:GPU:0" is underlined with a red line, and the text "Tesla T4" is circled with a red line.

Python

В сети появился курс по Python от Агентства нацбезопасности США

<https://dev.by/news/v-seti-poyavilsya-kurs-po-python-ot-anb>

<https://nsa.sfo2.digitaloceanspaces.com/comp3321.pdf>

Doc ID: 6689691

(U)

Instructor Notes

Updated about 2 years ago by [redacted] in [COMP 3321](#)

python fese

(U//FOUO) Instructor notes for COMP 3321.

Recommendations

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(U) So, you're teaching the Python class. What have you gotten yourself into? You should probably take a few moments (or possibly a few days) to reconsider the life choices that have put you in this position.

(U) Course Structure

(U) As mentioned in the [introduction](#), this course is designed for flexibility. When taught in a classroom setting, a single lesson or module can be covered in a session that lasts between 45 and 90 minutes, depending on the topics to be covered. The standard way to structure the course is as a full-time, two week block. During the first week, the ten lessons are covered with morning and afternoon lectures. During the second week, up to ten modules are covered in a similar manner, as needed or requested by the students in the class. (If the class needs are not known, take a vote). During the first few days of class, students should choose a project to work on. On the last day, students should report back on their progress and, if possible, demonstrate their work. Instructors should be available outside of lectures to assist students with exercises and projects.

(U) The two week block is not the only way of teaching the course. The material could be presented at a more leisurely pace, for instance during a weekly brown bag lunch that continues for several months. Alternatively, if students are already prepared (or willing to do some of the initial lessons in a self-study manner), a great deal can be accomplished in a two or three day workshop. For instance, if all students already have a basic knowledge of Python, they might well start with the lessons on [tooling](#) and [writing modules and packages](#), then move on to cover various modules of interest.

Approved for Release by NSA on 12-02-2019, FOIA Case # 108165

Python: упражнения numpy

<https://github.com/rougier/numpy-100>

100 numpy exercises

This is a collection of exercises that have been collected in the numpy mailing list, on stack overflow and in the numpy documentation. The goal of this collection is to offer a quick reference for both old and new users but also to provide a set of exercises for those who teach.

If you find an error or think you've a better way to solve some of them, feel free to open an issue at <https://github.com/rougier/numpy-100>.

File automatically generated. See the documentation to update questions/answers/hints programmatically.

Run the `initialize.py` module, then for each question you can query the answer or an hint with `hint(n)` or `answer(n)` for `n` question number.

```
In [ ]: %run initialise.py
```


Python: упражнения pandas

<https://github.com/ajcr/100-pandas-puzzles/>

100 pandas puzzles

Inspired by [100 Numpy exercises](#), here are 100* short puzzles for testing your knowledge of [pandas](#)' power.

Since pandas is a large library with many different specialist features and functions, these exercises focus mainly on the fundamentals of manipulating data (indexing, grouping, aggregating, cleaning), making use of the core DataFrame and Series objects.

Many of the exercises here are stright-forward in that the solutions require no more than a few lines of code (in pandas or NumPy... don't go using pure Python or Cython!). Choosing the right methods and following best practices is the underlying goal.

The exercises are loosely divided in sections. Each section has a difficulty rating; these ratings are subjective, of course, but should be seen as a rough guide as to how inventive the required solution is.

If you're just starting out with pandas and you are looking for some other resources, the official documentation is very extensive. In particular, some good places get a broader overview of pandas are...

- [10 minutes to pandas](#)
- [pandas basics](#)
- [tutorials](#)
- [cookbook and idioms](#)

Python: что почитать?

<https://www.sololearn.com/Course/Python/>

http://github.com/mechanoid5/ml_lectorium

Python: почти последний слайд...



Вопросы ?

Python: последний слайд...



IP[y]:

практика