

# Performance

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## 1 Measuring performance

- timeit - start to finish
- cProfile - logging
- PyInstrument - sampling
- py-spy - sampling
- Pyflame - sampling - ptrace based

## 2 Improving performance

- Measure, measure, measure
- Run with PyPy - Python version may be lagging  
<https://pypy.org>
- Memoize (cache) repeatedly used data

```
[2]: from functools import lru_cache

@lru_cache(maxsize=None)
def fib(n):
    if n < 2:
        return n
    return fib(n-1) + fib(n-2)

fib(16)
```

[2]: 987

- Move math to NumPy  
<https://numpy.org>
- Move math to Numba  
<https://numba.pydata.org/>
- Use a C library
- Convert to Cython  
<https://cython.org/>

- Go parallel with multiprocessing  
More functionality in future Python releases
- Know what your libraries are doing
- Know what your platform is doing