Chapter 1: An Introduction to NumPy

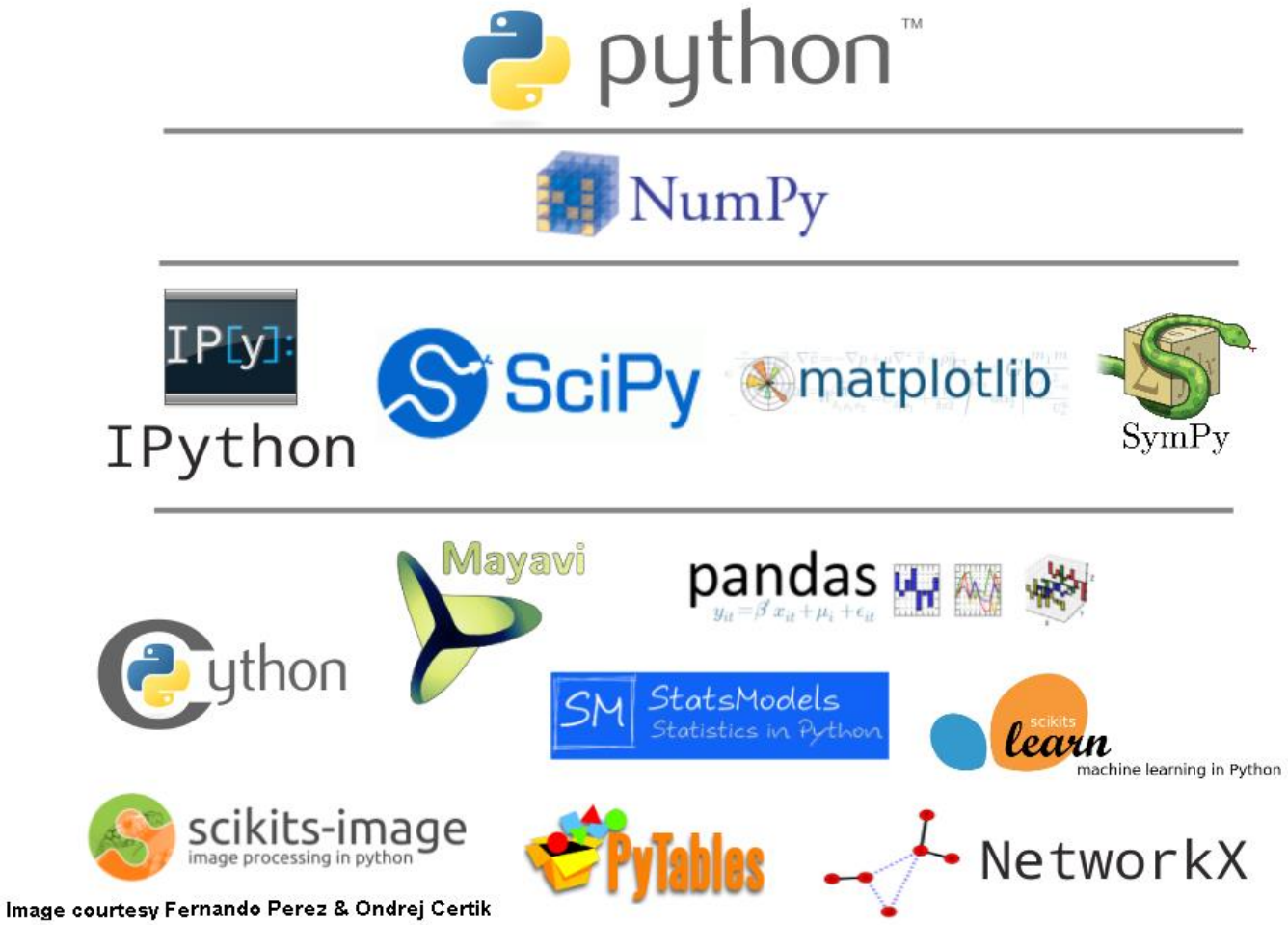


Image courtesy Fernando Perez & Ondrej Certik

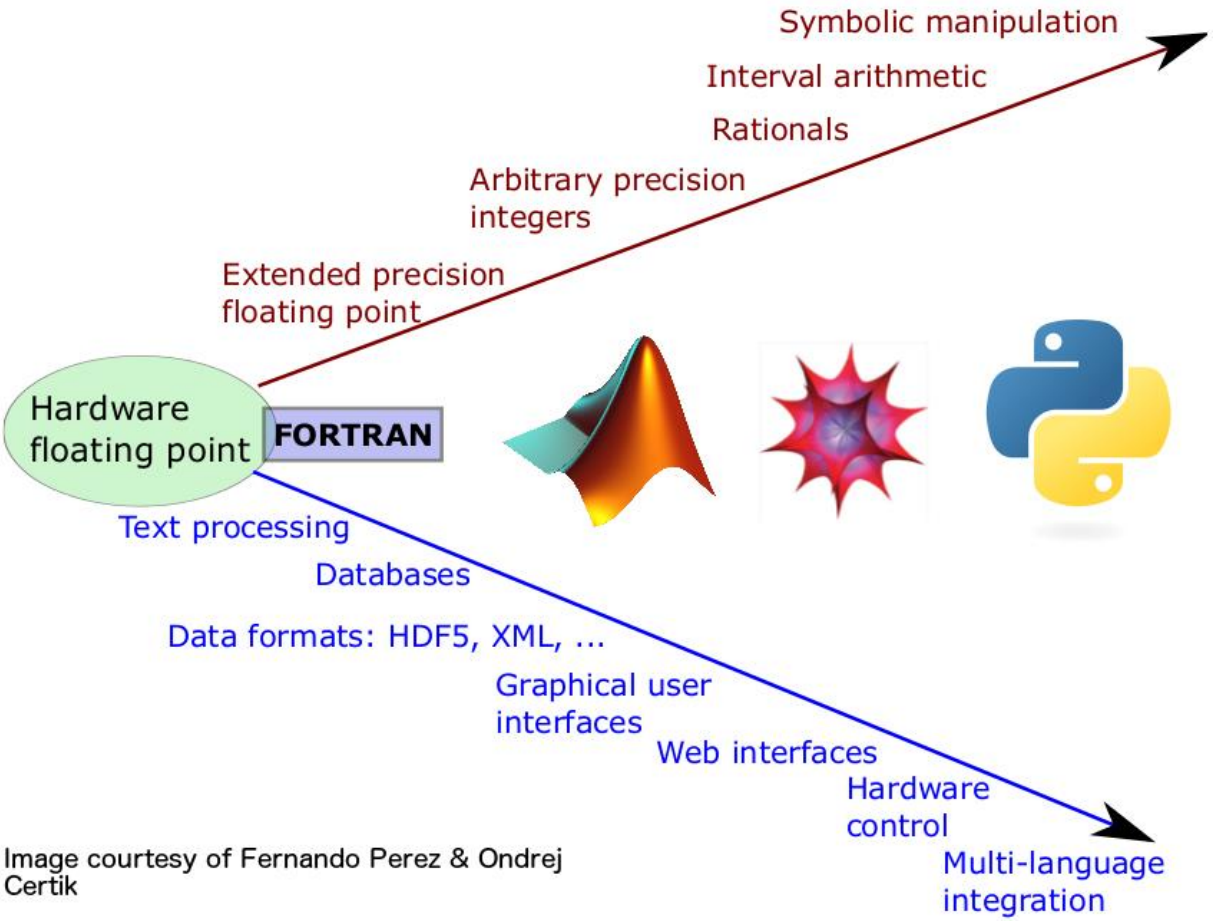
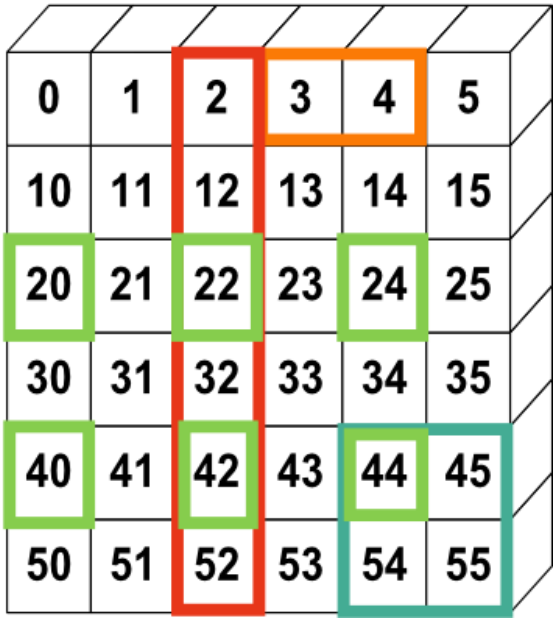
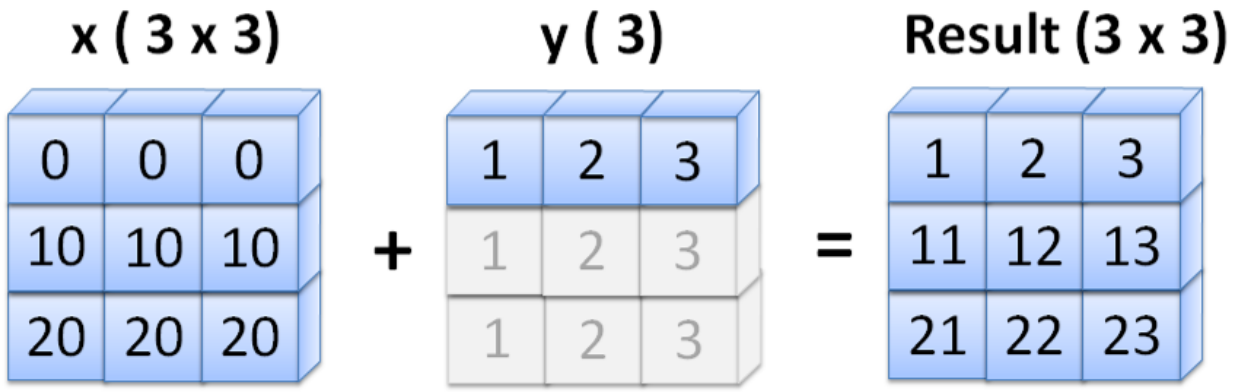


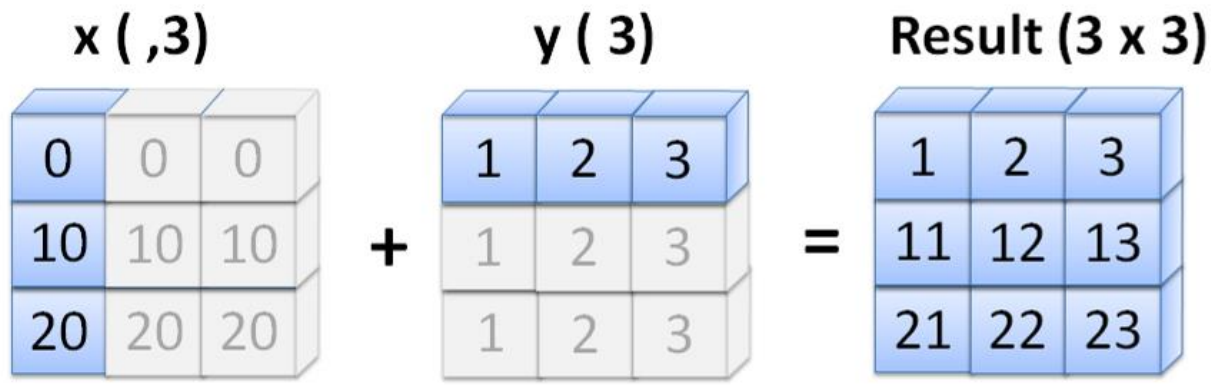
Image courtesy of Fernando Perez & Ondrej Certik

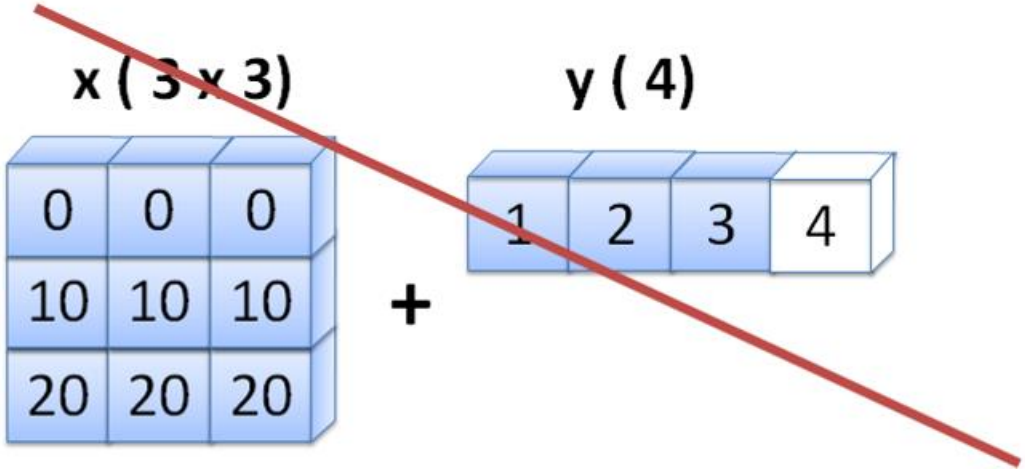
```
>>> a[0,3:5]
array([3,4])


>>> a[4:,4:]
array([[44, 45],
       [54, 55]])

>>> a[:,2]
array([2,12,22,32,42,52])

>>> a[2::2,::2]
array([[20,22,24]
       [40,42,44]])
```



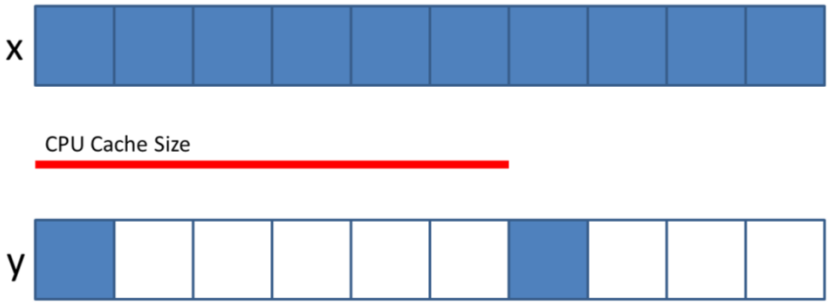
Chapter 3: Using NumPy Arrays







Chapter 4: NumPy Core and Libs Submodules



	A	B	C
1	0	0.0702	7/10/2014
2	1	0.4863	12/3/2014
3	2	0.9525	3/11/2014
4	3	0.3971	1/2/2014
5	4	0.8537	9/14/2014

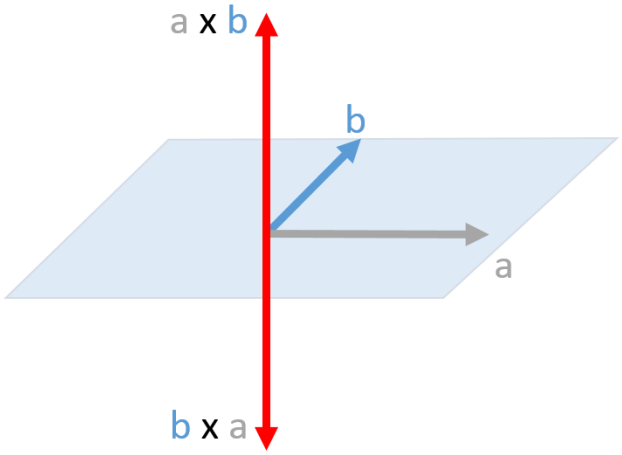
Chapter 5: Linear Algebra in NumPy

$$\begin{bmatrix} 1*10+2*30 & 1*20+2*40 \\ 3*10+4*30 & 3*20+4*40 \end{bmatrix} = \begin{bmatrix} 70 & 100 \\ 150 & 220 \end{bmatrix}$$

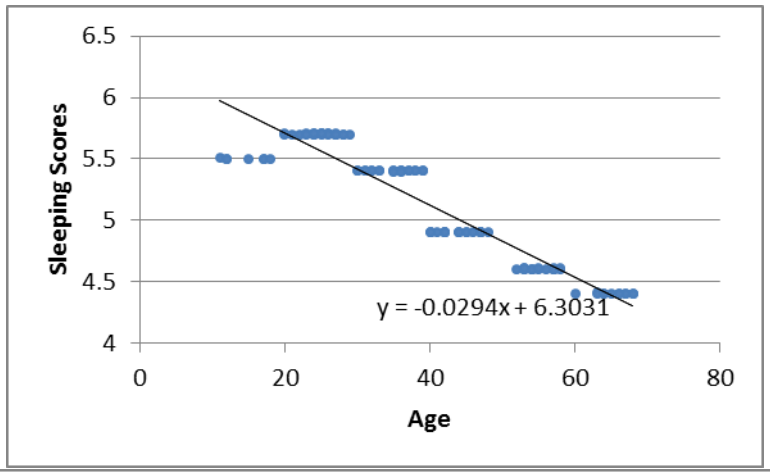
$$\begin{bmatrix} 1*10+2*30 & 1*20+2*40 \\ 3*10+4*30 & 3*20+4*40 \end{bmatrix}$$

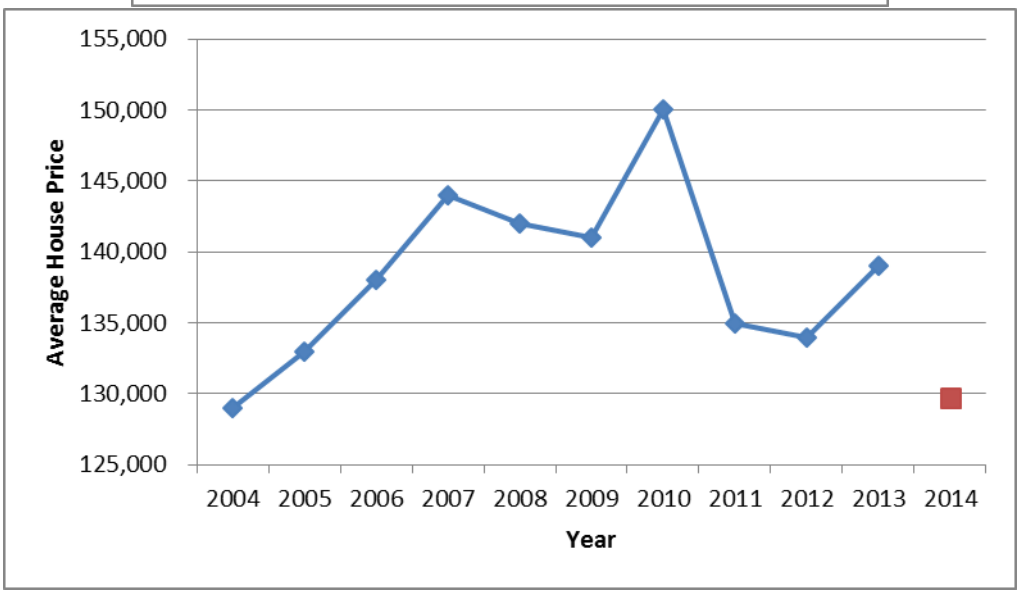
$$1*10+2*20+3*30+4*40=300$$

$$\begin{bmatrix} 1*10 & 1*20 & 1*30 & 1*40 \\ 2*10 & 2*20 & 2*30 & 2*40 \\ 3*10 & 3*20 & 3*30 & 3*40 \\ 4*10 & 4*20 & 4*30 & 4*40 \end{bmatrix} = \begin{bmatrix} 10 & 20 & 30 & 40 \\ 20 & 40 & 60 & 80 \\ 30 & 60 & 90 & 120 \\ 40 & 80 & 120 & 160 \end{bmatrix}$$

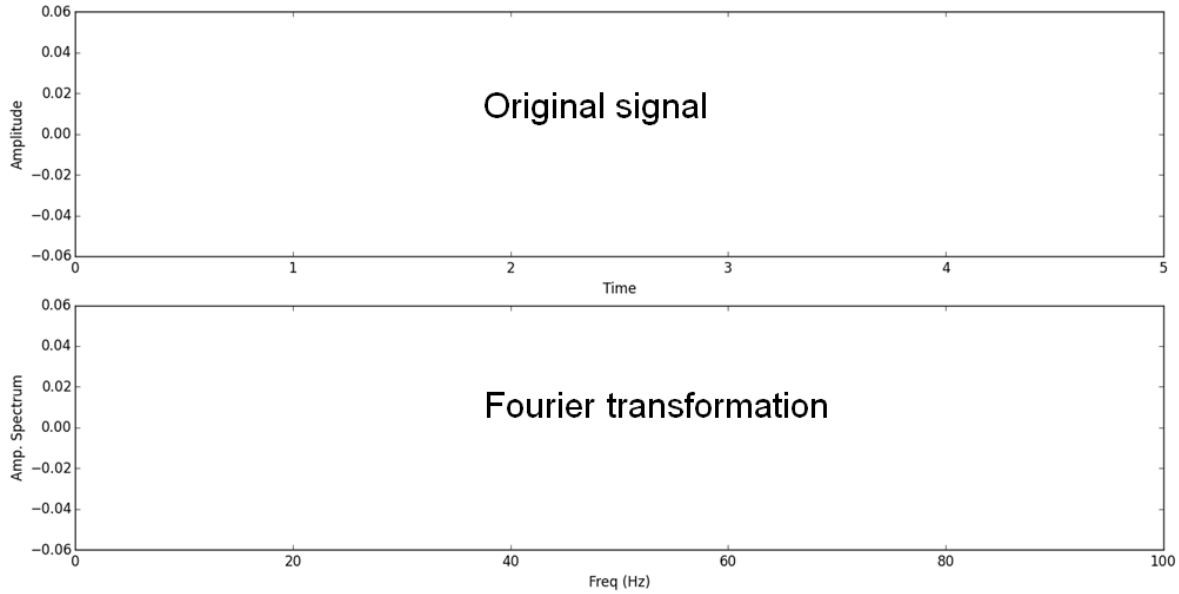


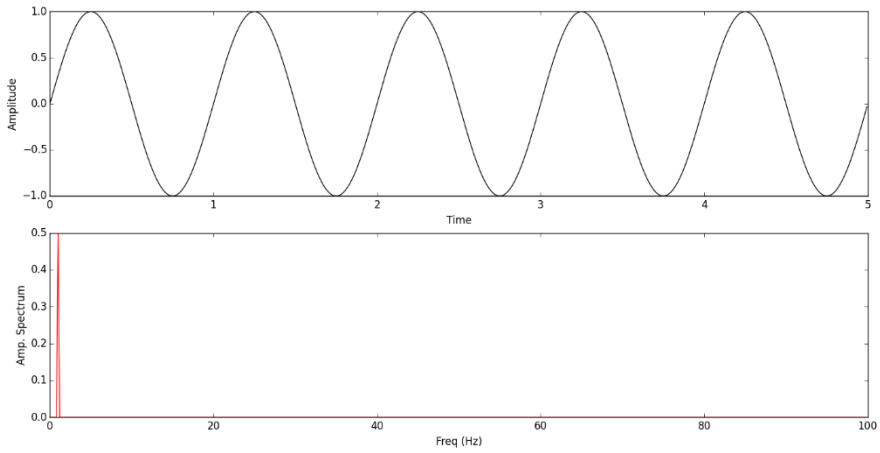
$$\frac{1}{5}x^5-\frac{1}{4}x^4+\frac{35}{3}x^3-25x^2+24x$$

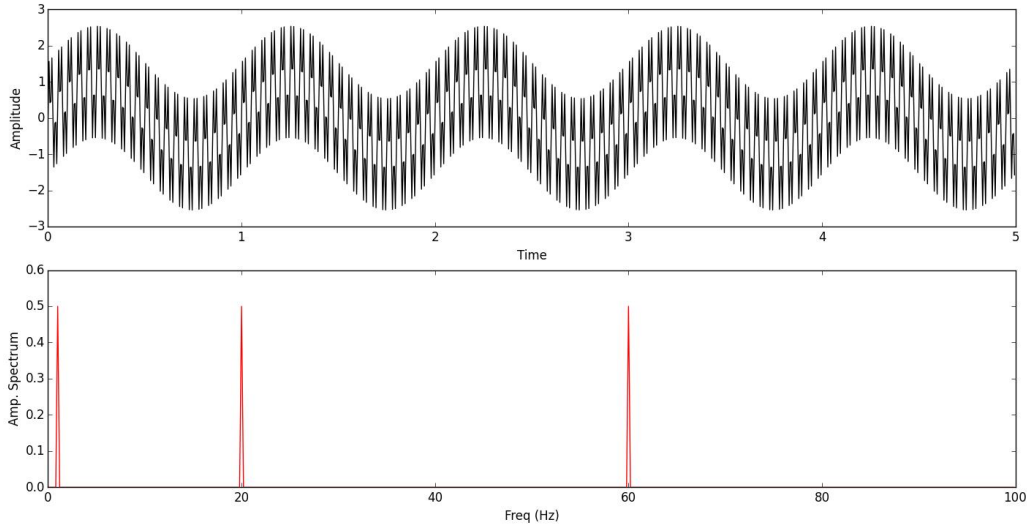

6.5
6
5.5
5
4.5
4
Sleeping Scores
y = -0.0294x + 6.3031
0
20
40
60
80
Age

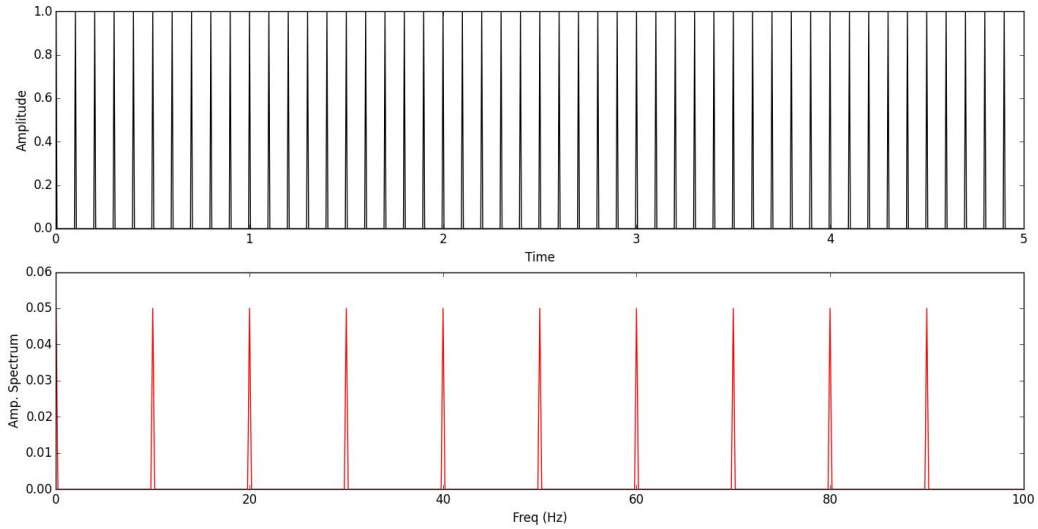

155,000
150,000
145,000
140,000
135,000
130,000
125,000
Average House Price
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Year

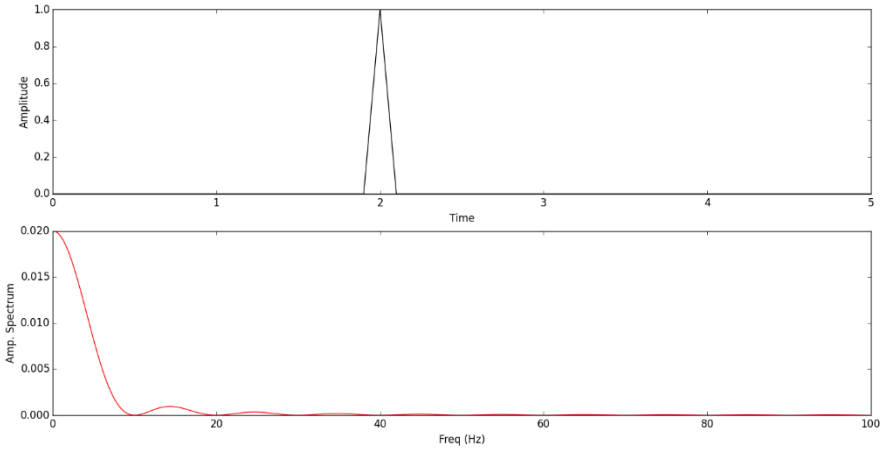
Chapter 6: Fourier Analysis in NumPy

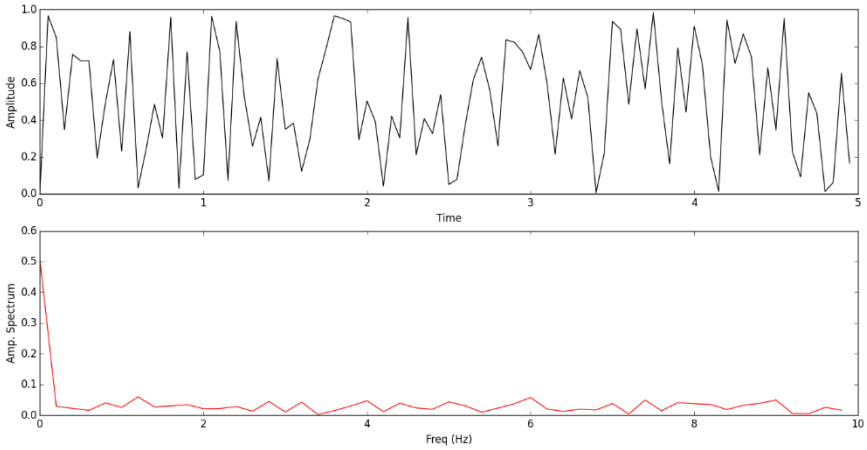





Amplitude
Time
Amp. Spectrum
Freq (Hz)


Amplitude
Time
Amp. Spectrum
Freq (Hz)


Amplitude
Time
Amp. Spectrum
Freq (Hz)

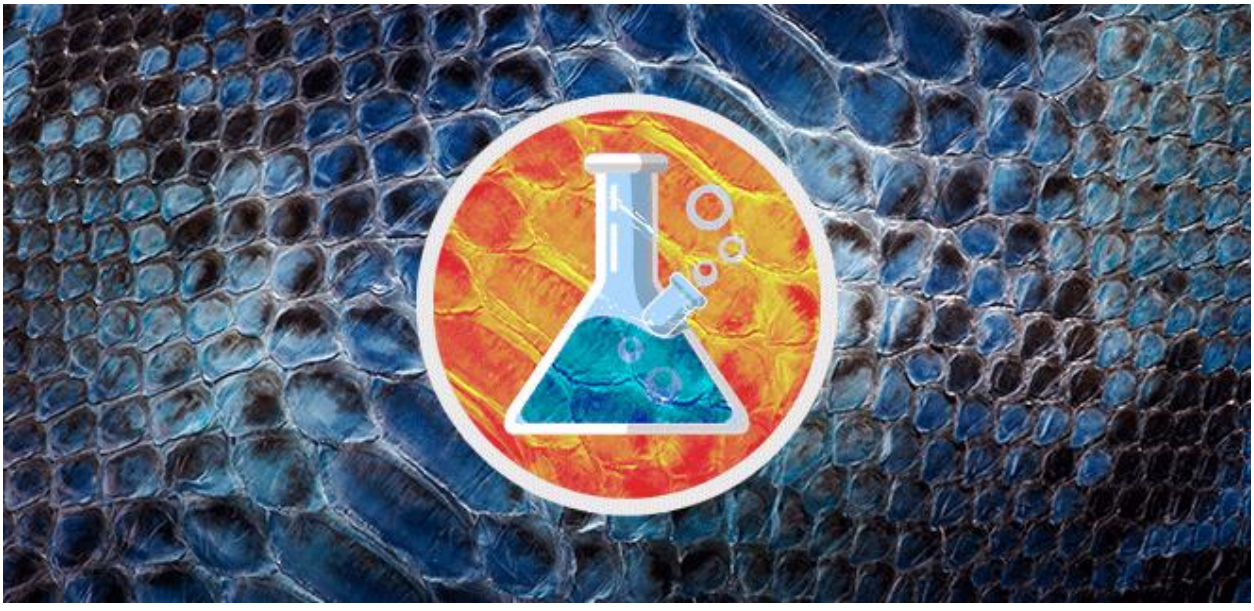


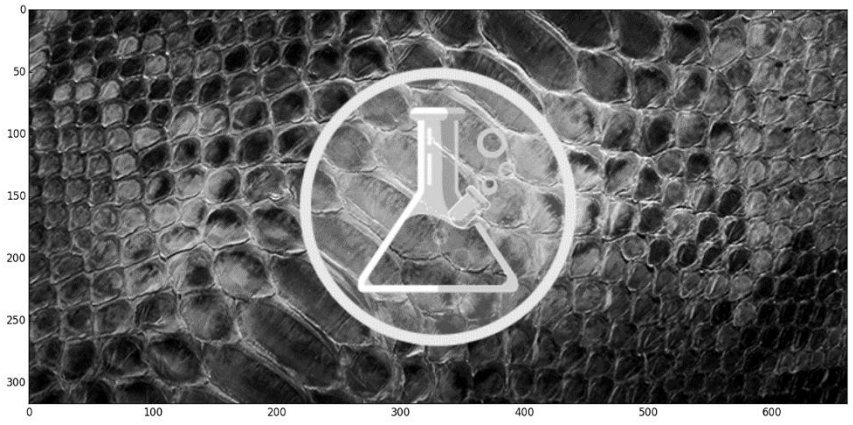
$$A_k = \sum_{m=0}^{n-1} a_m \exp\left\{-2\pi i \frac{mk}{n}\right\} \quad k = 0,1,\ldots,n-1$$

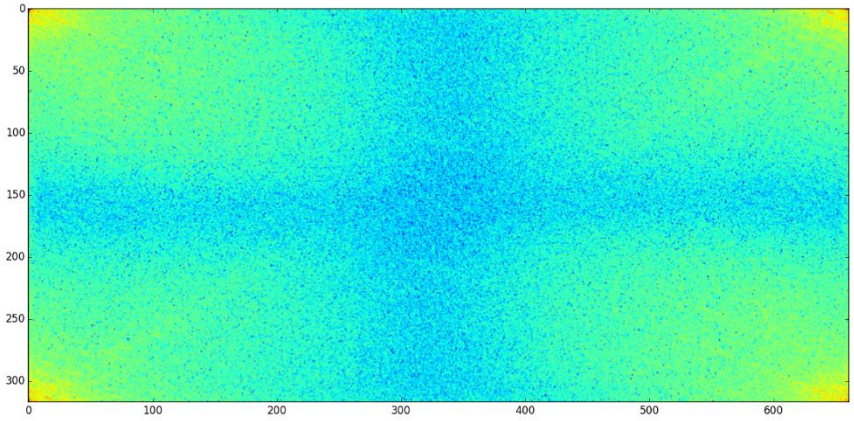
$$\exp\left\{-2\pi i \frac{mk}{n}\right\}$$

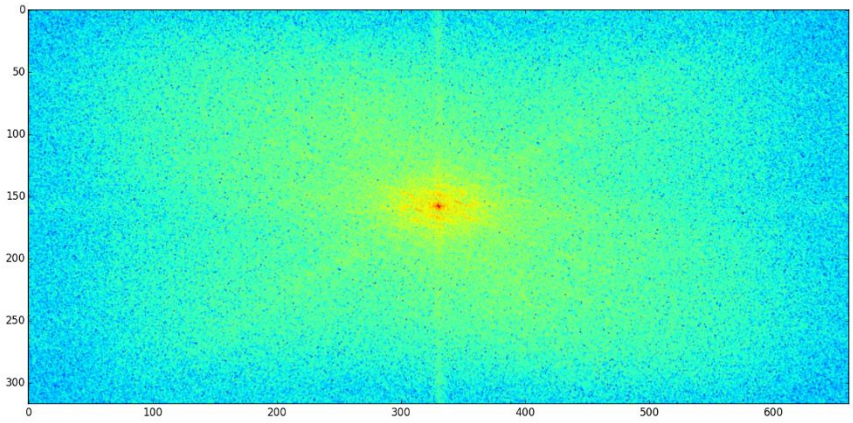
$$a_m = \frac{1}{n}\sum_{k=0}^{n-1} A_k \exp\left\{2\pi i \frac{mk}{n}\right\} \quad m = 0,1,\ldots,n-1$$

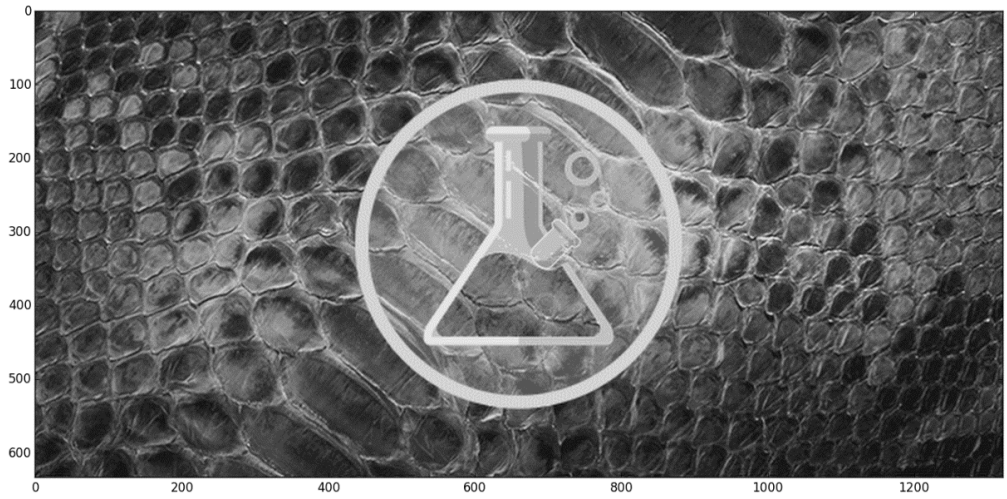
$$A_{kl} = \sum_{m=0}^{M-1}\sum_{n=0}^{N-1} a_{mn} \exp\left\{-2\pi i\left(\frac{mk}{M}+\frac{nl}{N}\right)\right\} \quad k = 0,1,\ldots,M-1; l = 0,1,\ldots,N-1$$



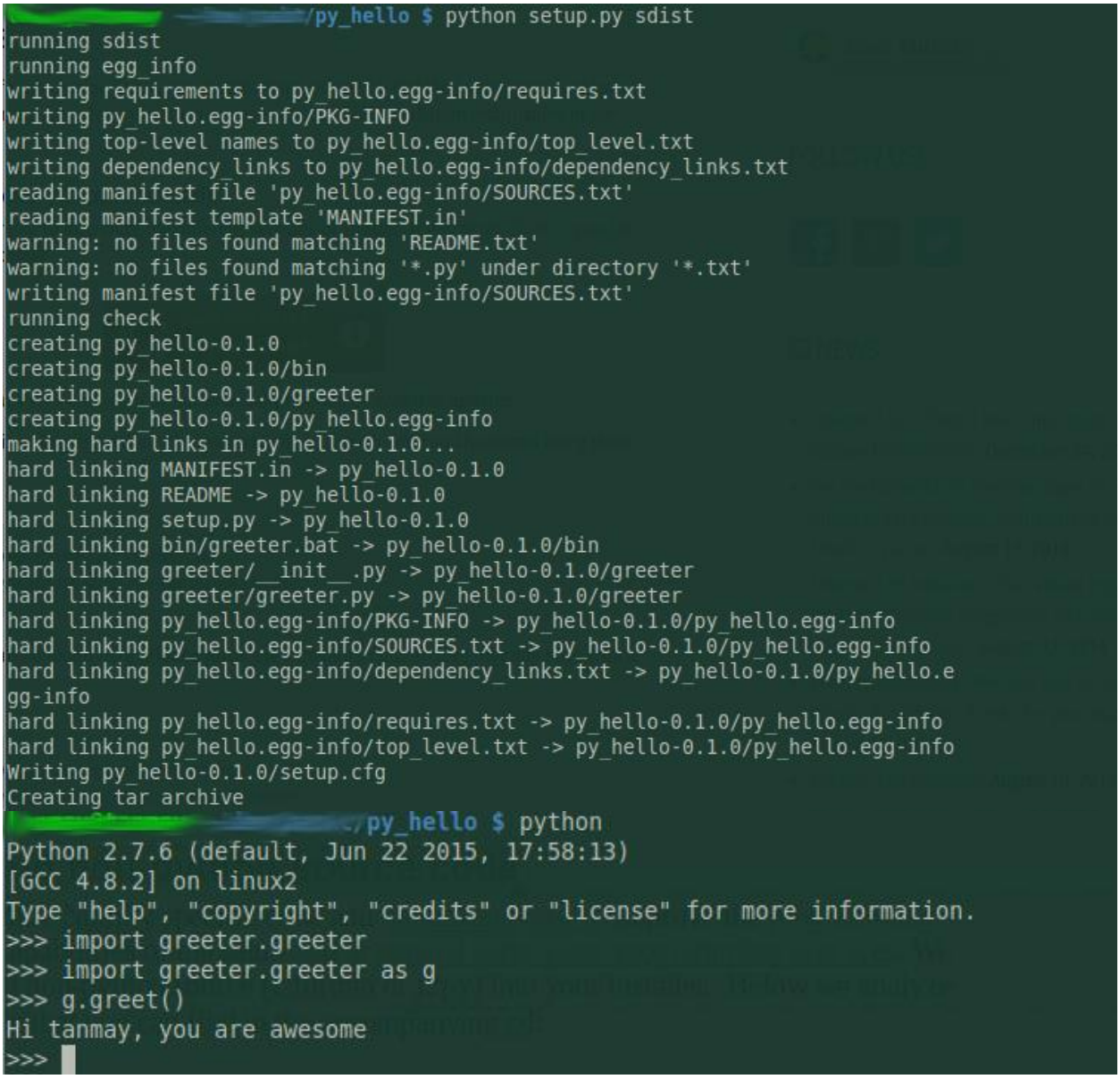

0
50
100
150
200
250
300
0
100
200
300
400
500
600


0
50
100
150
200
250
300
0
100
200
300
400
500
600

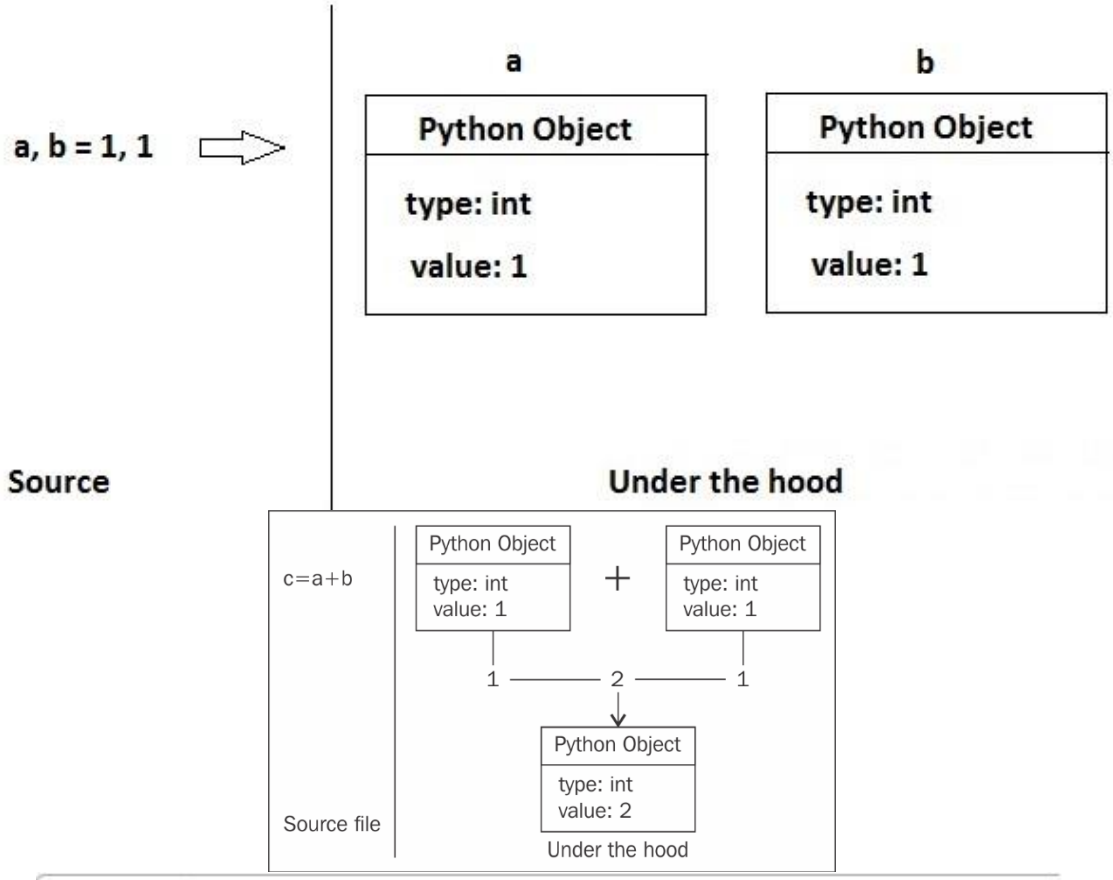

0
50
100
150
200
250
300
0
100
200
300
400
500
600


0
100
200
300
400
500
600
0
200
400
600
800
1000
1200

Chapter 7: Building and Distributing NumPy Code



Chapter 8: Speeding Up NumPy with Cython




```
In [6]: timeit(compute_fibonacchi(20))
        100000 loops, best of 3: 1.86 µs per loop
```

```
In [11]: timeit(compute_fibonacchi_cython(20))
         10000000 loops, best of 3: 64.5 ns per loop
```

```
C:\dev\packtcode>python setup.py build_ext --inplace
running build_ext
skipping 'first.c' Cython extension (up-to-date)
building 'testing' extension
C:\Anaconda\Scripts\gcc.bat -DMS_WIN64 -mdll -O -Wall -IC:\Anaconda\include -IC:
\Anaconda\PC -c first.c -o build\temp.win-amd64-2.7\Release\first.o
writing build\temp.win-amd64-2.7\Release\testing.def
C:\Anaconda\Scripts\gcc.bat -DMS_WIN64 -shared -s build\temp.win-amd64-2.7\Relea
se\first.o build\temp.win-amd64-2.7\Release\testing.def -LC:\Anaconda\libs -LC:\
Anaconda\PCbuild\amd64 -lpython27 -lmsvcr90 -o C:\dev\packtcode\testing.pyd
Cannot export inittesting: symbol not defined
collect2.exe: error: ld returned 1 exit status
error: command 'C:\\Anaconda\\Scripts\\gcc.bat' failed with exit status 1
```

Chapter 9: Introduction to the NumPy C-API (No Images)

Chapter 10: Further Reading