

Idiomatic Python

--Python裝X入门

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Agenda

Idioms

Data Manipulation

Control Flow

‘itertools’

Functional Python



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Shared publicly · Sep 19, 2013

Do not send me email like this:

....

Hi Guido,

I came across your resume in a Google web search. You seem to have an awesome expertise on Python. I would be glad if you can reply my email and let me know your interest and availability.

.....
Our client immediately needs a PYTHON Developers at its location in *, NJ. Below are the job details. If interested and available, kindly fwd me your updated resume along with the expected rate and the availability.

[...]

....

I might reply like this:

....

I'm not interested and not available.

....

The Zen of Python

```
C:\Users\Tim>python
Python 2.7.2 (default, Jun 12 2011, 15:08:59) [MSC v.1500 32 bit (Intel)] on win
32
Type "help", "copyright", "credits" or "license" for more information.
>>> import this
The Zen of Python, by Tim Peters

Beautiful is better than ugly.
Explicit is better than implicit.
Simple is better than complex.
Complex is better than complicated.
Flat is better than nested.
Sparse is better than dense.
Readability counts.
Special cases aren't special enough to break the rules.
Although practicality beats purity.
Errors should never pass silently.
Unless explicitly silenced.
In the face of ambiguity, refuse the temptation to guess.
There should be one-- and preferably only one --obvious way to do it.
Although that way may not be obvious at first unless you're Dutch.
Now is better than never.
Although never is often better than *right* now.
If the implementation is hard to explain, it's a bad idea.
If the implementation is easy to explain, it may be a good idea.
Namespaces are one honking great idea -- let's do more of those!
```

Idioms

- An unwritten rule
- A common use-case
- Usually make the code better in:
 - Readability
 - Speed
 - Resource usage

Data Manipulation

Unpacking

```
s = ('simon', 'shi', 066, 'simonshi@gmail.com')
```

```
firstname = s[0]
```

```
lastname = s[1]
```

```
weight = s[2]
```

```
email = s[3]
```

```
# Idiomatic
```

```
firstname, lastname, weight, email = s
```

Swap Values

```
temp = a  
a = b  
b = temp
```

```
# idiomatic way, using tuple packing & unpacking  
a, b = b, a
```

```
# For those pathetic C programmers  
a, b = (b, a)
```

Don't Underestimate

```
# machine-oriented, error-prone
next_x = x + dx * t
next_y = y + dy * t
next_dx = influence(m, x, y, dx, dy, partial='x')
next_dy = influence(m, x, y, dx, dy, partial='y')
x = next_x
y = next_y
dx = next_dx
dy = next_dy
```

Don't Underestimate (cont.)

```
# idiomatic, declarative
x, y, dx, dy = (x + dx * t,
                  y + dy * t,
                  influence(m, x, y, dx, dy, partial='x'),
                  influence(m, x, y, dx, dy, partial='y'))
```

Concatenating Strings

```
fruits = ['cherry', 'coconut', 'blueberry', 'kiwi']
```

```
# bad
s = fruits[0]
for i in fruits[1:]:
    s += ', ' + f
```

```
# idiomatic
print ', '.join(fruits)
```

Looping over a collection

```
colors = ['red', 'green', 'blue', 'yellow']
```

```
# bad
for i in range(len(colors)):
    print colors[i]
```

```
# idiomatic
for color in colors:
    print color
```

Looping backwards

```
colors = ['red', 'green', 'blue', 'yellow']
```

```
for color in reversed(colors):  
    print color
```

```
for color in colors[::-1]:  
    print color
```

Looping with indices

```
colors = ['red', 'green', 'blue', 'yellow']
```

```
# bad
for i in range(len(colors)):
    print i, '-->', colors[i]
```

```
# idiomatic
for i, color in enumerate(colors):
    print i, '-->', color
```

Looping over a dictionary

```
codes = {'Xian': '29', 'Beijing': '10', 'Shanghai': '21'}  
# bad  
for k in codes:  
    print k, '-->', codes[k]  
  
# recommended  
for k, v in codes.items():  
    print k, '-->', v  
  
for k, v in codes.iteritems():  
    print k, '-->', v
```

‘defaultdict’

```
names = ['james', 'peter', 'simon', 'jack', 'john', 'lawrence']

# expected result
{8: ['lawrence'], 4: ['jack', 'john'], 5: ['james', 'peter', 'simon']}

# old way
groups = {}
for name in names:
    key = len(name)
    if key not in groups:
        groups[key] = []
    groups[key].append(name)
```

‘defaultdict’ (cont.)

```
# use ‘setdefault’ with default value prepared
groups = {}
for name in names:
    groups.setdefault(len(name), []).append(name)
```

```
# use ‘defaultdict’
from collections import defaultdict
groups = defaultdict(list)
for name in names:
    groups[len(name)].append(name)
```

Comprehensions

```
# bad
A, odd_or_even = [1, 1, 2, 3, 5, 8, 13, 21], []
for number in A:
    odd_or_even.append(isOdd(number))

# expected result
[True, True, False, True, True, False, True, True]
```

Comprehensions (2/3)

```
A = [1, 1, 2, 3, 5, 8, 13, 21]
```

```
# idiomatic way
```

```
[isOdd(a) for a in A]
```

```
[True, True, False, True, True, False, True, True]
```

```
[a for a in A if a%2 != 0]
```

```
[1, 1, 3, 5, 13, 21]
```

Comprehensions (3/3)

List: [a**2 for a in A]
[1, 1, 4, 9, 25, 64, 169, 441]

Set: {int(sqrt(a)) for a in A}
set([1, 2, 3, 4])

Dict: {a:a%3 for a in A if a%3}
{8: 2, 1: 1, 2: 2, 5: 2, 13: 1}

Control Flow

Truthiness

```
# Avoid comparing directly to True, False, or None
if names != []:
    ...
if foo == True:
    ...

# idiomatic way
if names:
    ...
if foo:
```

Truthiness (cont.)

All of the following are considered ‘False’

- None
- False
- zero for numeric types
- empty sequence, e.g. [], tuple()
- empty dictionaries
- a value of 0 or False returned when either `__len__` or `__non_zero__` is called

‘if-in’

```
# ugly, repeating variables
is_generic_color = False
if color == 'red' or color == 'green' or color == 'blue':
    is_generic_color = True

# idiomatic way
is_generic_color = color in ('red', 'green', 'blue')
```

‘for-else’

```
ages = [42, 21, 18, 33, 19]
```

```
# old way
are_all_adult = True
for age in ages:
    if age < 18:
        are_all_adult = False
    break

if are_all_adult:
    print 'All are adults!'
```

‘for-else’ (cont.)

```
ages = [42, 21, 18, 33, 19]
```

```
# idiomatic way
for age in ages:
    if age < 18:
        break
else: # go through without break
    print 'All are adults!'
```

Context Manager

```
# old way
f = open('data.csv')
try:
    data = f.read()
finally:
    f.close()
```

```
# idiomatic way
with open('data.csv') as f:
    data = f.read()
```

import itertools

Looping with two collections

```
colors = ['red', 'blue', 'green', 'yellow']
fruits = ['cherry', 'blueberry', 'kiwi']
```

```
# old way
min_len = min(len(colors), len(fruits))
for i in range(min_len):
    print fruits[i], '-->', colors[i]
```

```
# idiomatic way
for fruit, color in izip(fruits, colors):
    print fruit, '-->', color
```

Building Dictionaries

```
fruits = ['cherry', 'blueberry', 'kiwi', 'mango']
colors = ['red', 'blue', 'green', 'yellow']

# expected
{'kiwi': 'green', 'cherry': 'red', 'mango': 'yellow',
 'blueberry': 'blue'}
```

```
# old way
pairs = {}
for fruit, color in izip(fruits, colors):
    pairs[fruit] = color
```

Building Dictionaries (cont.)

```
fruits = ['cherry', 'blueberry', 'kiwi', 'mango']
colors = ['red', 'blue', 'green', 'yellow']
```

```
# idiomatic way
from itertools import izip
```

```
pairs = dict(izip(fruits, colors))
```

‘groupby’

```
names = ['james', 'peter', 'simon', 'jack', 'john', 'lawrence']

{8: ['lawrence'], 4: ['jack', 'john'], 5: ['james', 'peter',
'simon']}
```

```
# use itertools
{k:list(v) for k, v in groupby(names, len)}
```

More

- `chain([1,2,3], ['a','b'], [4]) ==> 1,2,3,'a','b',4`
- `repeat('A', 3) ==> 'A' 'A' 'A'`
- `cycle('ABCD') ==> A B C D A B C D ...`
- `compress('ABCDEF', [1,0,1,0,1,1]) ==> A C E F`
- combinations/permutations/product
- ...

Functional Python

What is functional

- Imperative programming (C/C++, Java)
- Declarative programming
 - Functional programming (Lisp, Haskell, OCaml)
 - Logic programming (Prolog, Clojure)

“Functions are data, too. Can be passed through and manipulated like data.”

partial

```
# old way
def log(level, message):
    print "[{level}]: {msg}".format(level=level, msg=message)

def log_debug(message):
    log('debug', message)

def log_warn(message):
    log('warn', message)
```

partial (2/3)

```
# old way
def create_log_with_level(level):
    def log_with_level(message):
        log(level, message)
    return log_with_level

# construct functions like data
log_debug = create_log_with_level('debug')
log_warn = create_log_with_level('warn')
```

partial (3/3)

```
# use functools
from functools import partial

log_debug = partial(log, 'debug')
log_warn = partial(log, 'warn')
```

Decorator

```
# old way, mixing administrative logic with domain logic
def web_lookup(url, cache={}):
    if url not in cache:
        cache[url] = urllib.urlopen(url).read()
    return cache[url]
```

```
# use decorator, as in AOP
@cache
def web_lookup(url):
    return urllib.urlopen(url).read()
```

Decorator (cont.)

```
# implementation of the 'cache' decorator
from functools import wraps

def cache(func):
    saved = {}
    @wraps
    def new_func(*args):
        if args not in saved:
            saved[args] = func(*args)
        return saved[args]
    return new_func
```

Combine

```
# imperative way
expr, res = '28++32+++32+39', 0
for token in expr.split('+'):
    if token:
        res += int(token)

# result of split
[ "28", "", "32", "", "", "32", "39" ]
```

Combine (cont.)

```
# functional way
```

```
res = sum(map(int, filter(bool, expr.split('+'))))
```

```
# step by step
```

```
["28", "", "32", "", "", "32", "39"]
```

```
filter(pred, seq) => [t for t in seq if pred(t)]
```

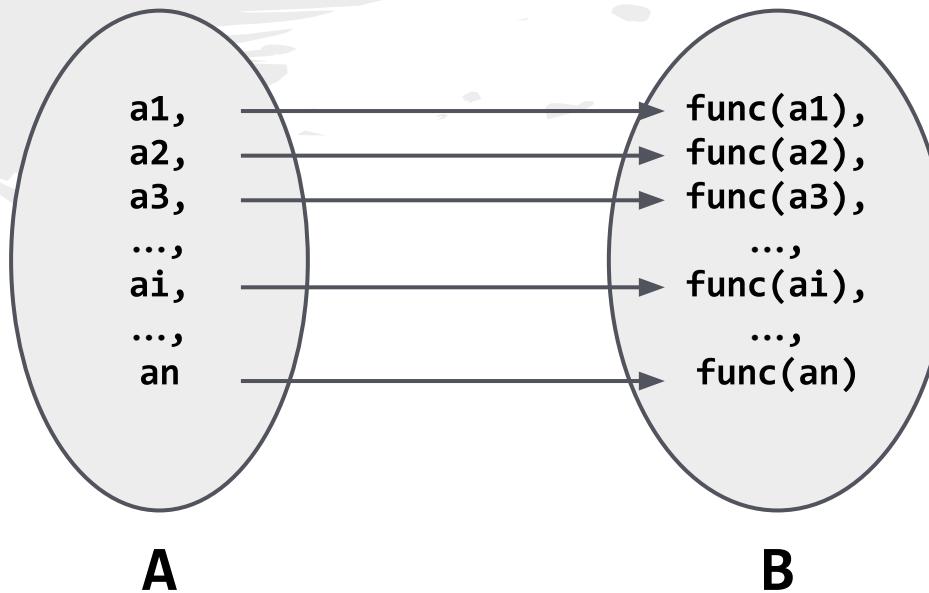
```
["28", "32", "32", "39"]
```

```
map(func, seq) => [func(t) for t in seq]
```

```
[28, 32, 32, 39]
```

‘map’

$B = \text{map}(\text{func}, A)$



‘all’

```
ages = [42, 21, 18, 33, 19]
```

```
# more expressive than using ‘for-else’  
if all(map(lambda a:a>=18, ages)):  
    print 'All are adults!'
```

Fluent Interface

```
expr = '28++32+++32+39'
```

```
IterHelper(expr.split('+')).filter(bool).map(int).sum()
```

```
ages = [42, 21, 18, 33, 19]
```

```
IterHelper(ages).map(lambda x:x>=18).all()
```

Fluent Interface (cont.)

```
class IterHelper(object):
    def __init__(self, iterable = []):
        self.iterable = iterable

    def dump(self):
        return list(self.iterable)

    def map(self, func):
        return IterHelper(itertools imap(func, self.iterable))

    def filter(self, predicate):
        return IterHelper(itertools ifilter(predicate, self.iterable))

    def sum(self):
        return sum(self.iterable)

    def all(self):
        return all(self.iterable)
```



*I have made this longer than usual
because I have not had time to make it
shorter.*

-- Blaise Pascal (1623-1662)

Terse Code Is Not A Free Lunch!

```
' '.join('{0:08b}'.format(ord(x)) for x in 'Bigger Than Bigger!')
```

```
01000010 01101001 01100111 01100111 01100101  
01110010 00100000 01010100 01101000 01100001  
01101110 00100000 01000010 01101001 01100111  
01100111 01100101 01110010 00100001
```

Bigger Than Bigger!

Thank You!

References:

- code like a pythonista: <http://python.net/~goodger/projects/pycon/2007/idiomatic/handout.html>
- itertools: <https://docs.python.org/2/library/itertools.html>
- functional python: <http://ua.pycon.org/static/talks/kachayev>
- functools: <https://docs.python.org/2/library/functools.html>
- pydash: <http://pydash.readthedocs.org/en/latest/>