How do I measure elapsed time in Python?

Asked 12 years, 8 months ago Modified 1 year, 1 month ago Viewed 2.8m times

2103

I want to measure the time it took to execute a function. I couldn't get `timeit` to work:

```python
import timeit
start = timeit.timeit()
print("hello")
end = timeit.timeit()
print(end - start)
```

python performance measure timeit

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edited Jun 13, 2022 at 1:03
Mateen Ulhaq
26.2k 20 113 143

asked Sep 10, 2011 at 9:21
gilbert8
21.1k 3 15 3

11 timeit.timeit() prints the time that it takes to execute its argument, which is "pass" by default. you have to instead use start= time.time() end = time.time() – Llopeth Mar 31, 2021 at 11:49

41 Answers

Sorted by: Highest score (default)

1 2 Next

Use `time.time()` to measure the elapsed wall-clock time between two points:

2523

```
import time

start = time.time()
print("hello")
end = time.time()
print(end - start)
```

This gives the execution time in seconds.

Another option since Python 3.3 might be to use `perf_counter` or `process_time`, depending on your requirements. Before 3.3 it was recommended to use `time.clock` (thanks Amber). However, it is currently deprecated:

> On Unix, return the current processor time as a floating point number expressed in seconds. The precision, and in fact the very definition of the meaning of “processor time”, depends on that of the C function of the same name.
>
> On Windows, this function returns wall-clock seconds elapsed since the first call to this function, as a floating point number, based on the Win32 function `QueryPerformanceCounter()`. The resolution is typically better than one microsecond.
>
> *Deprecated since version 3.3*: The behaviour of this function depends on the platform: **use `perf_counter()` or `process_time()` instead**, depending on your requirements, to have a well defined behaviour.

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edited Jun 13, 2022 at 1:06
Mateen Ulhaq
26.2k 20 113 143

answered Sep 10, 2011 at 9:26
NPE
495k 111 959 1k

2 time.time() is affected by NTP errors, someone accidentally setting the year to 3023 by mistake then correcting it, leap seconds, etc. So this is something that works most of the time, but occasionally gets it wrong, in ways that can be hard to understand and impossible to reproduce. – Martin C. Martin Nov 20, 2023 at 18:39

1 @MartinC.Martin: perf_counter() does include time elapsed during sleep: docs.python.org/3/library/time.html#time.perf_counter – jfs Jan 24 at 17:25

1176

Use `timeit.default_timer` instead of `timeit.timeit`. The former provides the best clock available on your platform and version of Python automatically:

```
from timeit import default_timer as timer

start = timer()
# ...
end = timer()
print(end - start) # Time in seconds, e.g. 5.38091952400282
```

timeit.default_timer is assigned to time.time() or time.clock() depending on OS. On Python 3.3+ default_timer is time.perf_counter() on all platforms. See Python - time.clock() vs. time.time() - accuracy?

See also:

- Optimizing code
- How to optimize for speed

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edited Sep 1, 2022 at 15:57

answered Sep 13, 2014 at 13:54
jfs
409k 200 1k 1.7k

82 Excellent answer - using **timeit** will produce far more accurate results since it will automatically account for things like garbage collection and OS differences – lkgarrison Dec 11, 2016 at 3:16

247

Python 3 only:

Since `time.clock()` is deprecated as of Python 3.3, you will want to use `time.perf_counter()` for system-wide timing, or `time.process_time()` for process-wide timing, just the way you used to use `time.clock()`:

```
import time
```

```
t = time.process_time()
#do some stuff
elapsed_time = time.process_time() - t
```

The new function `process_time` will not include time elapsed during sleep.

Share Edit Follow Flag

edited Oct 5, 2021 at 15:21
johnthagen
8,671 6 41 45

answered Jan 30, 2014 at 11:25
Pierre Prinetti
9,372 6 34 50

1 The docs say that `process_time()` returns the sum of CPU and user time. Doesn't that mean this only returns the time that `# do some stuff` was running (and not blocking -- like on IO) and not the actual elapsed time? – MikeB Mar 1, 2023 at 0:50

239

Measuring time **in seconds:**

```
from timeit import default_timer as timer
from datetime import timedelta

start = timer()

# ....
# (your code runs here)
# ...

end = timer()
print(timedelta(seconds=end-start))
```

Output:

```
0:00:01.946339
```

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edited Nov 30, 2021 at 12:49

answered Mar 19, 2019 at 10:42
Gal Bracha
19.6k 11 77 87

108

Given a function you'd like to time,

test.py:

```
def foo():
    # print "hello"
    return "hello"
```

the easiest way to use `timeit` is to call it from the command line:

```
% python -mtimeit -s'import test' 'test.foo()'
1000000 loops, best of 3: 0.254 usec per loop
```

Do not try to use `time.time` or `time.clock` (naively) to compare the speed of functions. They can give misleading results.

PS. Do not put print statements in a function you wish to time; otherwise the time measured will depend on the speed of the terminal.

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edited May 23, 2017 at 12:34
Community Bot
1 1

answered Sep 10, 2011 at 10:04
unutbu
866k 191 1.8k 1.7k

102

It's fun to do this with a context-manager that automatically remembers the start time upon entry to a `with` block, then freezes the end time on block exit. With a little trickery, you can even get a running elapsed-time tally inside the block from the same context-manager function.

The core library doesn't have this (but probably ought to). Once in place, you can do things like:

```
with elapsed_timer() as elapsed:
    # some lengthy code
    print( "midpoint at %.2f seconds" % elapsed() )  # time so far
    # other lengthy code
```

```
print( "all done at %.2f seconds" % elapsed() )
```

Here's contextmanager code sufficient to do the trick:

```
from contextlib import contextmanager
from timeit import default_timer

@contextmanager
def elapsed_timer():
    start = default_timer()
    elapser = lambda: default_timer() - start
    yield lambda: elapser()
    end = default_timer()
    elapser = lambda: end-start
```

And some runnable demo code:

```
import time

with elapsed_timer() as elapsed:
    time.sleep(1)
    print(elapsed())
    time.sleep(2)
    print(elapsed())
    time.sleep(3)
```

Note that by design of this function, the return value of `elapsed()` is frozen on block exit, and further calls return the same duration (of about 6 seconds in this toy example).

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edited Nov 28, 2015 at 21:29
Nicholas Riley
44k 6 103 125

answered May 4, 2015 at 7:18
gojomo
53.6k 15 88 119

2 Other context manager example: dabeaz.blogspot.fr/2010/02/... – Jérôme May 3, 2016 at 14:03

1 @Jérôme nice example - I adapted it as another answer - stackoverflow.com/a/41408510/243392 – Brian Burns Dec 31, 2016 at 13:05

80

I prefer this. `timeit` doc is far too confusing.

```
from datetime import datetime

start_time = datetime.now()

# INSERT YOUR CODE

time_elapsed = datetime.now() - start_time

print('Time elapsed (hh:mm:ss.ms) {}'.format(time_elapsed))
```

Note, that there isn't any formatting going on here, I just wrote `hh:mm:ss` into the printout so one can interpret `time_elapsed`

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edited Jan 1, 2018 at 7:46
Saugat
1,329 14 22

answered Aug 14, 2017 at 6:40
Reddspark
7,373 9 52 72

12 It's risky to measure elapsed time this way because datetime.now() can change between the two calls for reasons like network time syncing, daylight savings switchover or the user twiddling the clock. – user1318499 Jul 22, 2019 at 2:20

69

Here's another way to do this:

```
>> from pytictoc import TicToc
>> t = TicToc() # create TicToc instance
>> t.tic() # Start timer
>> # do something
>> t.toc() # Print elapsed time
Elapsed time is 2.612231 seconds.
```

Comparing with traditional way:

```
>> from time import time
>> t1 = time()
>> # do something
>> t2 = time()
>> elapsed = t2 - t1
>> print('Elapsed time is %f seconds.' % elapsed)
Elapsed time is 2.612231 seconds.
```

Installation:

```
pip install pytictoc
```

Refer to the PyPi page for more details.

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edited Apr 14, 2020 at 19:05

answered Jul 8, 2019 at 5:30
Mingwei He
844 6 11

21 It would be good to explain the advantage of using this library over other approaches. – hlg Jul 8, 2019 at 5:50

1 @PetarMI : FYI, I just fixed the issue with `ttictoc` . Quite a mess I had, but it should be good now. – H. Sánchez Apr 6, 2020 at 0:10

64

The easiest way to calculate the duration of an operation:

```
import time

start_time = time.monotonic()

<operations, programs>
```

```
print('seconds: ', time.monotonic() - start_time)
```

Official docs here.

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edited Apr 14, 2021 at 5:40
user1318499
1,325 11 35

answered May 30, 2020 at 18:08
Wojciech Moszczyński
3,037 23 27

2 It is better to use `time.monotonic_ns()` , see docs.python.org/3/library/time.html#time.monotonic_ns – alexsmail Oct 26, 2021 at 17:14

|

49

Here are my findings after going through many good answers here as well as a few other articles.

First, if you are debating between `timeit` and `time.time`, the `timeit` has two advantages:

1. `timeit` selects the best timer available on your OS and Python version.
2. `timeit` disables garbage collection, however, this is not something you may or may not want.

Now the problem is that `timeit` is not that simple to use because it needs setup and things get ugly when you have a bunch of imports. Ideally, you just want a decorator or use `with` block and measure time. Unfortunately, there is nothing built-in available for this so you have two options:

Option 1: Use timebudget library

The timebudget is a versatile and very simple library that you can use just in one line of code after pip install.

```
@timebudget  # Record how long this function takes
def my_method():
    # my code
```

Option 2: Use my small module

I created below little timing utility module called timing.py. Just drop this file in your project and start using it. The only external dependency is runstats which is again small.

Now you can time any function just by putting a decorator in front of it:

```
import timing

@timing.MeasureTime
def MyBigFunc():
    #do something time consuming
    for i in range(10000):
        print(i)

timing.print_all_timings()
```

If you want to time portion of code then just put it inside `with` block:

```
import timing

#somewhere in my code

with timing.MeasureBlockTime("MyBlock"):
    #do something time consuming
    for i in range(10000):
        print(i)

# rest of my code

timing.print_all_timings()
```

Advantages:

There are several half-backed versions floating around so I want to point out few highlights:

1. Use timer from timeit instead of time.time for reasons described earlier.
2. You can disable GC during timing if you want.
3. Decorator accepts functions with named or unnamed params.

4. Ability to disable printing in block timing (use `with timing.MeasureBlockTime() as t` and then `t.elapsed`).
5. Ability to keep gc enabled for block timing.

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edited Aug 2, 2020 at 4:53

answered Sep 12, 2018 at 6:18
Shital Shah
66.6k 18 250 193

|

31

Using `time.time` to measure execution gives you the overall execution time of your commands including running time spent by other processes on your computer. It is the time the user notices, but is not good if you want to compare different code snippets / algorithms / functions / ...

More information on `timeit`:

- Using the timeit Module
- timeit – Time the execution of small bits of Python code

If you want a deeper insight into profiling:

- http://wiki.python.org/moin/PythonSpeed/PerformanceTips#Profiling_Code
- How can you profile a python script?

Update: I used http://pythonhosted.org/line_profiler/ a lot during the last year and find it very helpfull and recommend to use it instead of Pythons profile module.

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edited May 23, 2017 at 11:47
Community Bot
1 1

answered Sep 10, 2011 at 9:38
rocksportrocker
7,339 2 33 50

on python3:

27

```
from time import sleep, perf_counter as pc
t0 = pc()
sleep(1)
print(pc()-t0)
```

elegant and short.

output:

```
1.001345009999568
```

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edited Apr 4, 2023 at 11:40
Markus Dutschke
10.1k 4 69 63

answered Jan 15, 2016 at 7:15
DmitrySemenov
9,905 20 84 135

1 @KIC It's in seconds. – Guimoute Jun 7, 2020 at 11:56

1 I can't believe this is the first answer mentioning performance counter `perf_counter` ! Thank you :) – Markus Dutschke Apr 4, 2023 at 11:42

23

Here's another context manager for timing code -

Usage:

```
from benchmark import benchmark

with benchmark("Test 1+1"):
    1+1
=>
Test 1+1 : 1.41e-06 seconds
```

or, if you need the time value

```
with benchmark("Test 1+1") as b:
    1+1
print(b.time)
=>
Test 1+1 : 7.05e-07 seconds
7.05233786763e-07
```

benchmark.py:

```
from timeit import default_timer as timer

class benchmark(object):

    def __init__(self, msg, fmt="%0.3g"):
        self.msg = msg
        self.fmt = fmt

    def __enter__(self):
        self.start = timer()
        return self

    def __exit__(self, *args):
        t = timer() - self.start
        print(("%s : " + self.fmt + " seconds") % (self.msg, t))
        self.time = t
```

Adapted from http://dabeaz.blogspot.fr/2010/02/context-manager-for-timing-benchmarks.html

Share Edit Follow Flag

answered Dec 31, 2016 at 13:03
Brian Burns
21.4k 10 89 78

22

Use profiler module. It gives a very detailed profile.

```
import profile
profile.run('main()')
```

it outputs something like:

```
          5 function calls in 0.047 seconds

    Ordered by: standard name

    ncalls  tottime  percall  cumtime  percall filename:lineno(function)
         1    0.000    0.000    0.000    0.000 :0(exec)
         1    0.047    0.047    0.047    0.047 :0(setprofile)
         1    0.000    0.000    0.000    0.000 <string>:1(<module>)
         0    0.000             0.000          profile:0(profiler)
         1    0.000    0.000    0.047    0.047 profile:0(main())
         1    0.000    0.000    0.000    0.000 two_sum.py:2(twoSum)
```

I've found it very informative.

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answered Jul 18, 2017 at 23:19
Leonid Ganeline
616 6 17

1 What is `main()` ? Would be more useful if you could provide a simple code example. – not2qubit Sep 26, 2018 at 10:17

21

The python cProfile and pstats modules offer great support for measuring time elapsed in certain functions without having to add any code around the existing functions.

For example if you have a python script timeFunctions.py:

```
import time

def hello():
    print "Hello :)"
    time.sleep(0.1)

def thankyou():
    print "Thank you!"
    time.sleep(0.05)

for idx in range(10):
    hello()

for idx in range(100):
    thankyou()
```

To run the profiler and generate stats for the file you can just run:

```
python -m cProfile -o timeStats.profile timeFunctions.py
```

What this is doing is using the cProfile module to profile all functions in timeFunctions.py and collecting the stats in the timeStats.profile file. Note that we did not have to add any code to existing module (timeFunctions.py) and this can be done with any module.

Once you have the stats file you can run the pstats module as follows:

```
python -m pstats timeStats.profile
```

This runs the interactive statistics browser which gives you a lot of nice functionality. For your particular use case you can just check the stats for your function. In our example checking stats for both functions shows us the following:

```
Welcome to the profile statistics browser.
timeStats.profile% stats hello
<timestamp>    timeStats.profile

         224 function calls in 6.014 seconds

   Random listing order was used
```

```
    List reduced from 6 to 1 due to restriction <'hello'>

    ncalls  tottime  percall  cumtime  percall filename:lineno(function)
        10    0.000    0.000    1.001    0.100 timeFunctions.py:3(hello)

 timeStats.profile% stats thankyou
 <timestamp>    timeStats.profile

          224 function calls in 6.014 seconds

    Random listing order was used
    List reduced from 6 to 1 due to restriction <'thankyou'>

    ncalls  tottime  percall  cumtime  percall filename:lineno(function)
       100    0.002    0.000    5.012    0.050 timeFunctions.py:7(thankyou)
```

The dummy example does not do much but give you an idea of what can be done. The best part about this approach is that I dont have to edit any of my existing code to get these numbers and obviously help with profiling.

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answered Dec 26, 2013 at 22:03
sanchitarora
900 10 19

2 Actually there is some confusion; it appears cProfile does look at wall-clock time by default. I've upvoted your answer. – ShreevatsaR Apr 10, 2014 at 14:42

21

(With Ipython only) you can use %timeit to measure average processing time:

```
def foo():
    print "hello"
```

and then:

```
%timeit foo()
```

the result is something like:

```
10000 loops, best of 3: 27 µs per loop
```

Share Edit Follow Flag

edited Dec 15, 2016 at 14:24
raacer
5,392 3 28 47

answered Nov 24, 2014 at 14:25
Eyal Ch
9,858 5 48 54

5 It worth to mention it is possible to pass flags to %timeit, for example -n specifies how many times the code should be repeated. – raacer Dec 15, 2016 at 12:50

1 `%%timeit` for jupyter notebook cell! – Memming Jul 9, 2023 at 12:35

21

Here is a tiny timer class that returns "hh:mm:ss" string:

```
class Timer:
  def __init__(self):
    self.start = time.time()

  def restart(self):
    self.start = time.time()

  def get_time_hhmmss(self):
    end = time.time()
    m, s = divmod(end - self.start, 60)
    h, m = divmod(m, 60)
    time_str = "%02d:%02d:%02d" % (h, m, s)
    return time_str
```

Usage:

```
# Start timer
my_timer = Timer()

# ... do something
# Get time string:
time_hhmmss = my_timer.get_time_hhmmss()
print("Time elapsed: %s" % time_hhmmss )

# ... use the timer again
my_timer.restart()

# ... do something

# Get time:
time_hhmmss = my_timer.get_time_hhmmss()

# ... etc
```

Share Edit Follow Flag

edited Apr 27, 2017 at 6:35
Shai
114k 39 252 384

answered Feb 4, 2016 at 10:49
Danijel
8,407 19 79 139

|

19

If you want to be able to time functions conveniently, you can use a simple decorator:

```
import time

def timing_decorator(func):
    def wrapper(*args, **kwargs):
        start = time.perf_counter()
        original_return_val = func(*args, **kwargs)
        end = time.perf_counter()
        print("time elapsed in ", func.__name__, ": ", end - start, sep='')
        return original_return_val

    return wrapper
```

You can use it on a function that you want to time like this:

```
@timing_decorator
def function_to_time():
    time.sleep(1)
```

```
function_to_time()
```

Any time you call `function_to_time`, it will print how long it took and the name of the function being timed.

Share Edit Follow Flag

edited Aug 19, 2022 at 22:44

answered May 1, 2020 at 3:21
Daniel Giger
2,353 23 21

18

I like it **simple** (python 3):

```
from timeit import timeit

timeit(lambda: print("hello"))
```

Output is *microseconds* for a single execution:

```
2.430883963010274
```

Explanation: timeit executes the anonymous function **1 million times** by default and the result is given in *seconds*. Therefore the result for *1 single execution* is the same amount but in *microseconds* on average.

For **slow** operations add a lower *number* of iterations or you could be waiting forever:

```
import time

timeit(lambda: time.sleep(1.5), number=1)
```

Output is always in *seconds* for the total *number* of iterations:

```
1.5015795179999714
```

Share Edit Follow Flag

edited Jul 2, 2019 at 20:10

answered Jun 18, 2019 at 18:51

David
3,052 34 17

|

17

Here is an answer using:

- a concise context manager to time code snippets
- `time.perf_counter()` to compute time delta. It should be preferred as it is not adjustable (neither a sysadmin nor a daemon can change its value) contrary to `time.time()` (see doc)

```
import time
from collections.abc import Iterator
from contextlib import contextmanager

@contextmanager
def time_it() -> Iterator[None]:
    tic: float = time.perf_counter()
    try:
        yield
    finally:
        toc: float = time.perf_counter()
        print(f"Computation time = {1000*(toc - tic):.3f}ms")
```

An example how to use it:

```
# Example: vector dot product computation
with time_it():
    A = B = range(1_000_000)
    dot = sum(a*b for a,b in zip(A,B))
# Computation time = 95.353ms
```

Appendix

```
import time

# to check adjustability
assert time.get_clock_info('time').adjustable
assert time.get_clock_info('perf_counter').adjustable is False
```

Share Edit Follow Flag

edited Apr 11, 2023 at 12:59

answered Nov 19, 2022 at 17:19

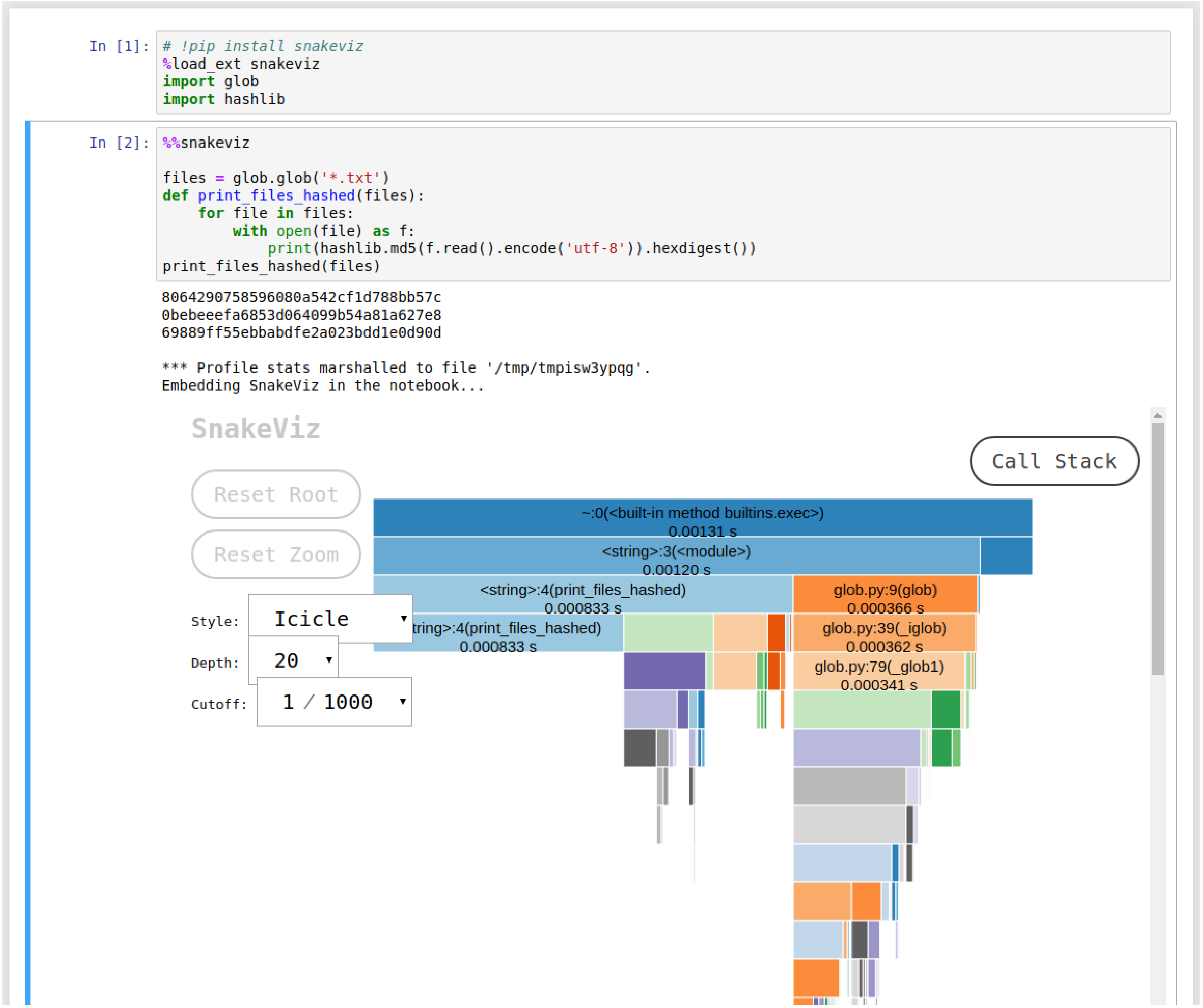
x0s
1,768 18 18

15

To get insight on every function calls recursively, do:

```
%load_ext snakeviz
%%snakeviz
```

It just takes those **2 lines of code** in a **Jupyter notebook**, and it generates a nice interactive diagram. For example:



```
In [1]: # !pip install snakeviz
        %load_ext snakeviz
        import glob
        import hashlib
```

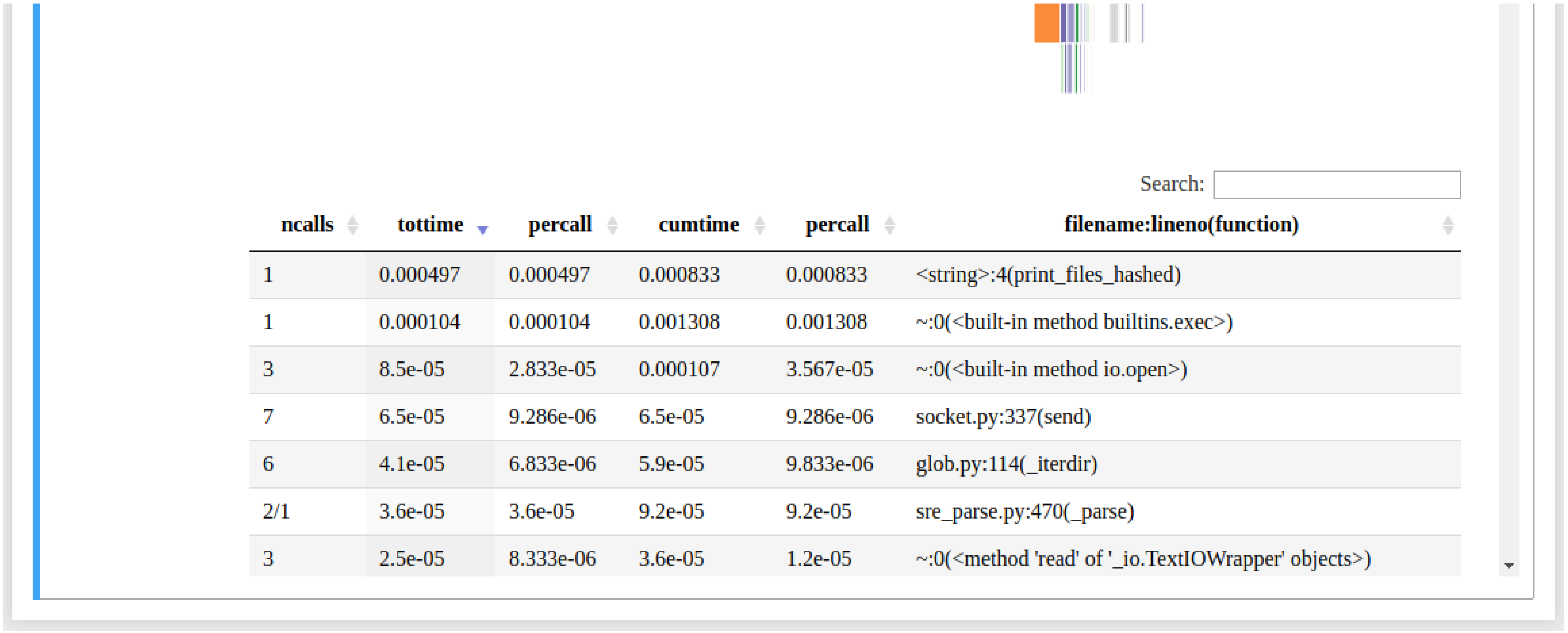
```
In [2]: %%snakeviz

        files = glob.glob('*.txt')
        def print_files_hashed(files):
            for file in files:
                with open(file) as f:
                    print(hashlib.md5(f.read().encode('utf-8')).hexdigest())
        print_files_hashed(files)
```

```
8064290758596080a542cf1d788bb57c
0bebeeefa6853d064099b54a81a627e8
69889ff55ebbabdfe2a023bdd1e0d90d

*** Profile stats marshalled to file '/tmp/tmpisw3ypqg'.
Embedding SnakeViz in the notebook...
```

Style: Icicle
Depth: 20
Cutoff: 1 / 1000



Search:

ncalls	tottime	percall	cumtime	percall	filename:lineno(function)
1	0.000497	0.000497	0.000833	0.000833	<string>:4(print_files_hashed)
1	0.000104	0.000104	0.001308	0.001308	~:0(<built-in method builtins.exec>)
3	8.5e-05	2.833e-05	0.000107	3.567e-05	~:0(<built-in method io.open>)
7	6.5e-05	9.286e-06	6.5e-05	9.286e-06	socket.py:337(send)
6	4.1e-05	6.833e-06	5.9e-05	9.833e-06	glob.py:114(_iterdir)
2/1	3.6e-05	3.6e-05	9.2e-05	9.2e-05	sre_parse.py:470(_parse)
3	2.5e-05	8.333e-06	3.6e-05	1.2e-05	~:0(<method 'read' of '_io.TextIOWrapper' objects>)

Here is the code. Again, the 2 lines starting with `%` are the only extra lines of code needed to use snakeviz:

```
# !pip install snakeviz
%load_ext snakeviz
import glob
import hashlib

%%snakeviz

files = glob.glob('*.txt')
def print_files_hashed(files):
    for file in files:
        with open(file) as f:
            print(hashlib.md5(f.read().encode('utf-8')).hexdigest())
print_files_hashed(files)
```

It also seems possible to run snakeviz outside notebooks. More info on the snakeviz website.

Share Edit Follow Flag edited Jun 14, 2019 at 4:37 answered Jun 14, 2019 at 4:31

Guillaume Chevalier
10.4k 11 51 81

13

One more way to use timeit:

```
from timeit import timeit

def func():
    return 1 + 1

time = timeit(func, number=1)
print(time)
```

Share Edit Follow Flag

answered Dec 15, 2016 at 12:39

raacer
5,392 3 28 47

13

How to measure the time between two operations. Compare the time of two operations.

```
import time

b = (123*321)*123
t1 = time.time()

c = ((9999^123)*321)^123
t2 = time.time()

print(t2-t1)
```

7.987022399902344e-05

Share Edit Follow Flag

answered Sep 17, 2020 at 8:33

Wojciech Moszczyński
3,037 23 27

|

10

Here's a pretty well documented and fully type hinted decorator I use as a general utility:

```
from functools import wraps
from time import perf_counter
from typing import Any, Callable, Optional, TypeVar, cast

F = TypeVar("F", bound=Callable[..., Any])


def timer(prefix: Optional[str] = None, precision: int = 6) -> Callable[[F], F]:
    """Use as a decorator to time the execution of any function.

    Args:
        prefix: String to print before the time taken.
            Default is the name of the function.
        precision: How many decimals to include in the seconds value.

    Examples:
        >>> @timer()
        ... def foo(x):
```

```
        ...     return x
        >>> foo(123)
        foo: 0.000...s
        123
        >>> @timer("Time taken: ", 2)
        ... def foo(x):
        ...     return x
        >>> foo(123)
        Time taken: 0.00s
        123

    """
    def decorator(func: F) -> F:
        @wraps(func)
        def wrapper(*args: Any, **kwargs: Any) -> Any:
            nonlocal prefix
            prefix = prefix if prefix is not None else f"{func.__name__}: "
            start = perf_counter()
            result = func(*args, **kwargs)
            end = perf_counter()
            print(f"{prefix}{end - start:.{precision}f}s")
            return result
        return cast(F, wrapper)
    return decorator
```

Example usage:

```
from timer import timer


@timer(precision=9)
def takes_long(x: int) -> bool:
    return x in (i for i in range(x + 1))


result = takes_long(10**8)
print(result)
```

Output:

```
takes_long: 4.942629056s
```

```
        True
```

The doctests can be checked with:

```
$ python3 -m doctest --verbose -o=ELLIPSIS timer.py
```

And the type hints with:

```
$ mypy timer.py
```

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edited Jul 21, 2020 at 16:28

answered Jun 1, 2020 at 21:18

ruohola
23.1k 7 69 106

1 This is super cool, thank you for sharing. I have not encountered the typing library or the nonlocal keyword -- fun to find new things to learn about. I'm having trouble wrapping my head around this: `Callable[[AnyF], AnyF]` . What does it mean? – Danny Jun 3, 2020 at 11:17

1 @Danny On the top I've defined the type alias `AnyF` to mean `Callable[..., Any]` , so `AnyF` is a function that can take any amount of any type arguments and return anything. So `Callable[[AnyF], AnyF]` would expand to `Callable[[Callable[..., Any]], Callable[..., Any]]` . This is the type of the return value of `timer` aka the full type of `decorator` . It is a function that takes any kind of function as its only argument and returns any kind of function. – ruohola Jun 3, 2020 at 12:42

1 Thanks for the explanation! I'm still trying to fully wrap my head around the internals of decorators. This helped a lot! – Danny Jun 3, 2020 at 14:04

9

Kind of a super later response, but maybe it serves a purpose for someone. This is a way to do it which I think is super clean.

```
import time

def timed(fun, *args):
    s = time.time()
    r = fun(*args)
    print('{} execution took {} seconds.'.format(fun.__name__, time.time()-s))
    return(r)
```

```
timed(print, "Hello")
```

Keep in mind that "print" is a function in Python 3 and not Python 2.7. However, it works with any other function. Cheers!

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edited Aug 14, 2017 at 14:33

answered Aug 14, 2017 at 12:54

Andreas Herman
91 1 2

8

You can use timeit.

Here is an example on how to test naive_func that takes parameter using Python REPL:

```
>>> import timeit

>>> def naive_func(x):
...     a = 0
...     for i in range(a):
...         a += i
...     return a

>>> def wrapper(func, *args, **kwargs):
...     def wrapper():
...         return func(*args, **kwargs)
...     return wrapper

>>> wrapped = wrapper(naive_func, 1_000)

>>> timeit.timeit(wrapped, number=1_000_000)
0.4458435332577161
```

You don't need wrapper function if function doesn't have any parameters.

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answered Jun 19, 2017 at 17:52

Vlad Bezden
87.2k 26 254 187

1 A `lambda` would be more succinct: `print(timeit.timeit(lambda: naive_func(1_000), number=1_000_000))` – Ciro Santilli OurBigBook.com Sep 4, 2018 at 7:49

8

print_elapsed_time function is below

```
def print_elapsed_time(prefix=''):
    e_time = time.time()
    if not hasattr(print_elapsed_time, 's_time'):
        print_elapsed_time.s_time = e_time
    else:
        print(f'{prefix} elapsed time: {e_time - print_elapsed_time.s_time:.2f}
sec')
        print_elapsed_time.s_time = e_time
```

use it in this way

```
print_elapsed_time()
.... heavy jobs ...
print_elapsed_time('after heavy jobs')
.... tons of jobs ...
print_elapsed_time('after tons of jobs')
```

result is

```
after heavy jobs elapsed time: 0.39 sec
after tons of jobs elapsed time: 0.60 sec
```

the pros and cons of this function is that you don't need to pass start time

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edited Oct 20, 2020 at 23:47

answered Oct 20, 2020 at 7:49

Myeongsik Joo
609 7 7

7

We can also convert time into human-readable time.

```
import time, datetime

start = time.clock()

def num_multi1(max):
    result = 0
    for num in range(0, 1000):
        if (num % 3 == 0 or num % 5 == 0):
            result += num

    print "Sum is %d " % result

num_multi1(1000)

end = time.clock()
value = end - start
timestamp = datetime.datetime.fromtimestamp(value)
print timestamp.strftime('%Y-%m-%d %H:%M:%S')
```

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edited Feb 16, 2017 at 22:01
Ninjakannon
3,821 7 54 80

answered Sep 17, 2016 at 17:27
Kamlesh Verma
81 1 1

7

Although it's not strictly asked in the question, it is quite often the case that you want a simple, uniform way to incrementally measure the elapsed time between several lines of code.

If you are using Python 3.8 or above, you can make use of assignment expressions (a.k.a. the walrus operator) to achieve this in a fairly elegant way:

```
import time

start, times = time.perf_counter(), {}

print("hello")
times["print"] = -start + (start := time.perf_counter())
```

```
time.sleep(1.42)
times["sleep"] = -start + (start := time.perf_counter())

a = [n**2 for n in range(10000)]
times["pow"] = -start + (start := time.perf_counter())

print(times)
```

=>

```
{'print': 2.193450927734375e-05, 'sleep': 1.4210970401763916, 'power':
0.005671024322509766}
```

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edited Feb 11, 2021 at 10:00

answered Feb 11, 2021 at 9:39

Lee Netherton
22k 12 71 103

6

I made a library for this, if you want to measure a function you can just do it like this

```
from pythonbenchmark import compare, measure
import time

a,b,c,d,e = 10,10,10,10,10
something = [a,b,c,d,e]

@measure
def myFunction(something):
    time.sleep(0.4)

@measure
def myOptimizedFunction(something):
    time.sleep(0.2)

myFunction(input)
myOptimizedFunction(input)
```

https://github.com/Karlheinzniebuhr/pythonbenchmark

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answered May 4, 2015 at 17:02

Karl
521 1 6 14

1 2 Next