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New Media
Data Analytics and Application

Lecture 2: Python Programming

Ting Wang

Outlines

- Installation
- Grammar
- Functions
- Debugging

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to build an environment for running python

Installation

Installation

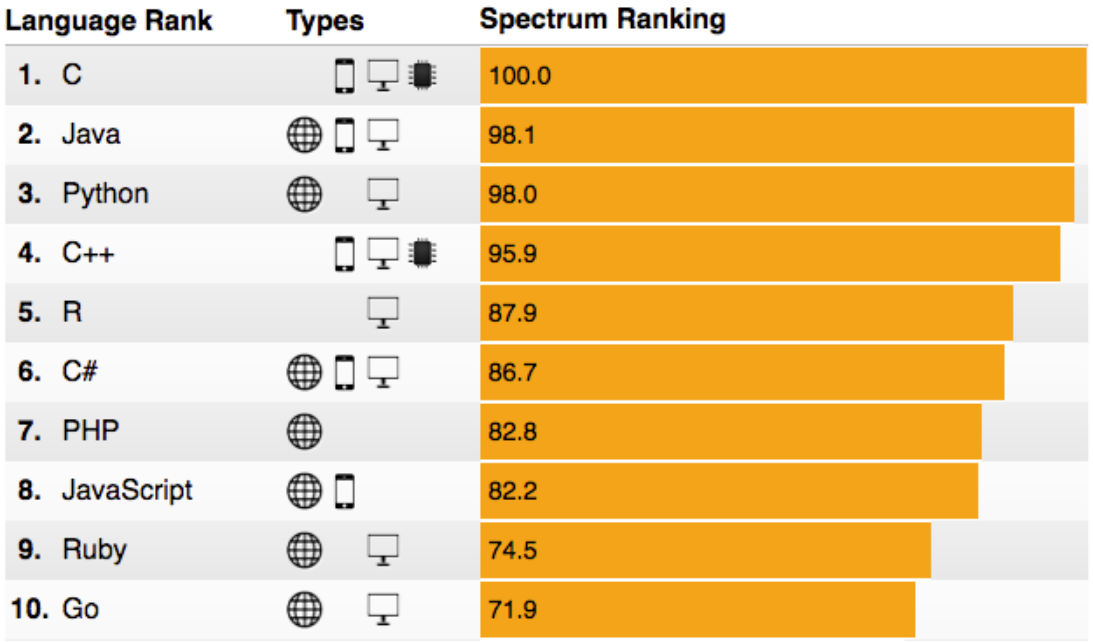
Guido van Rossum

The Birth of Python

Python is a widely used high-level, general-purpose, interpreted, dynamic programming language designed by Guido van Rossum in 1991.

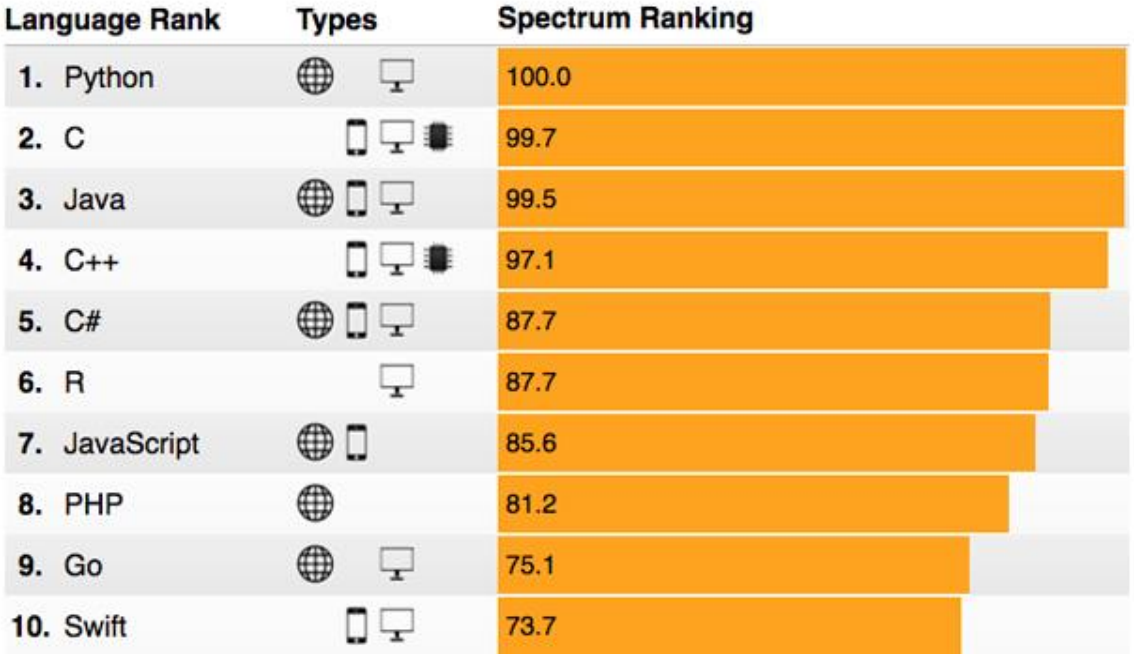
IEEE Spectrum

http://spectrum.ieee.org/computing/software/the-2016-top-programming-languages



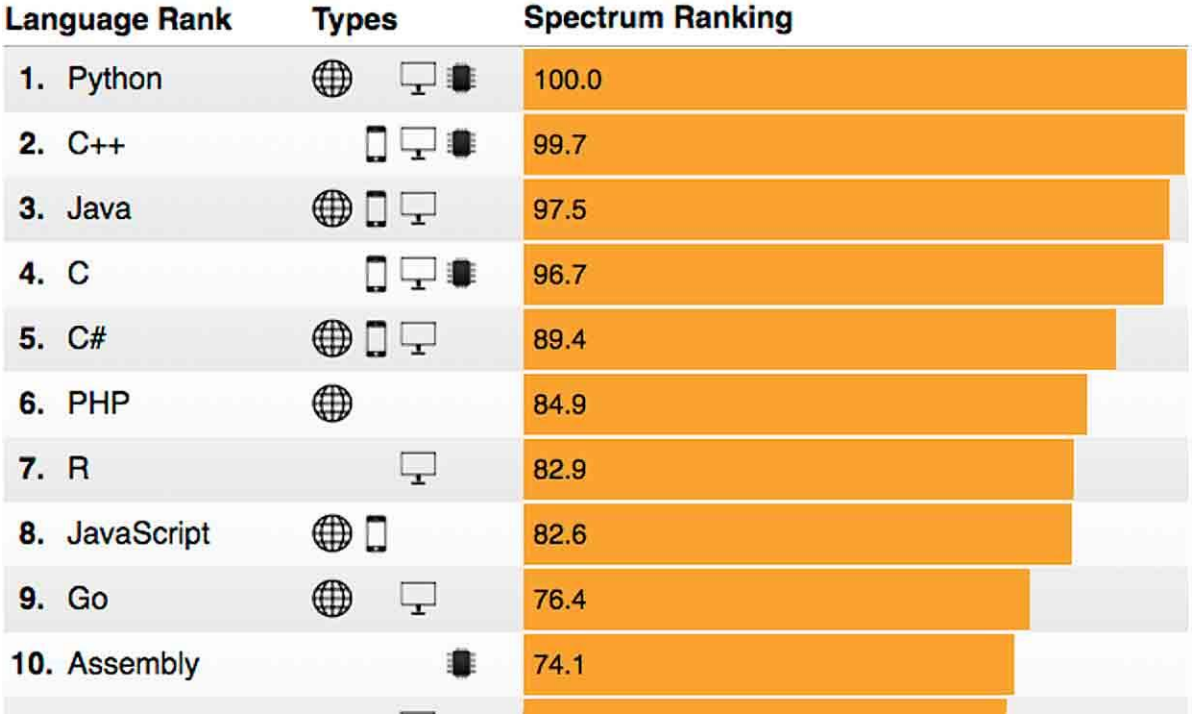
IEEE Spectrum

https://spectrum.ieee.org/computing/software/the-2017-top-programming-languages



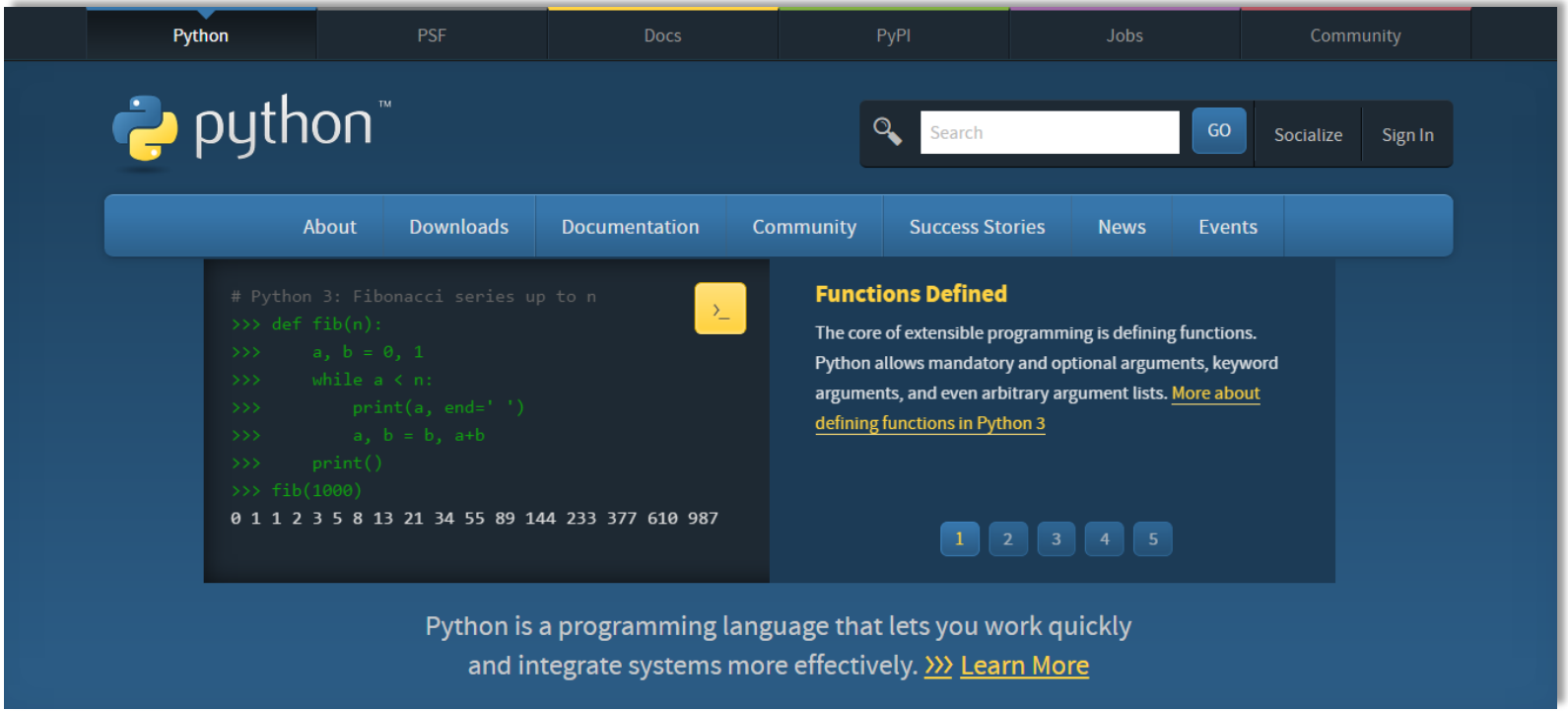
IEEE Spectrum

https://spectrum.ieee.org/at-work/innovation/the-2018-top-programming-languages



Installation

Official Website of Python（https://www.python.org/）

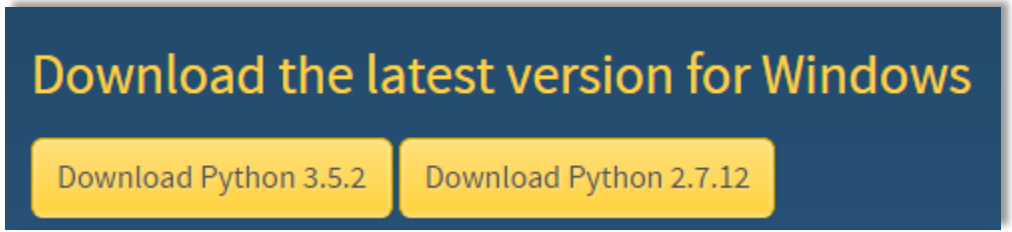


Python 2.X or 3.X?

Python 2.x is legacy, Python 3.x is the present and future of the language

Python 2.x is old, but mature;

Python 3.x is new, but slow.



https://wiki.python.org/moin/Python2orPython3

Download the Installation Package

https://www.python.org/downloads/

Python Releases for Windows

- Latest Python 2 Release - Python 2.7.12
- Latest Python 3 Release - Python 3.5.2

Python Releases for Mac OS X

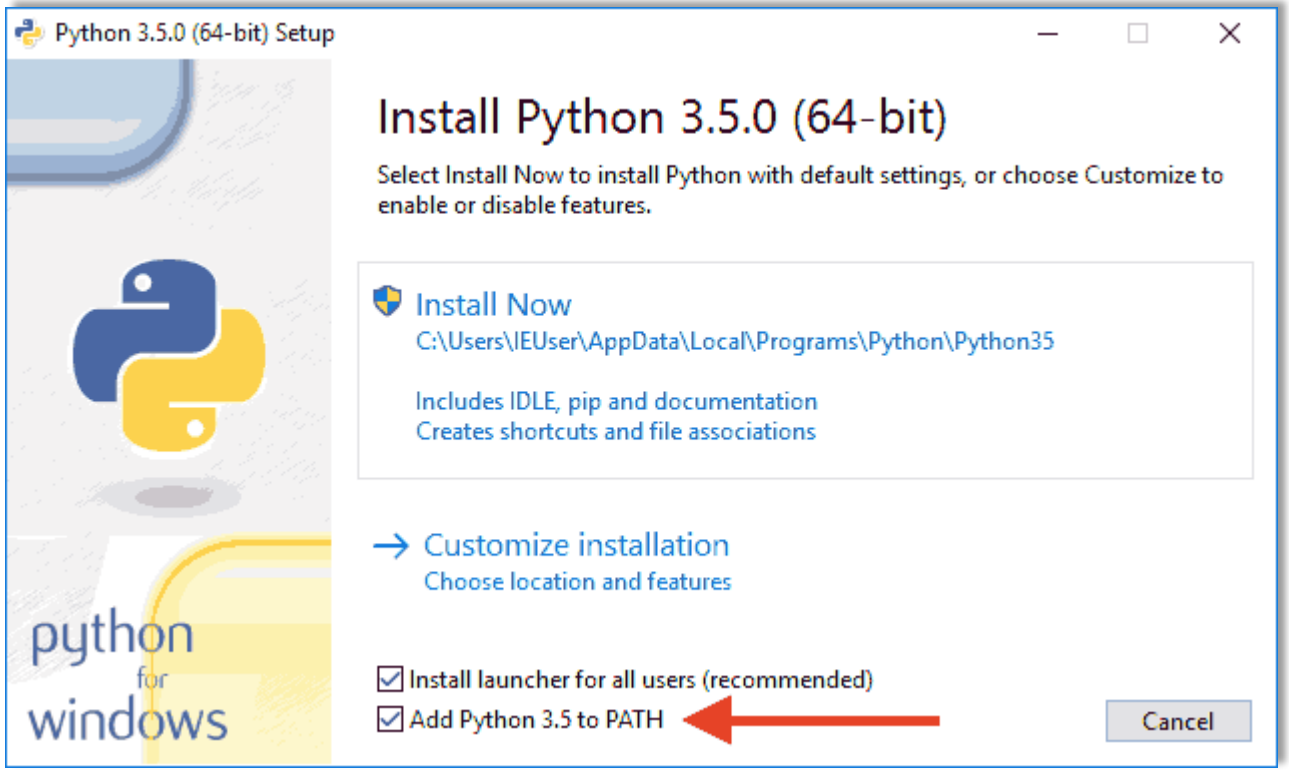
- Latest Python 2 Release - Python 2.7.12
- Latest Python 3 Release - Python 3.5.2

Python Source Releases

- Latest Python 2 Release - Python 2.7.12
- Latest Python 3 Release - Python 3.5.2

Installation

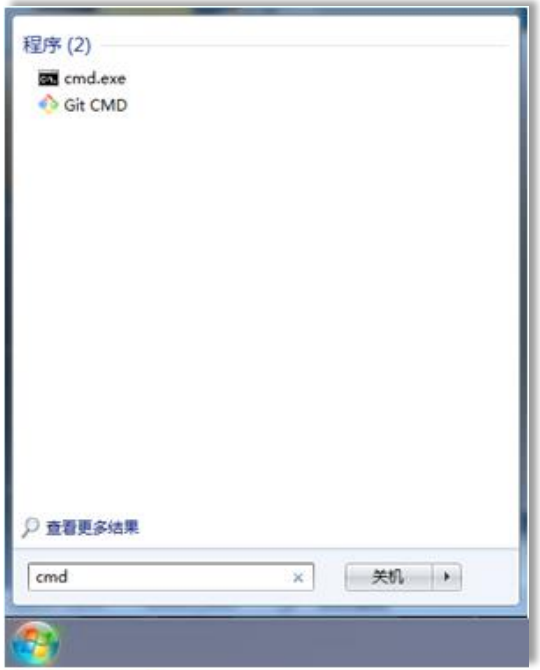
Next Step

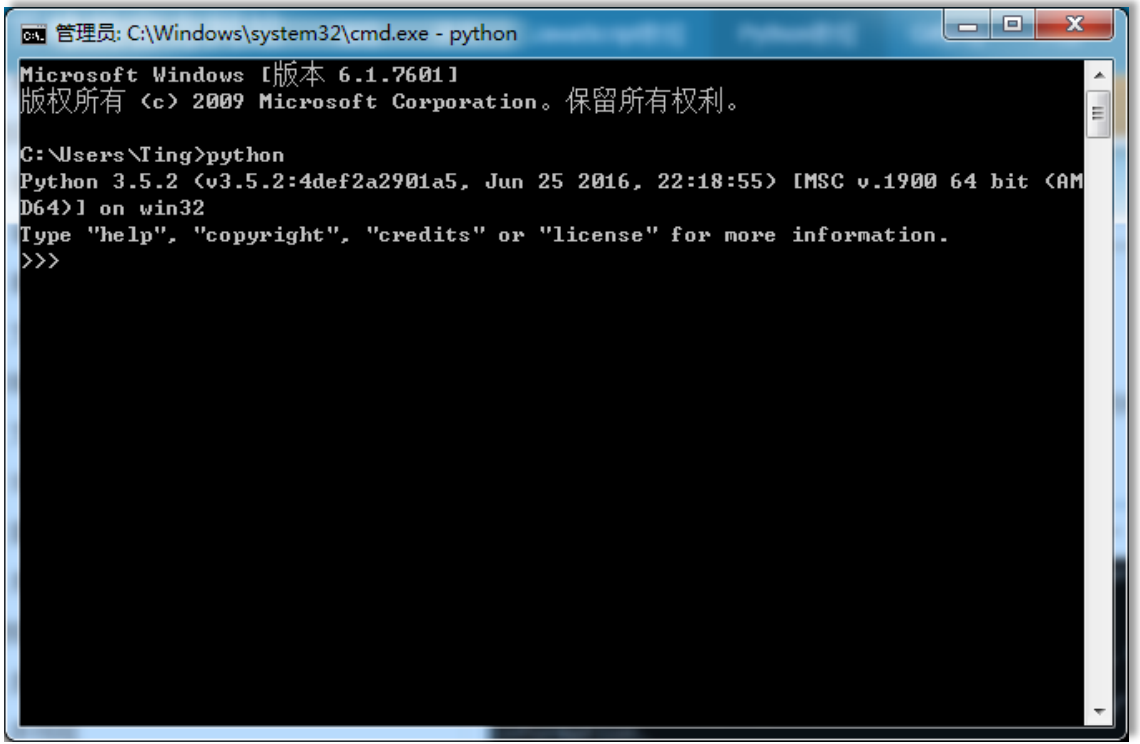


Installation

Success ！

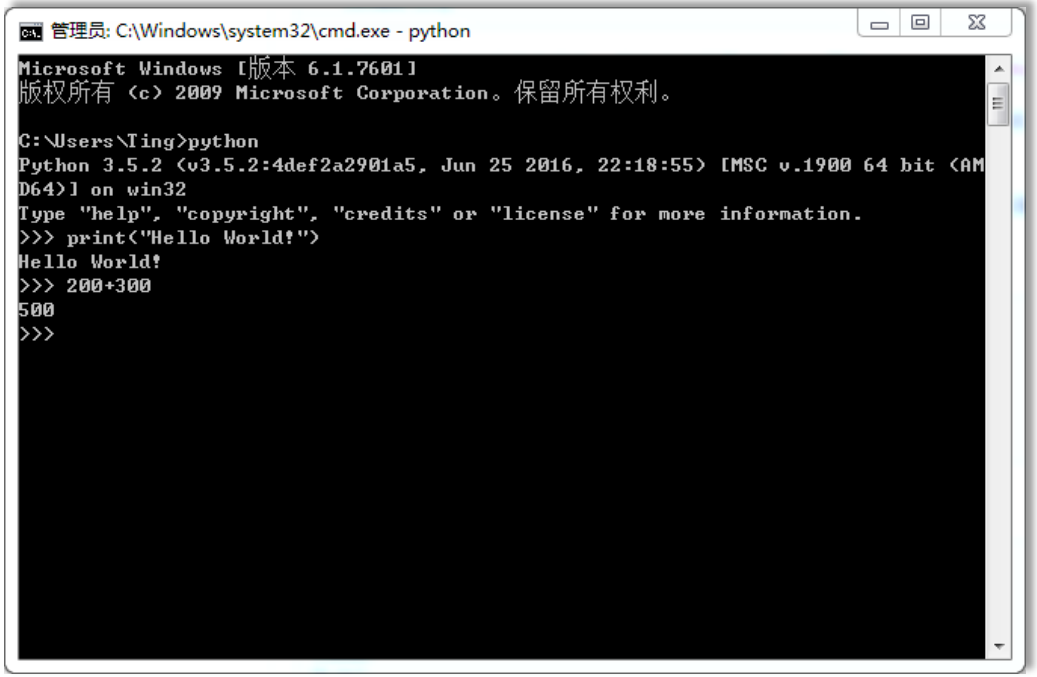
Start menu:





Installation

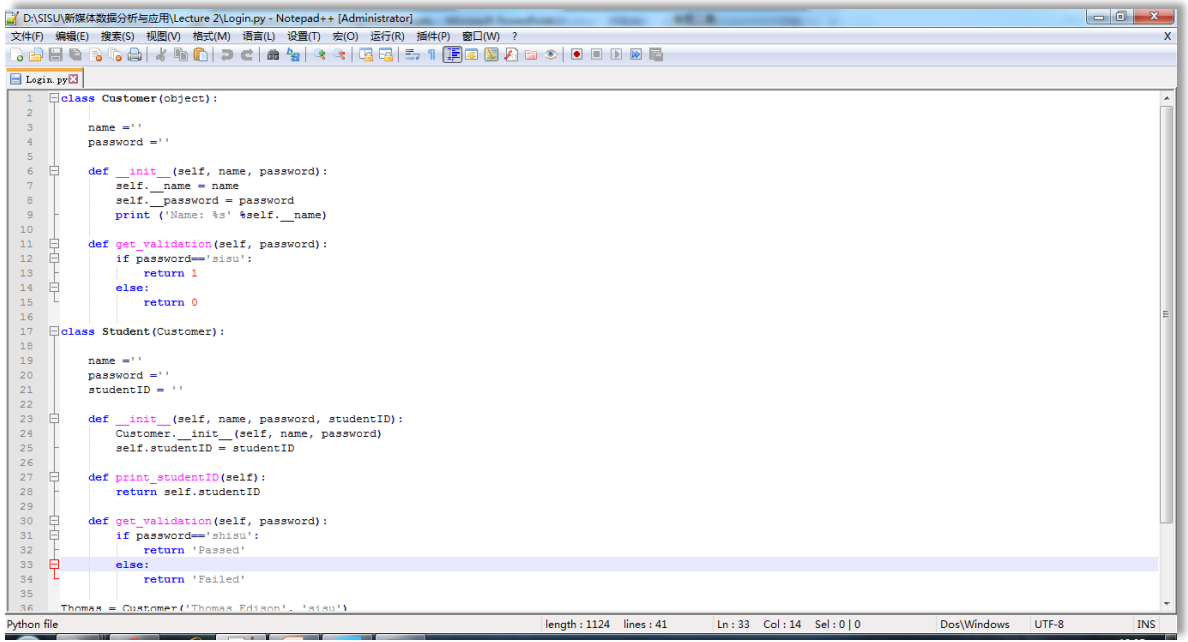
Example 1: Hello World, Python with CMD



IDE, Integrated Development Environment

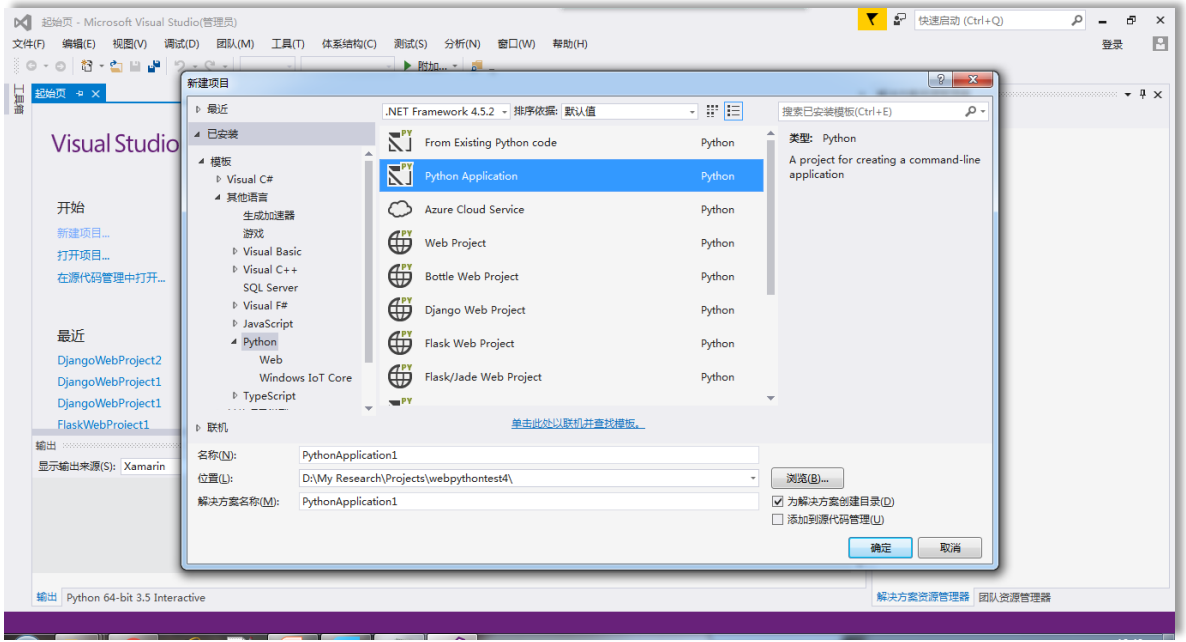
集成开发环境

1. Notepad++



IDE

2. Visual Studio 2015

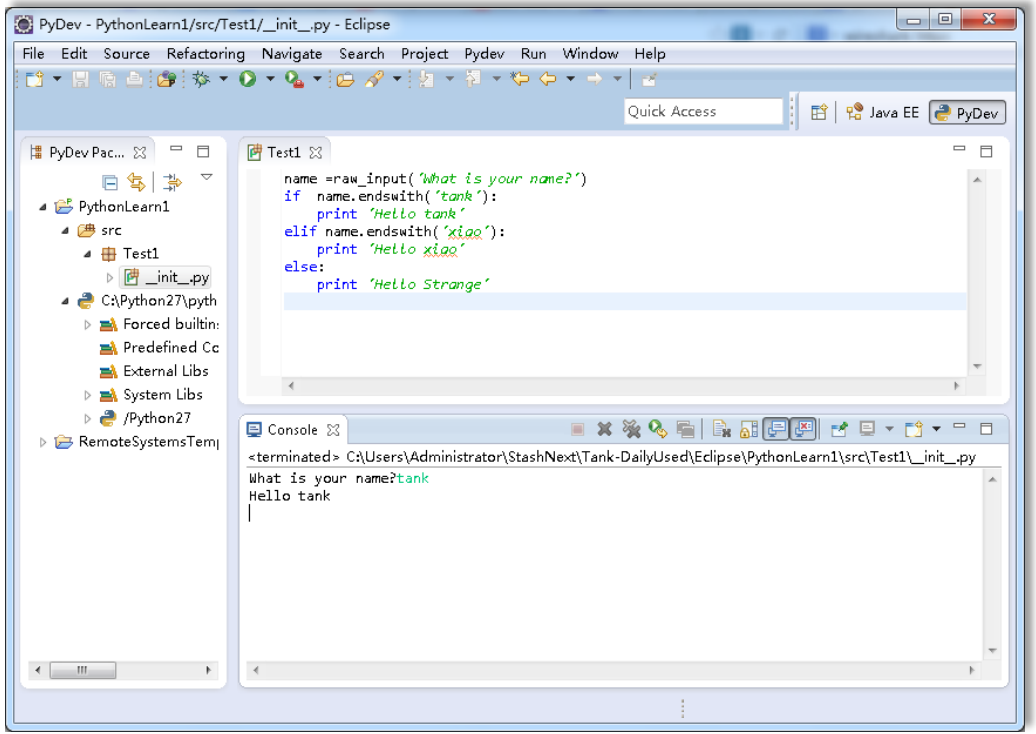


Installation

IDE

3. Eclipse + pydev

http://pydev.org/



http://www.cnblogs.com/Bonker/p/3584707.html

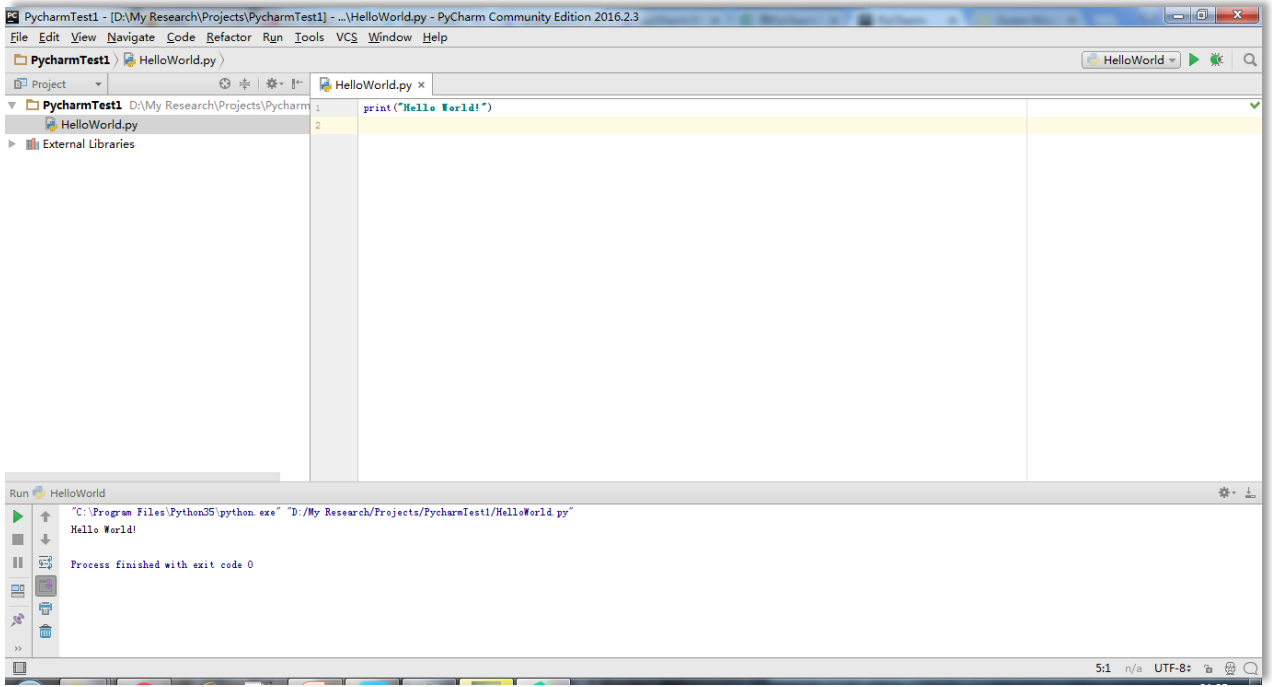
Installation

IDE

4. PyCharm

Professional Version

Community Version



http://www.jetbrains.com/pycharm/

Installation on Other Operation Systems

https://www.python.org/download/other/

- IBM AS/400 (OS/400)
- BeOS
- MS-DOS
- IBM OS/2
- IBM OS/390
- Series 60
- Oracle Solaris
- HP-UX

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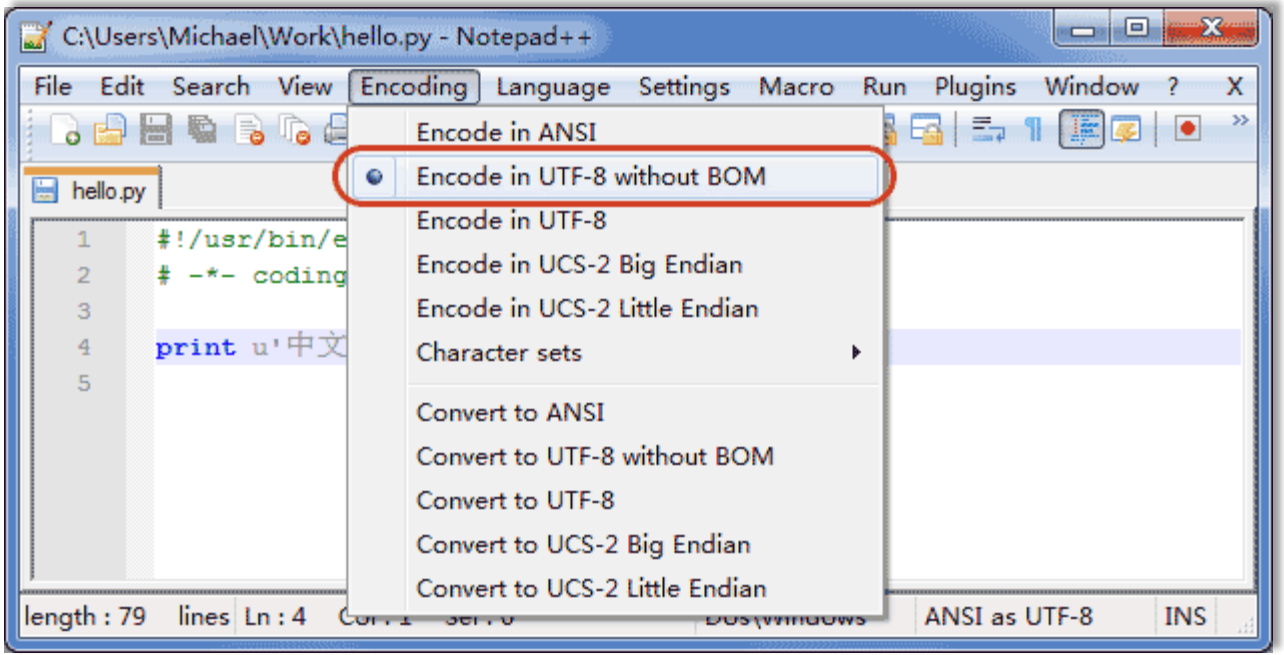
how to use python

Grammar

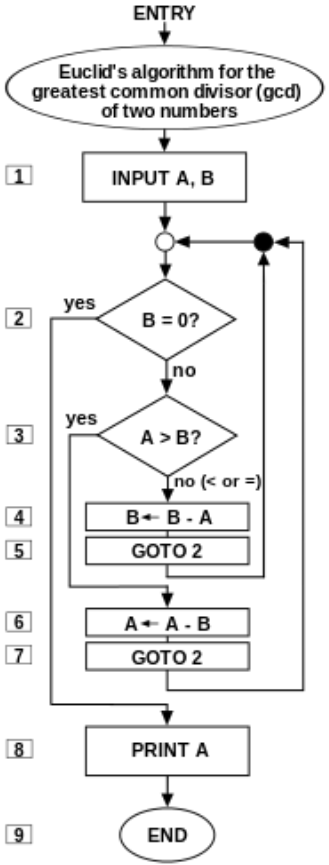
Character Encoding 字符编码

- Make sure that the encode is in UTF-8



Algorithm 算法

a self-contained step-by-step set of operations



Variables变量

a **storage location** paired with an associated symbolic **name** (an identifier), which contains some known or unknown quantity of information referred to as a **value**.

```
>>>x=2
>>>name="Thomas"
```

Case sensitive 大小写敏感 in python

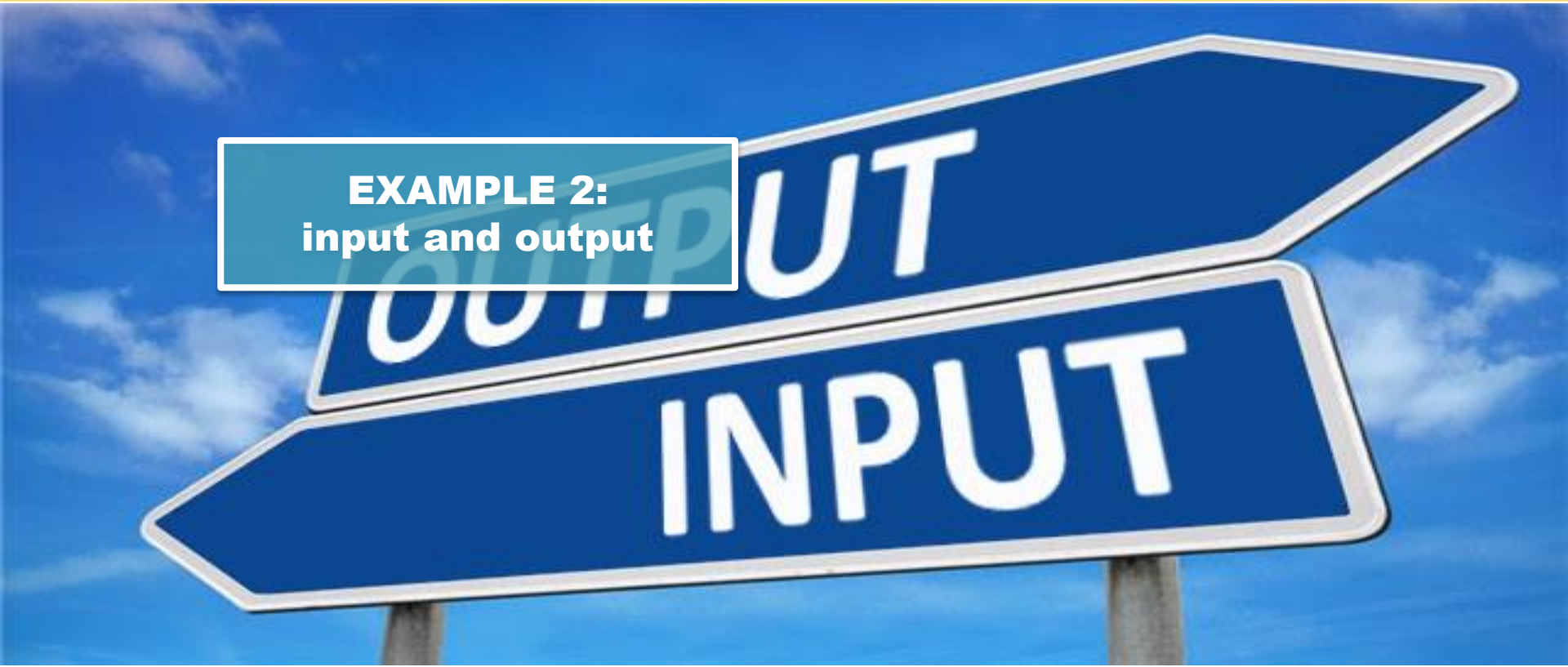
```
>>> x=2
>>> X=3
```

They are different variables!

Input and output 输入和输出

- input()
- print()

Grammar



Example 2: Hello 谁谁谁!

```
>>>name=input("What is your name?")
>>>print("Hello "+name+"!")
```

Data Structure of Variables 变量的数据结构

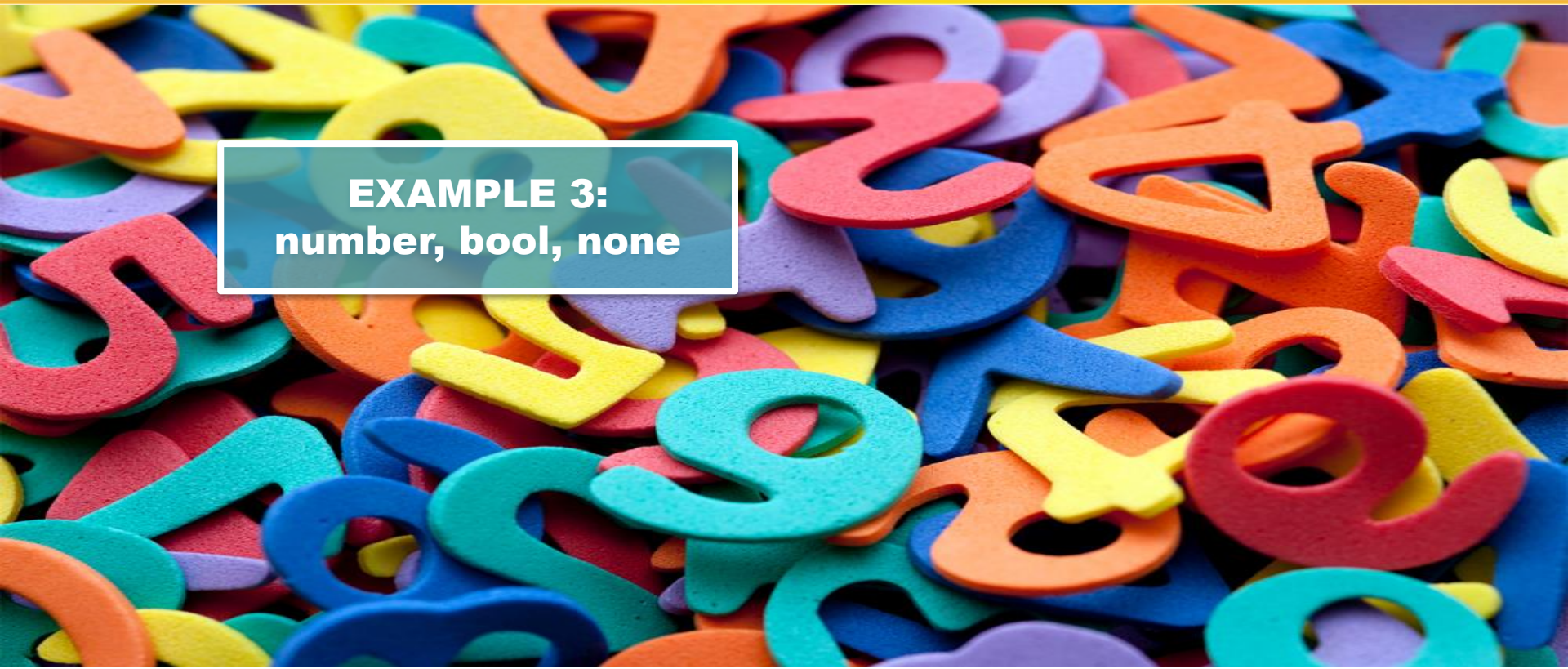
#	Type	#	Type
1	Number 数字	5	List 列表
2	Bool布尔逻辑	6	Tuple 元组
3	None 空值	7	Dict 字典
4	String 字符串	8	Datetime 日期

Reference: http://www.cnblogs.com/linjiqin/p/3608541.html

Number, bool, none 数字，布尔，空

Type_EN	Type_CN	Human_words	Example
integer	整型	整数	x=1
float	浮点型	小数	y=1.0
bool	布尔值 True, False, and, or, not	对错，与或非	print(x>y) print(x==y) print(not(x>y))
none	空值	二胎还没怀上，先把名字给取了，占位	x=None print(x)

Grammar



Operator Precedence

运算符	描述
lambda	Lambda表达式
or	布尔“或”
and	布尔“与”
not x	布尔“非”
in，not in	成员测试
is，is not	同一性测试
<，<=，>，>=，!=，==	比较
|	按位或
^	按位异或
&	按位与
<<，>>	移位
+，-	加法与减法

Low

Low High

High

运算符	描述
*，/，%	乘法、除法与取余
+x，-x	正负号
~x	按位翻转
**	指数
x.attribute	属性参考
x[index]	下标
x[index:index]	寻址段
f(arguments...)	函数调用
(experession,...)	绑定或元组显示
[expression,...]	列表显示
{key:datum,...}	字典显示
'expression,...'	字符串转换

String 字符串

– ***Convert***

强制转化

– ***ESC***

转义字符

- %d 整数
- %f 浮点数
- %s 字符串

```
def AddNumber(a, b):
    return int(a)+int(b)

def AddString(a, b):
    return a+b

InputOne=input("please input the first number: ")
InputTwo=input("please input the second number: ")
print("AddNumber: "+str(AddNumber(InputOne, InputTwo)))
print("AddString: "+AddString(InputOne, InputTwo))
```

```
( another style of Example 2):
>>>name=input("What is your name?")
>>>print("Hello, %s !" %name)
```

Grammar

Start from 0!

List列表，数组

```
>>>classmates = ['Michael', 'Bob', 'Tracy']
>>> classmates[0]
'Michael'
>>> classmates[1]
'Bob'
>>> classmates[2]
'Tracy'
>>> classmates[3]
Traceback (most recent call last): File "<stdin>", line 1, in <module>
IndexError: list index out of range
```

Use [ ]!

Tuple 元组

A list where values CANNOT be changed.

```
>>> classmates = ('Michael', 'Bob', 'Tracy')
```

Use ( )!

Grammar

dict 字典

d = {'key1':value1, 'key2':value2}

```
>>> d = {'Michael': 95, 'Bob': 75, 'Tracy': 85}
>>> d['Michael']
  95
```

Use {}!

set 集合

s = set([key1, key2, key3])

- Repetitions will be discarded
- No value, only key
- Actually, set is a function

```
>>> s = set([1, 1, 2, 2, 3, 3])
>>> s
 {1, 2, 3}
```

Datetime 时间

```
>>>import datetime
>>>print(datetime.datetime.now())
>>> dt = datetime.datetime (2018, 3, 5, 15, 30) # 用指定日期时间创建datetime
>>> print(dt)
            2018-03-05 15:30:00
```

Note:

1. “datetime” is a module. It should be imported before it is employed.
2. Python has many modules for different usages. Moreover, there are also a great number of **third-party modules**, which can be installed by Python command “pip”.

Conditional Statement 条件判断

```
if <condition 1>:
    <statement1>
elif < condition 2>:
    <statement2>
elif < condition 3>:
    <statement3>
else:
    <statement4>
```

Iteration 循环

for <counter> in <range>:
    <statement>

while <condition>:
    <statement>

break: stop the whole iteration

continue: stop this round, but continue to start the next round of this iteration

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reuse and encapsulation

Functions

Functions

Define Functions

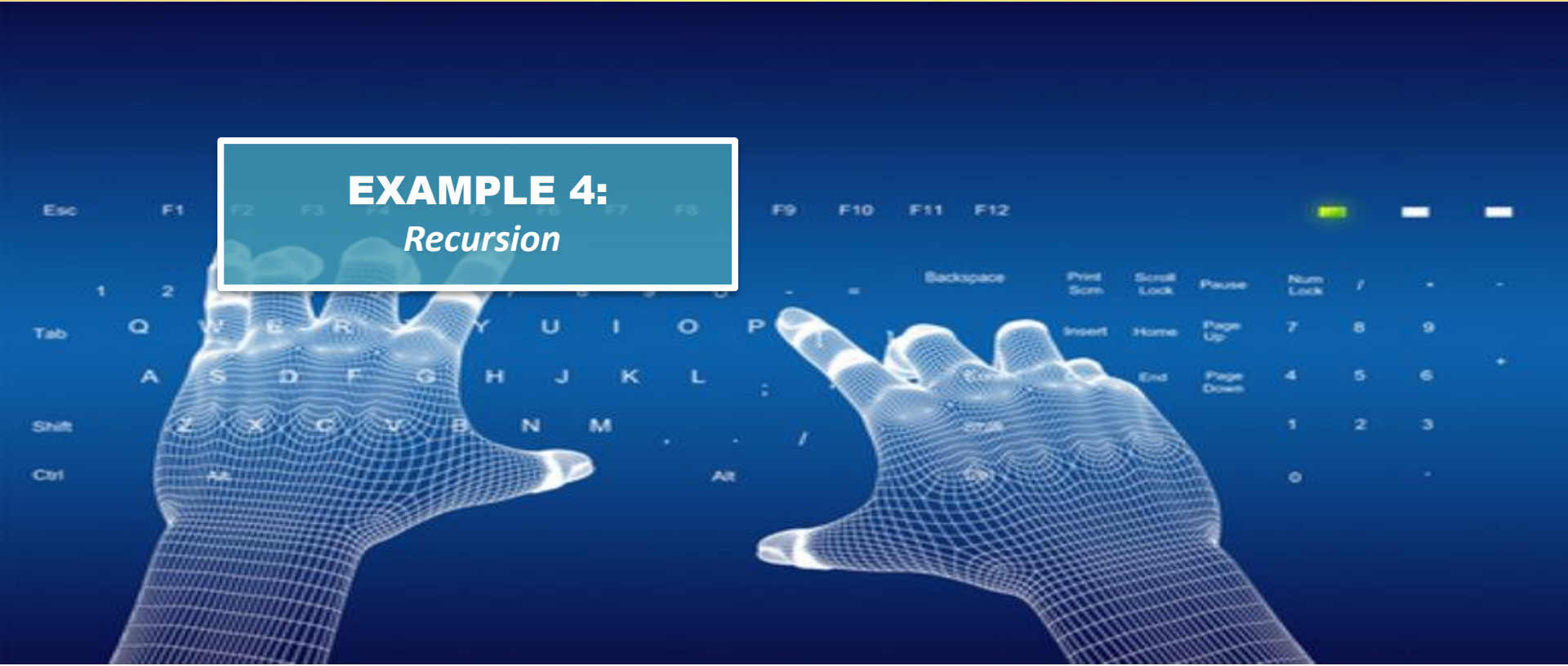
```
def FunctionName(parameter1, parameter2,…):
    <statement>
    [return value]
```

Optional

Call Functions

```
FunctionName(para1, para2,…)
```

Functions



Recursion: the function call itself 递归

Example: factorial 阶乘

n! = n*...*4*3*2*1

n! = n*(n-1)!

Assume that, F(n)=n!

Then F(n-1)=(n-1)!

∴ F(n)=n*F(n-1)

```
def factorial(n):
    if n==1:
        return 1
    else:
        return n*factorial(n-1)

number=input("Please input the number:")
print(factorial(int(number)))
```

Functions

Object Oriented Programming

- Class
- Object
- Attribute
- Method

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testing, exception and modification

Debugging

Test-Driven Development

- STEP:
  1. print() it!
  2. Do NOT forget to delete print().

try...except...finally...

If we are not sure whether there are some errors in our code, we can use this statement.

Step 1: “try”

Step 2: Errors occur, stop “try”;

Step 3: go to “except”, and finish this part

Step 4: if there is a “finally” part then execute it;

Step 5: finish

```
try:
    print('try...')
    r = 10 / 0
    print('result:', r)
except ZeroDivisionError as e:
    print('except:', e)
finally:
    print('finally...')
print('END')
```

References

References

廖雪峰的官方网站（Python教程）

http://www.liaoxuefeng.com/wiki/0014316089557264a6b348958f449949df42a6d3a2e542c000

References

Microsoft Virtual Academy

https://mva.microsoft.com/zh-cn/training-courses/-python--8360?l=EK9zuOO8_2604984382

Home Work

Home Work

1. Print **all** the **Prime Numbers** smaller than **10,000**.

2. Print the first **30** numbers of ***Successione di Fibonacci***

You should do this homework by yourself and submit the report and the code to me individually before March 17 via email attachment with the title "2016 + Your Chinese Name+ID"

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The End of Lecture 2

Thank You

http://www.wangting.ac.cn