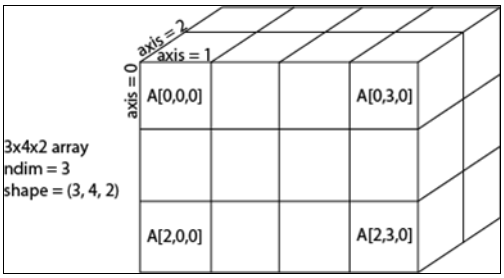
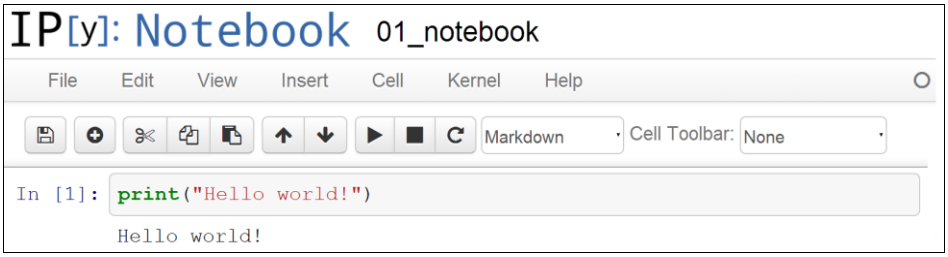
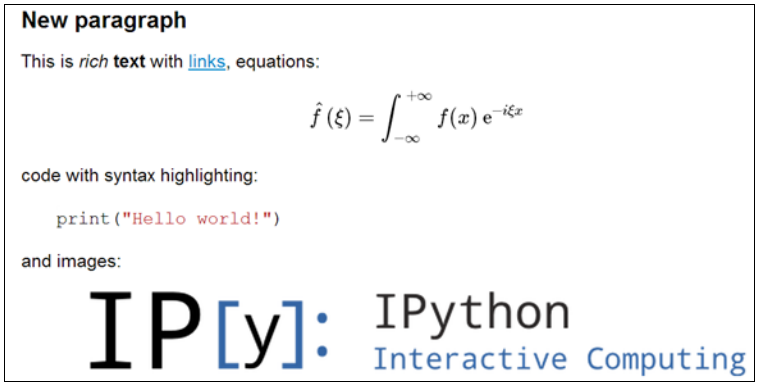
Chapter 1, A Tour of Interactive Computing with IPython







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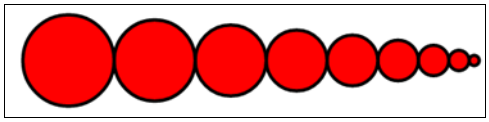
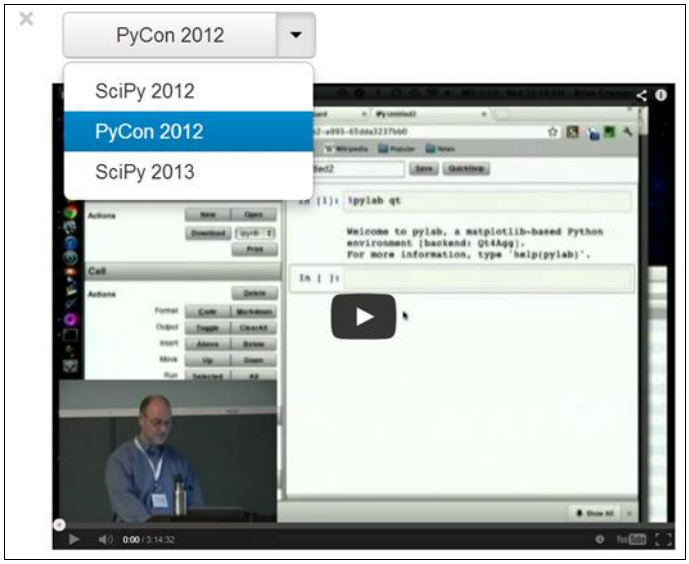
4,0	4,1	4,2	4,3	4,4



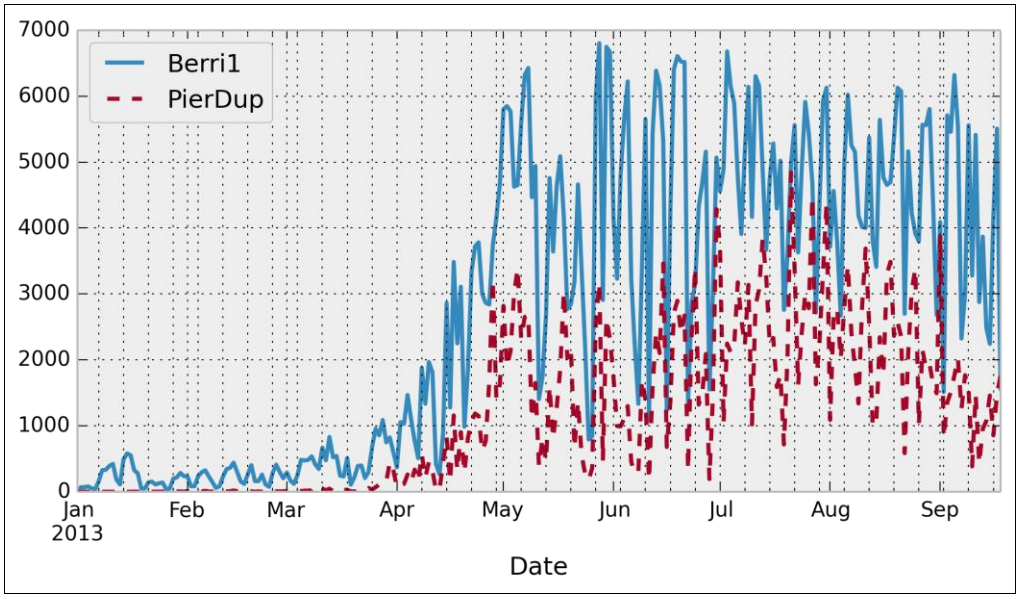
```
In [13]: YouTubeVideo('j9YpkSX7NNM')
```

Out[13]:

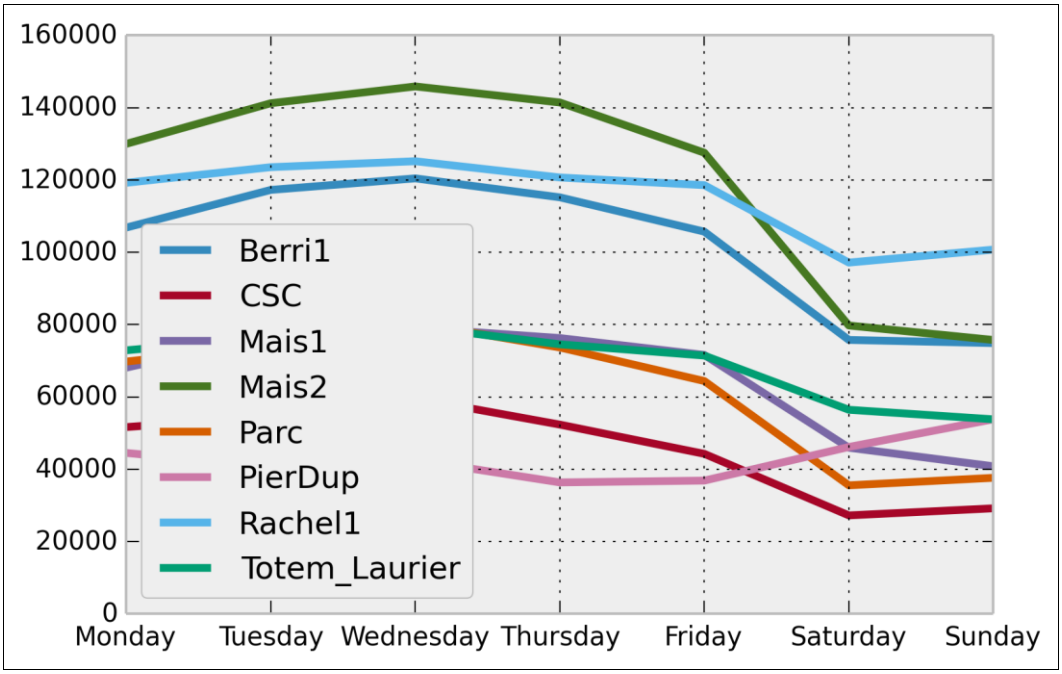


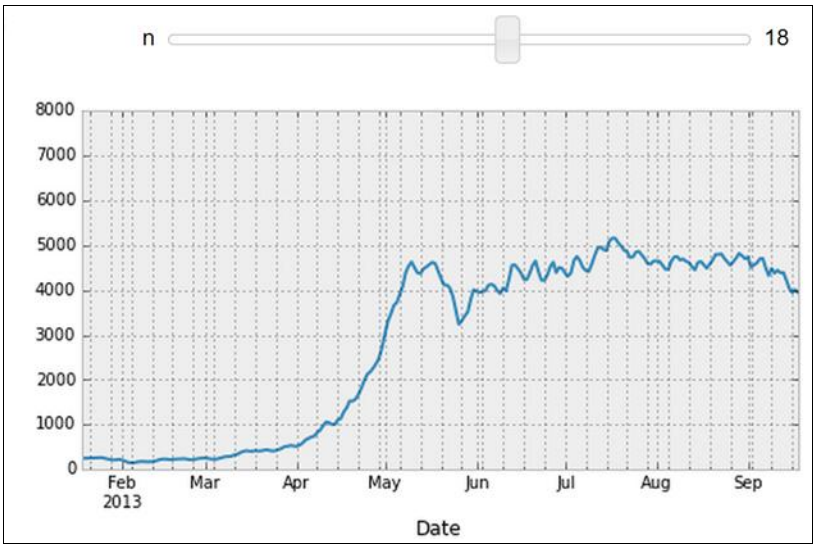
	Unnamed: 1	Berri1	CSC	Mais1	Mais2	Parc	PierDup	Rachel1	Totem_Laurier
Date									
2013-01-01	00:00	0	0	1	0	6	0	1	0
2013-01-02	00:00	69	0	13	0	18	0	2	0

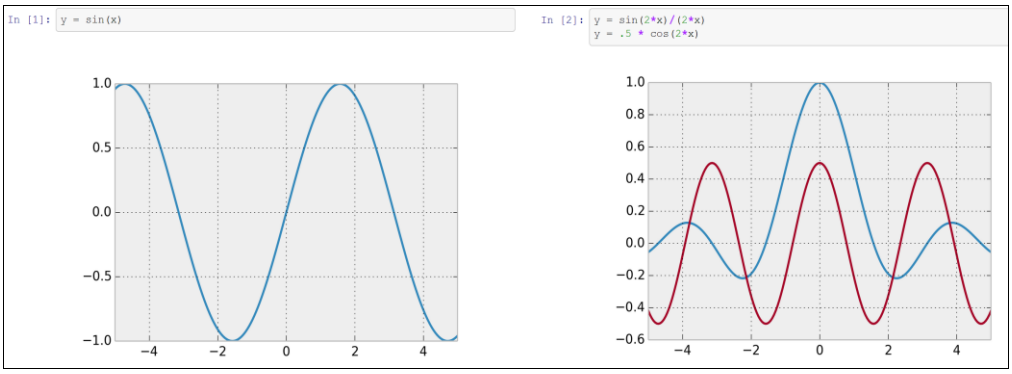
	Berri1	CSC	Mais1	Mais2	Parc	PierDup	Rachel1	Totem_Laurier
count	261.000000	261.000000	261.000000	261.000000	261.000000	261.000000	261.000000	261.000000
mean	2743.390805	1221.858238	1757.590038	3224.130268	1669.425287	1152.885057	3084.425287	1858.793103
std	2247.957848	1070.037364	1458.793882	2589.514354	1363.738862	1208.848429	2380.255540	1434.899574
min	0.000000	0.000000	1.000000	0.000000	6.000000	0.000000	0.000000	0.000000
25%	392.000000	12.000000	236.000000	516.000000	222.000000	12.000000	451.000000	340.000000
50%	2771.000000	1184.000000	1706.000000	3178.000000	1584.000000	818.000000	3111.000000	2087.000000
75%	4767.000000	2168.000000	3158.000000	5812.000000	3068.000000	2104.000000	5338.000000	3168.000000
max	6803.000000	3330.000000	4716.000000	7684.000000	4103.000000	4841.000000	8555.000000	4293.000000



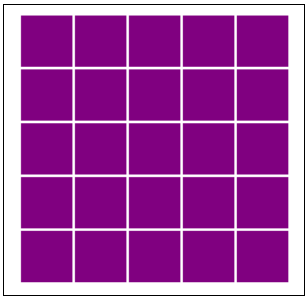
	Berri1	CSC	Mais1	Mais2	Parc	PierDup	Rachel1	Totem_Laurier
Weekday								
Friday	105701	44252	71605	127526	64385	36850	118556	71426
Monday	106826	51646	68087	129982	69767	44500	119211	72883
Saturday	75754	27226	45947	79743	35544	46149	97143	56438
Sunday	74873	29181	40812	75746	37620	53812	100735	53798
Thursday	115193	52340	76273	141424	73668	36349	120684	74540
Tuesday	117244	54656	76974	141217	74299	40679	123533	76559
Wednesday	120434	59604	79033	145860	80437	42564	125173	79501

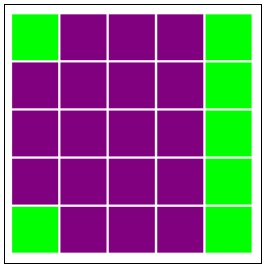


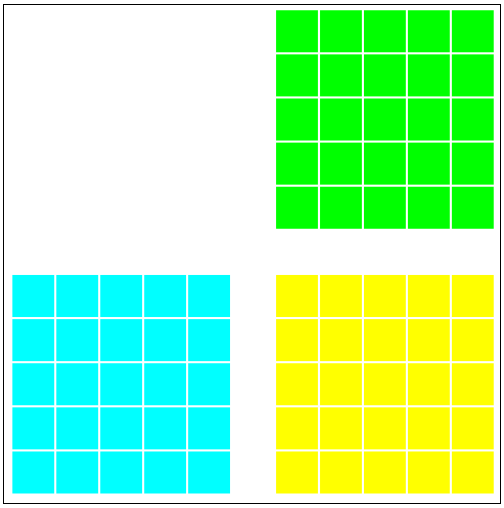


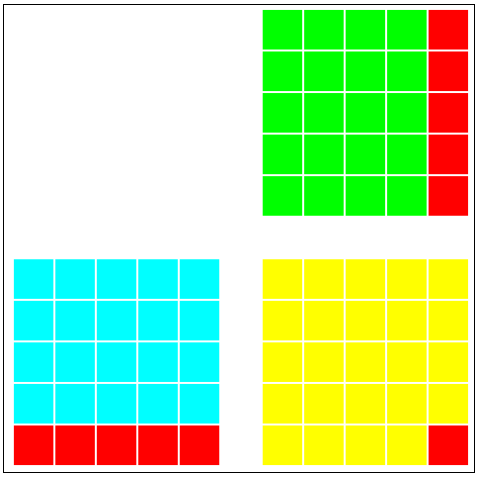


Chapter 2, Mastering the Notebook









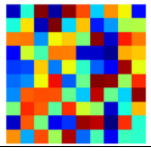
In [9]:
```
rows, cols = imdata.size
grid = BlockGrid(width=rows, height=cols,
                 block_size=4, lines_on=False)
for block, rgb in zip(grid, imdata):
    block.rgb = rgb
grid.show()
```

First chapter

Let's write some *rich* **text** with links and lists:

- item1
- item2
  1. subitem
  2. subitem
- item3

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
plt.figure(figsize=(2,2));
plt.imshow(np.random.rand(10,10), interpolation='none');
plt.axis('off');
plt.tight_layout();
```



My document

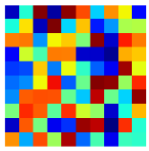
Cyrille Rossant

1 First chapter

Let's write some *rich* **text** with links and lists:

- item1
- item2
  1. subitem
  2. subitem
- item3

```
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        %matplotlib inline
        plt.figure(figsize=(2,2));
        plt.imshow(np.random.rand(10,10), interpolation='none');
        plt.axis('off');
        plt.tight_layout();
```



Customize CSS in the notebook

In this recipe, we show how to customize the CSS in the notebook interface and in a exported HTML notebook.

Getting started

You are expected to know a bit of CSS3 for this recipe. You can find many tutorials online (see references at the end of this recipe).

In [ ]:
```
# editing a cell
```

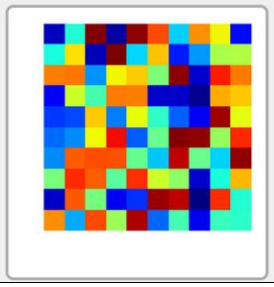
First chapter

Let's write some *rich* **text** with links and lists:

- item1
- item2
  1. subitem
  2. subitem
- item3

In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
plt.figure(figsize=(2,2));
plt.imshow(np.random.rand(10,10), interpolation='none');
plt.axis('off');
plt.tight_layout();
```



```
octave_slider = widgets.IntSliderWidget()
octave_slider.max = 1
octave_slider
```

0

0:02

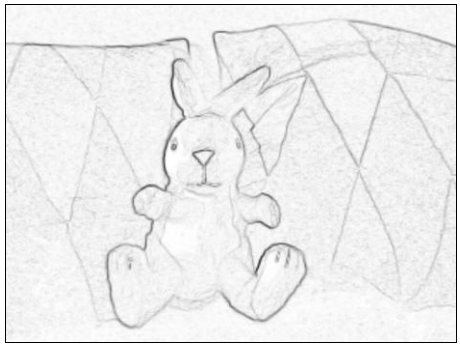
0

C C# D D# E F F# G G# A A# B C

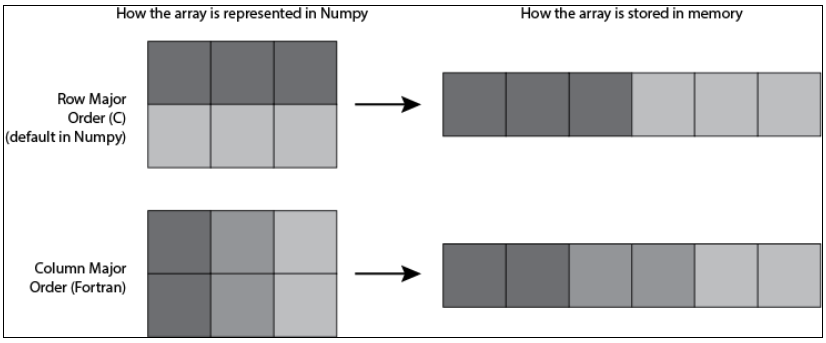
In [14]:

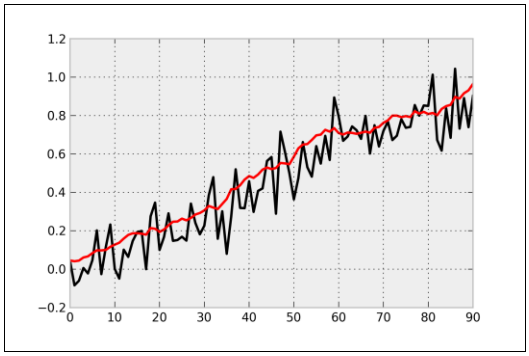
```
ht = HandsonDataFrame(df)
ht.show()
```

✖	352	201	859	322	352
	326	519	848	1024	42
	171	480	213	619	192

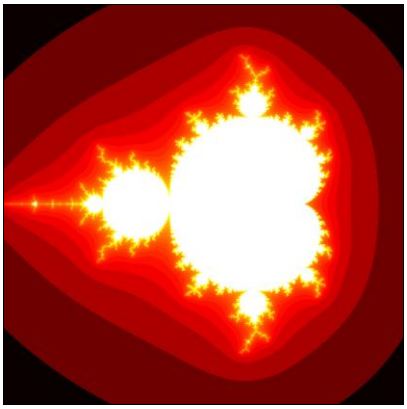


Chapter 4, Profiling and Optimization

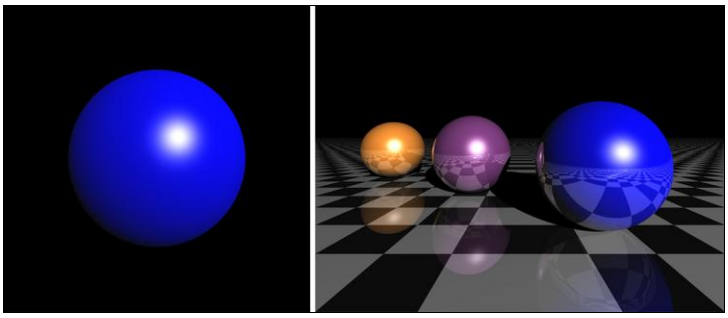


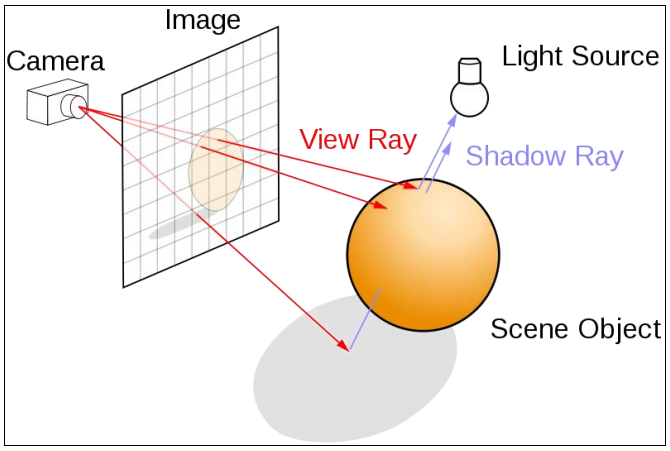


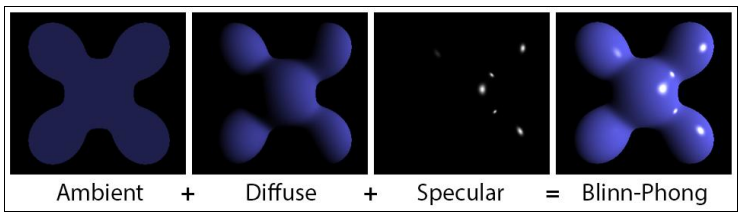
Chapter 5, High-performance Computing

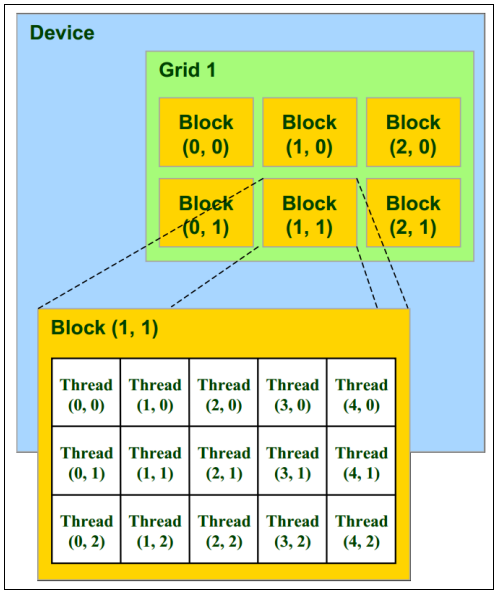


```
1: import numpy as np
2:
3: def mandelbrot_cython(int[:,::1] m,
4:                       int size,
5:                       int iterations):
6:     cdef int i, j, n
7:     cdef complex z, c
8:     for i in range(size):
9:         for j in range(size):
10:            c = -2 + 3./size*j + 1j*(1.5-3./size*i)
11:            z = 0
12:            for n in range(iterations):
13:                if z.real**2 + z.imag**2 <= 100:
14:                    z = z*z + c
15:                    m[i, j] = n
16:                else:
17:                    break
```

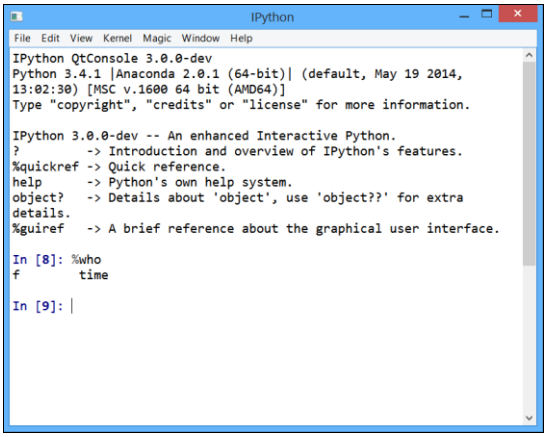


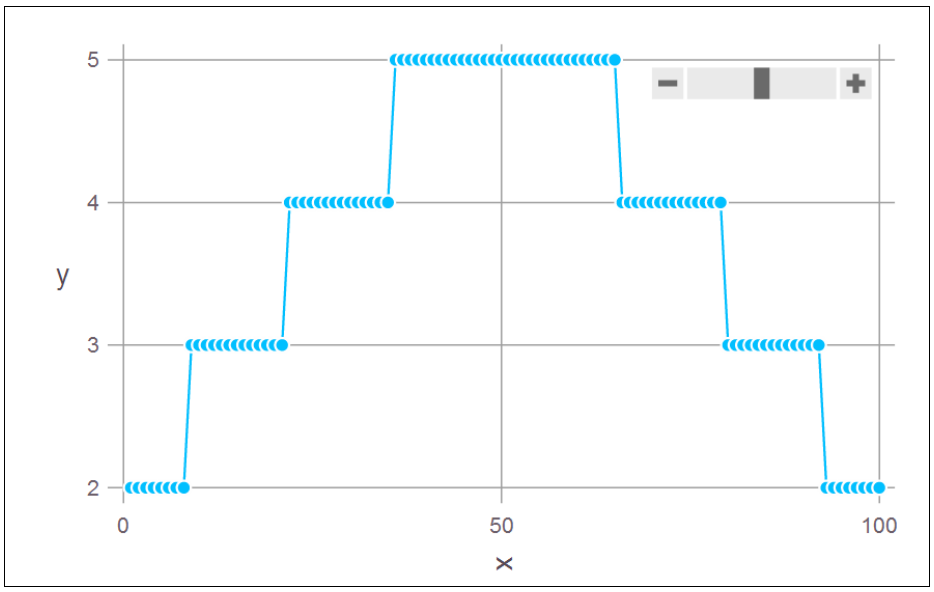


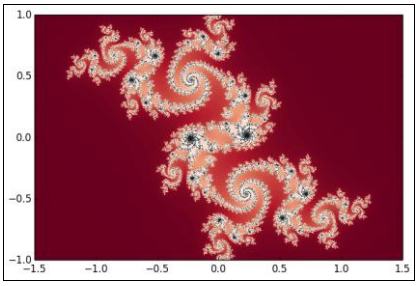




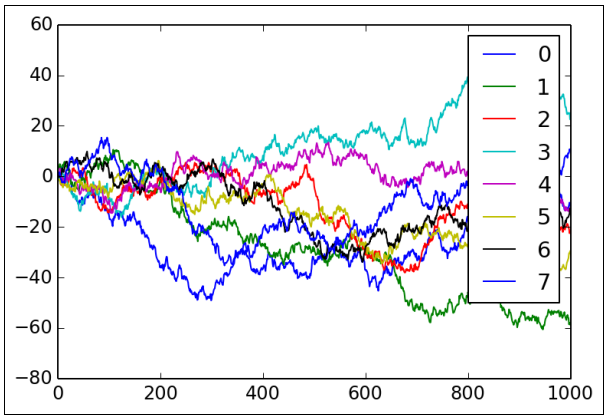

```
progress_bar(ar)
```

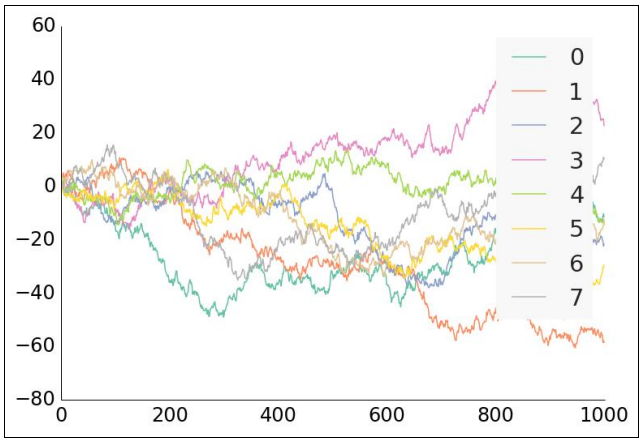






Chapter 6, Advanced Visualization




60
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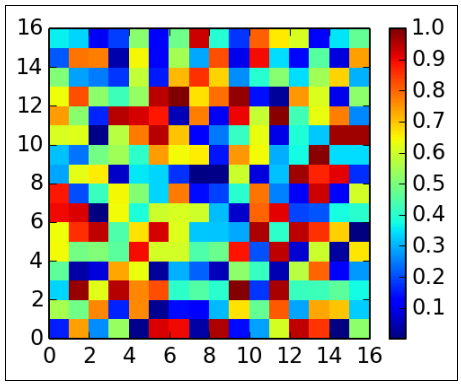
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0 2 4 6 8 10 12 14 16
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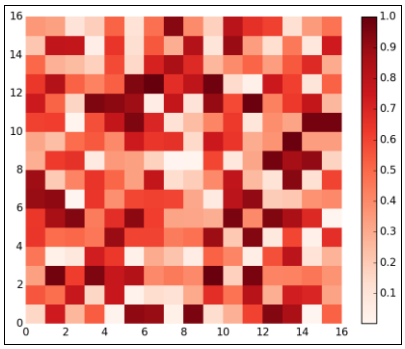

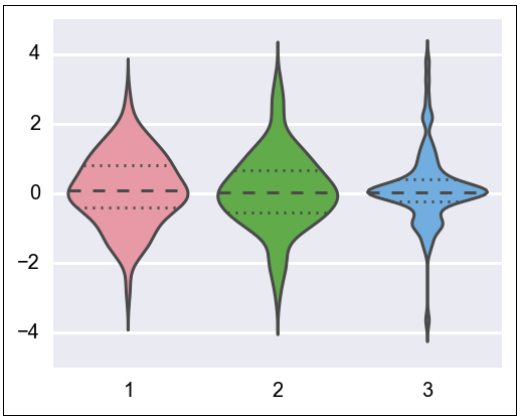
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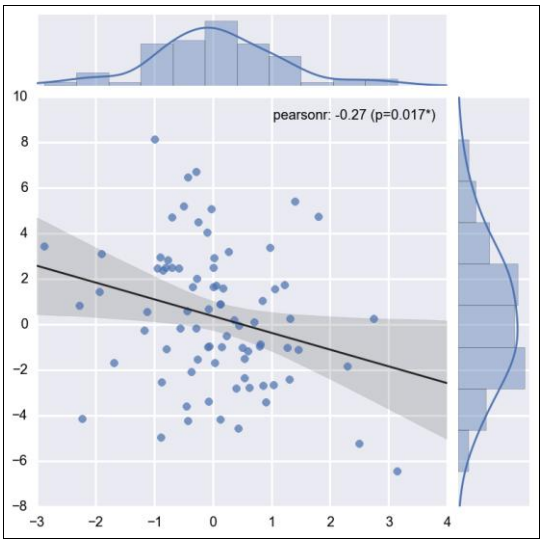
pearsonr: -0.27 (p=0.017*)
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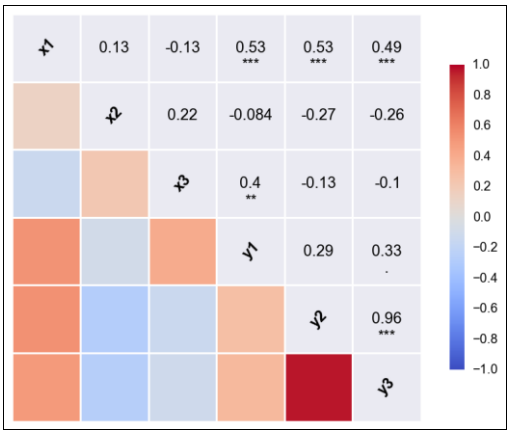
x1
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x2
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x3
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y2
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y3
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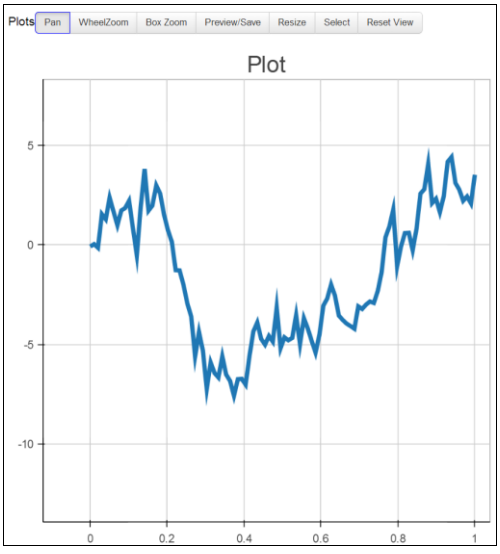
Plots
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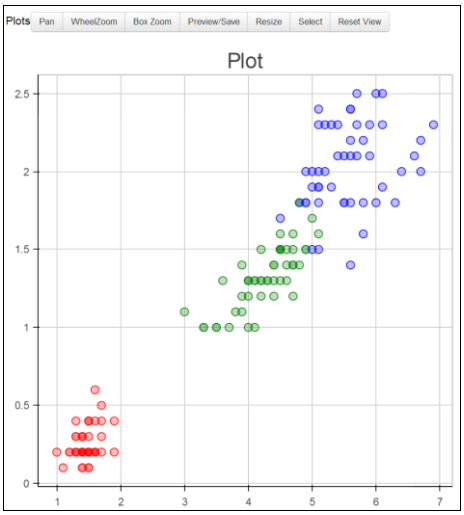
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Box Zoom
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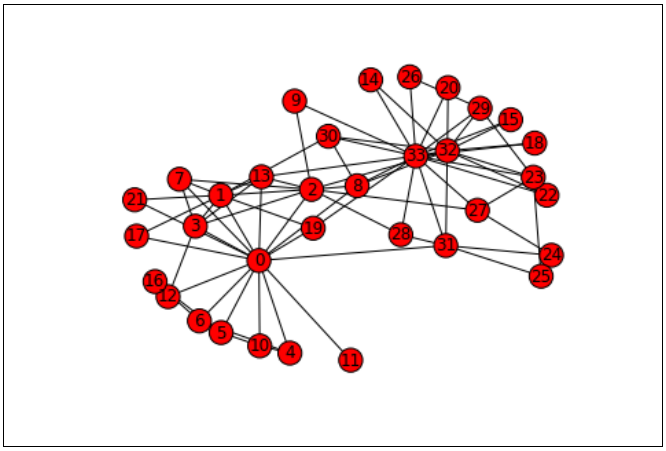
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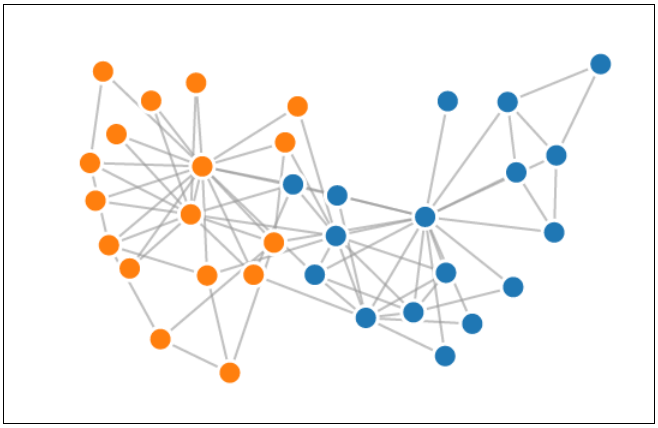

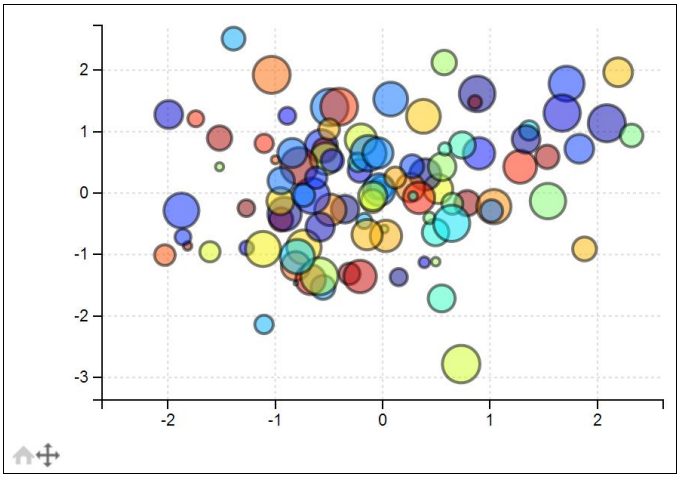
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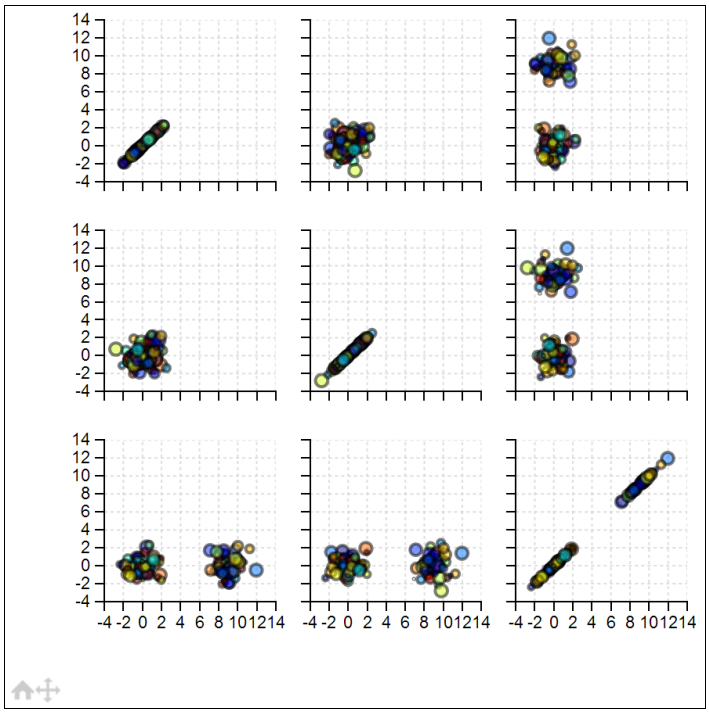
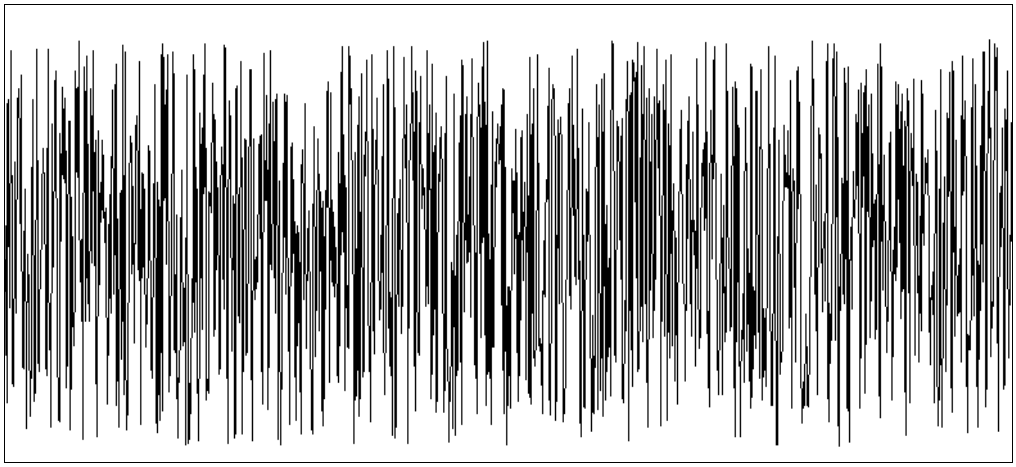
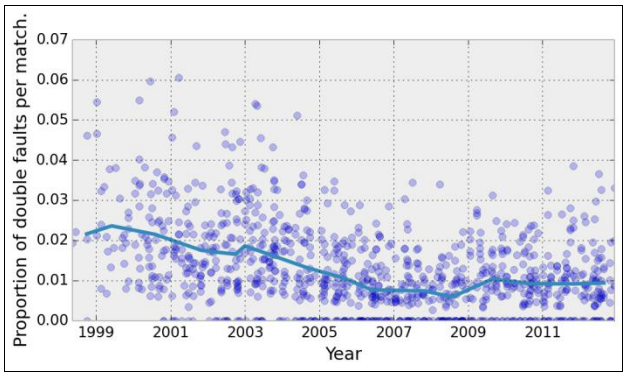
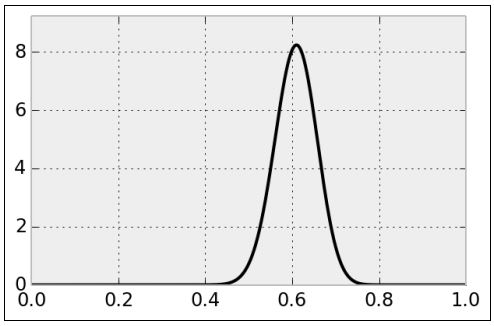
-3
-2
-1
0
1
2

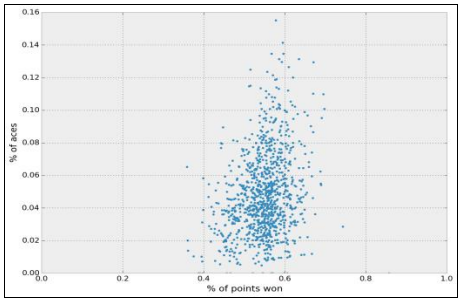

14
12
10
8
6
4
2
0
-2
-4
-4 -2 0 2 4 6 8 10 12 14

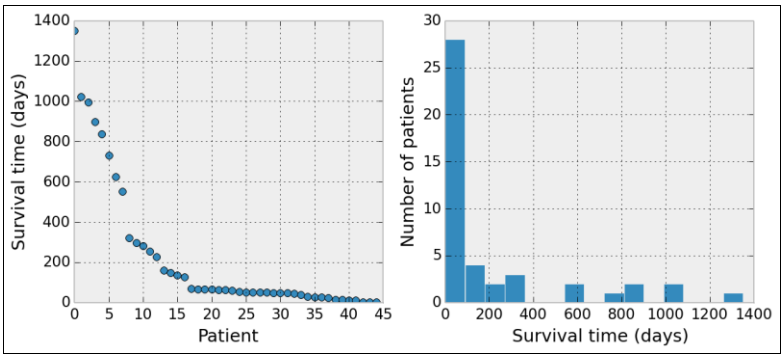


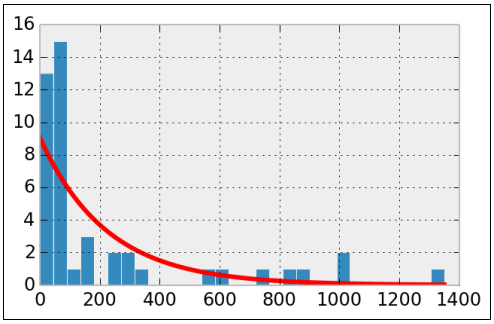
Chapter 7, Statistical Data Analysis

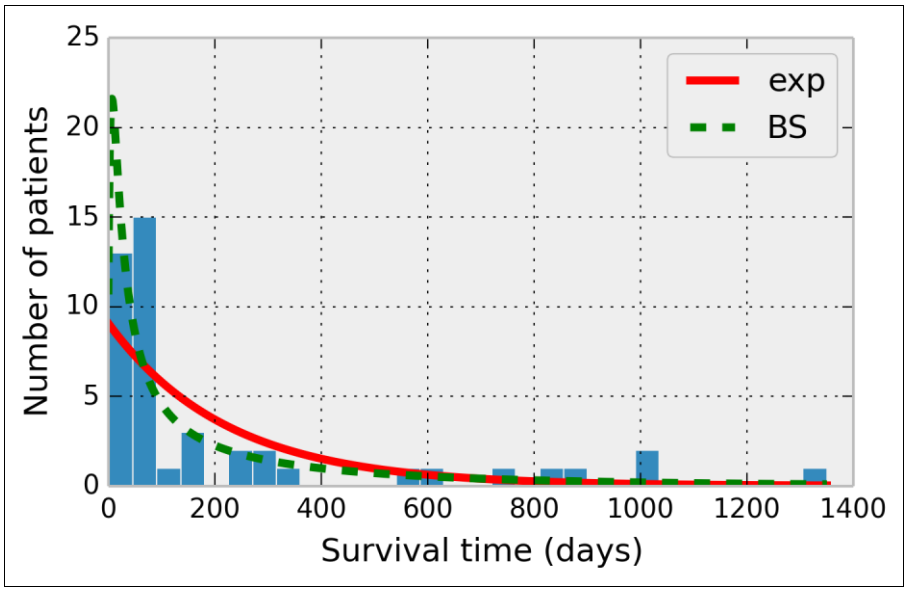


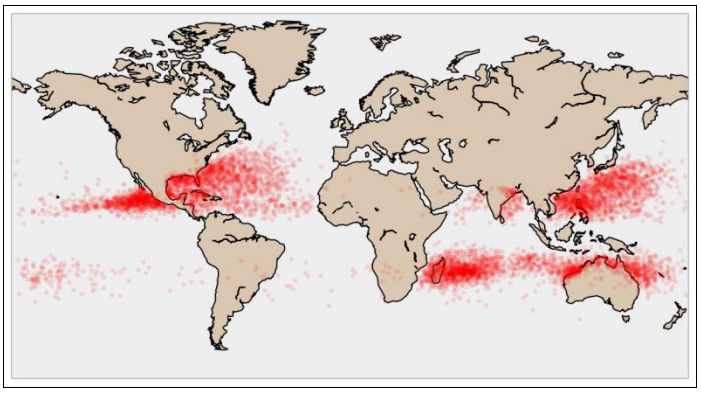


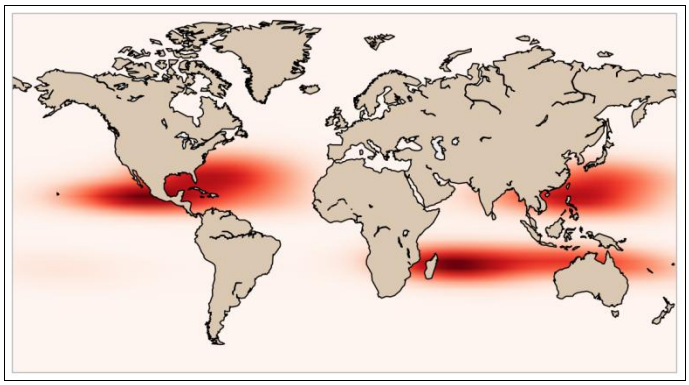


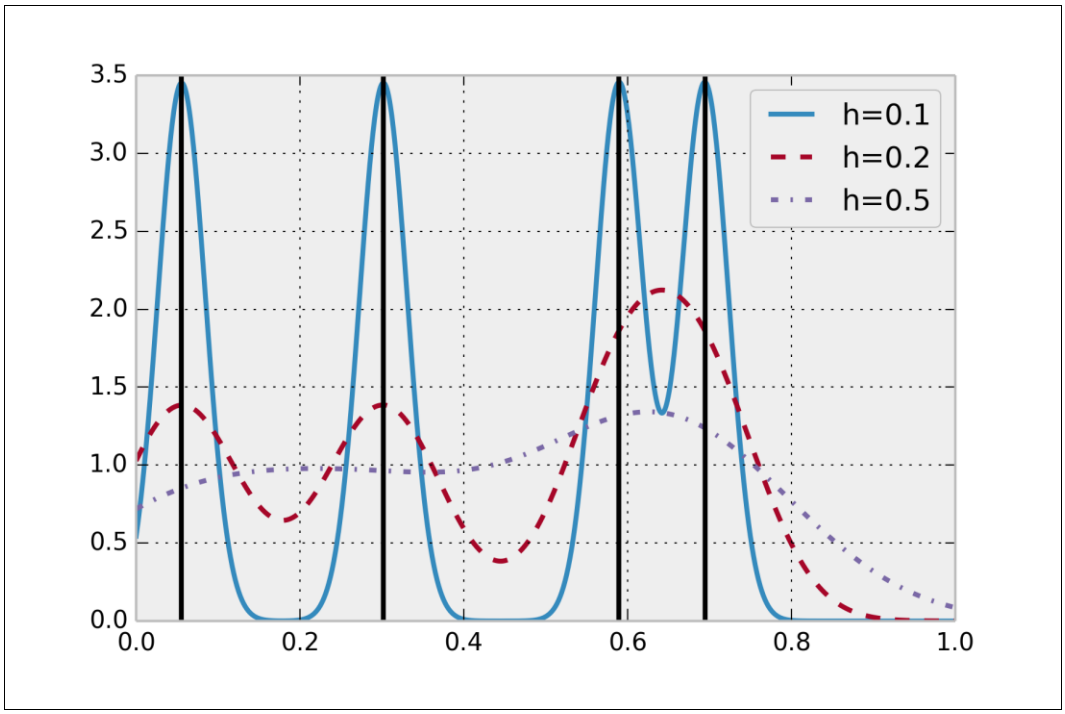


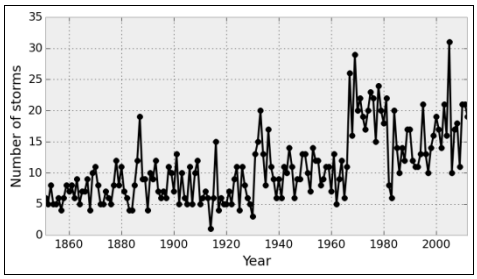

16
14
12
10
8
6
4
2
0
0
200
400
600
800
1000
1200
1400

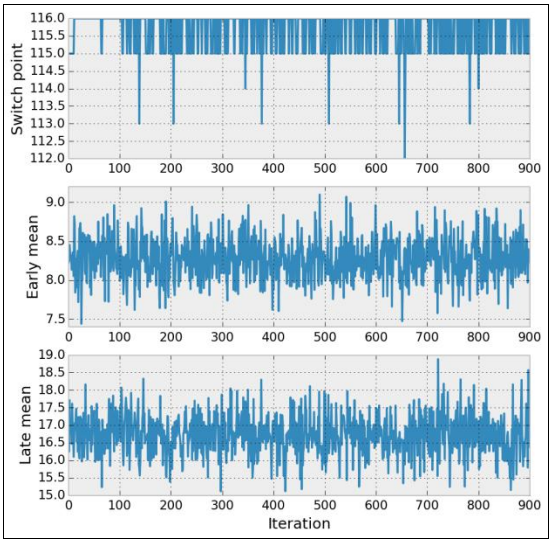

25
20
15
10
5
0
Number of patients
0
200
400
600
800
1000
1200
1400
Survival time (days)
exp
BS

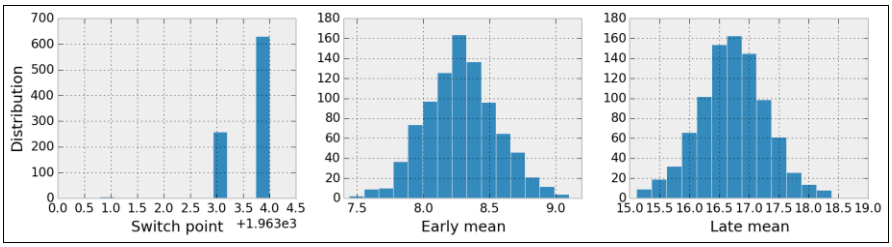


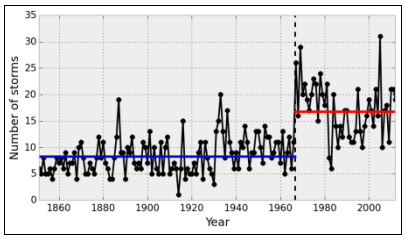


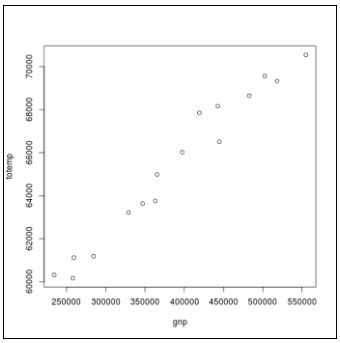

h=0.1
h=0.2
h=0.5
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.2
0.4
0.6
0.8
1.0

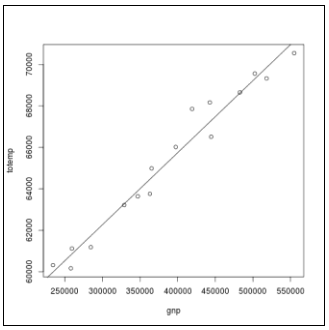

Number of storms
Year
35
30
25
20
15
10
5
0
1860
1880
1900
1920
1940
1960
1980
2000


Switch point
Early mean
Late mean
Iteration

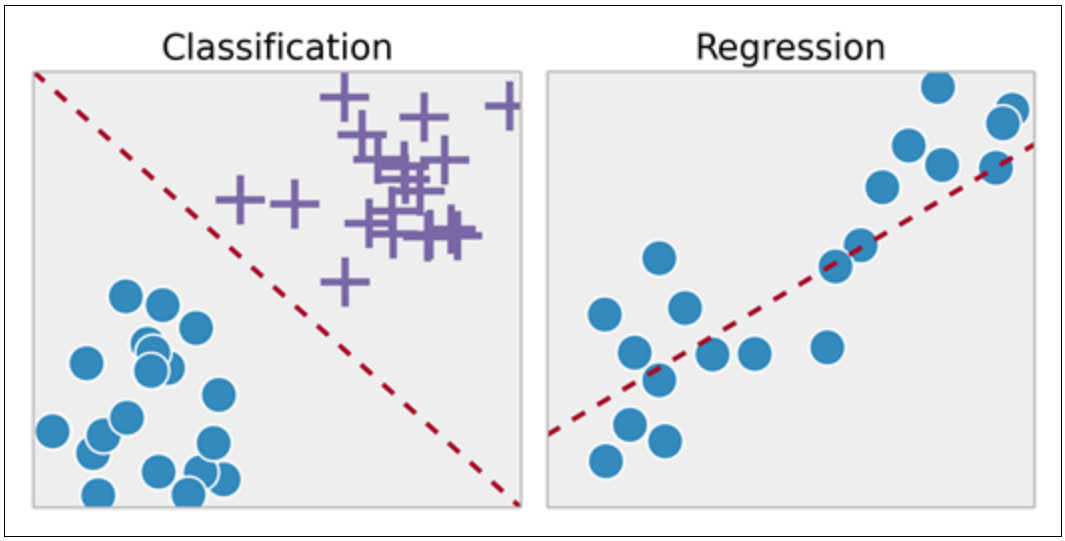

Distribution
Switch point
+1.963e3
Early mean
Late mean

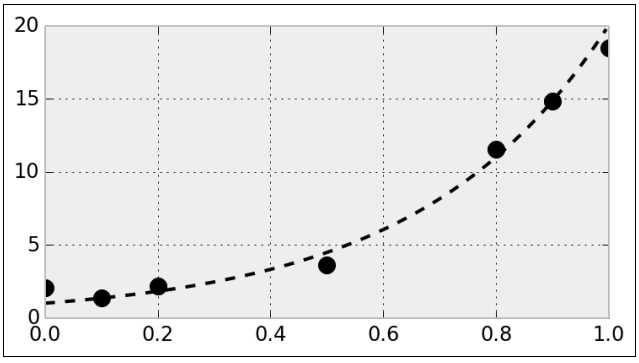

Number of storms
Year

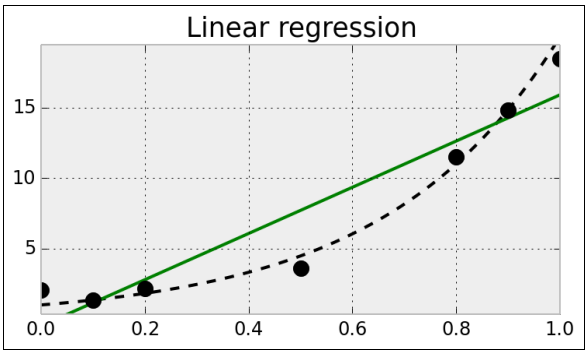

tblemp
gnp

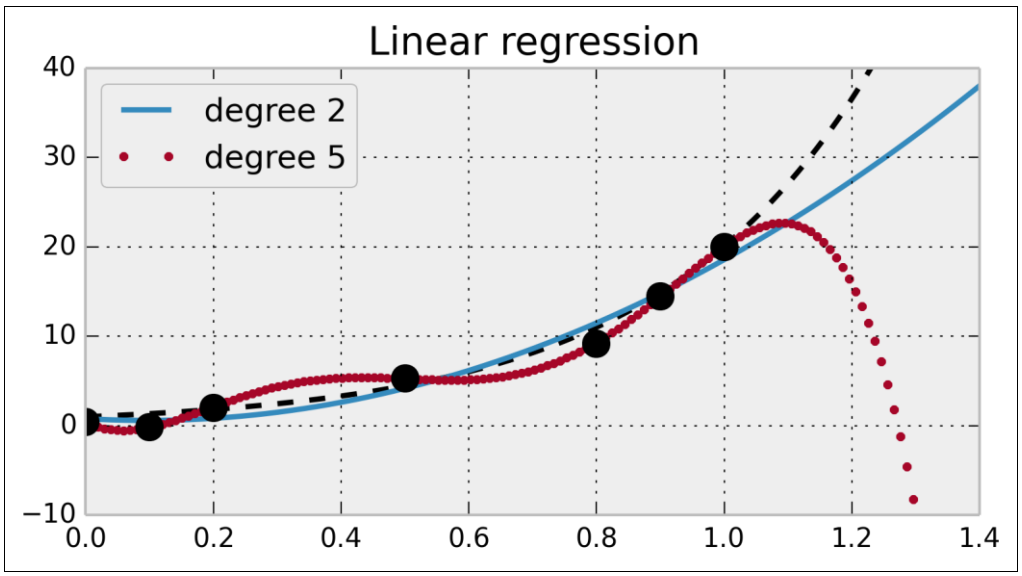


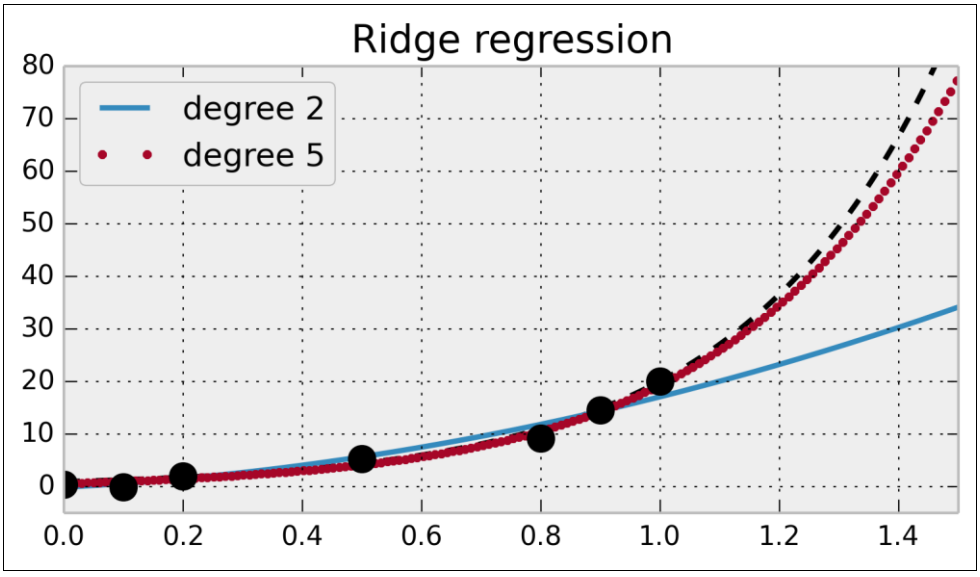
Chapter 8, Machine Learning

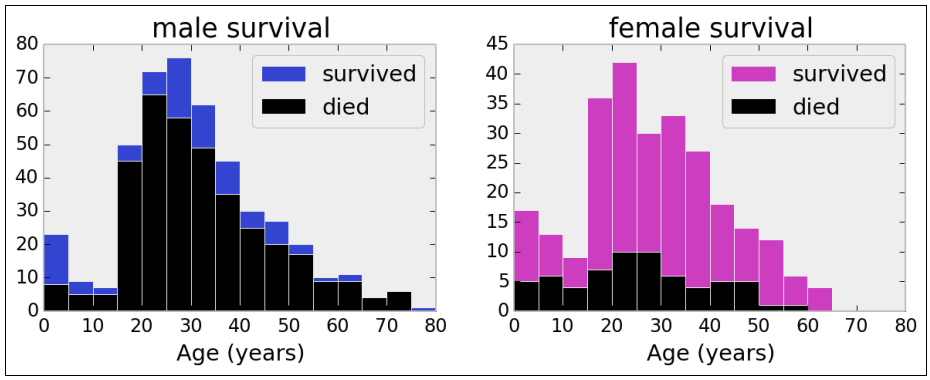


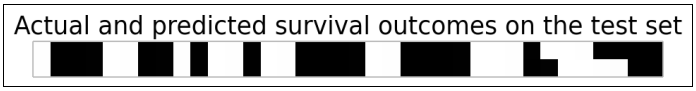


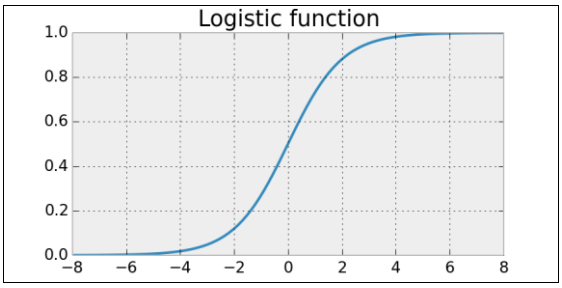

Linear regression
15
10
5
0.0
0.2
0.4
0.6
0.8
1.0

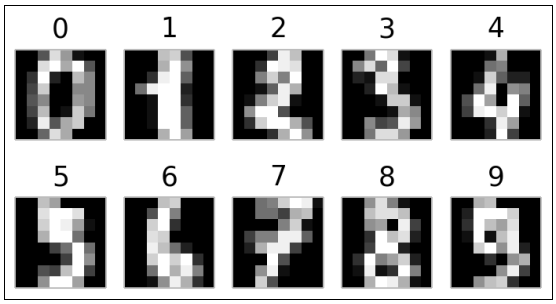

Linear regression
degree 2
degree 5
40
30
20
10
0
−10
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

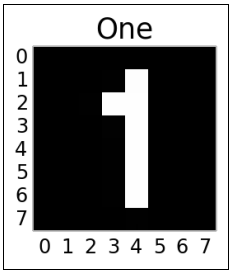

Ridge regression
degree 2
degree 5
80
70
60
50
40
30
20
10
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4

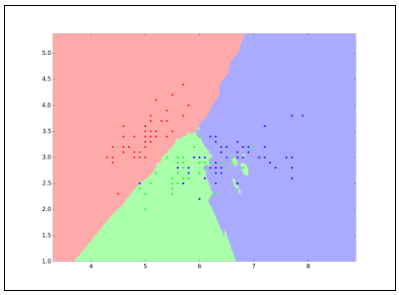

male survival
survived
died
Age (years)
female survival
survived
died
Age (years)

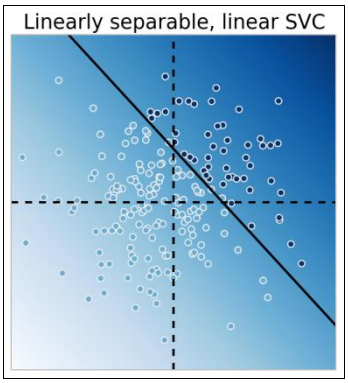

Actual and predicted survival outcomes on the test set

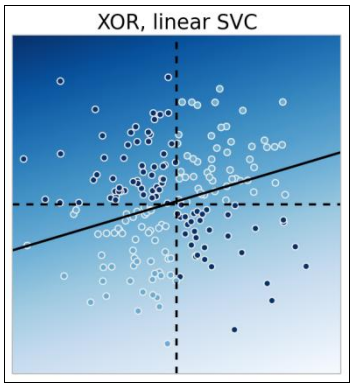

Logistic function

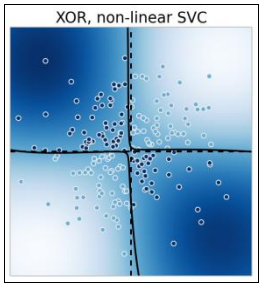

0
1
2
3
4
5
6
7
8
9

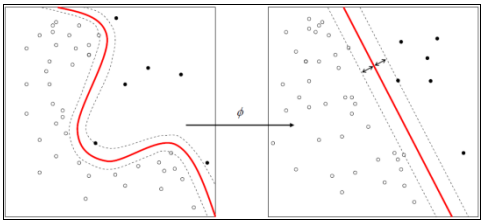

One

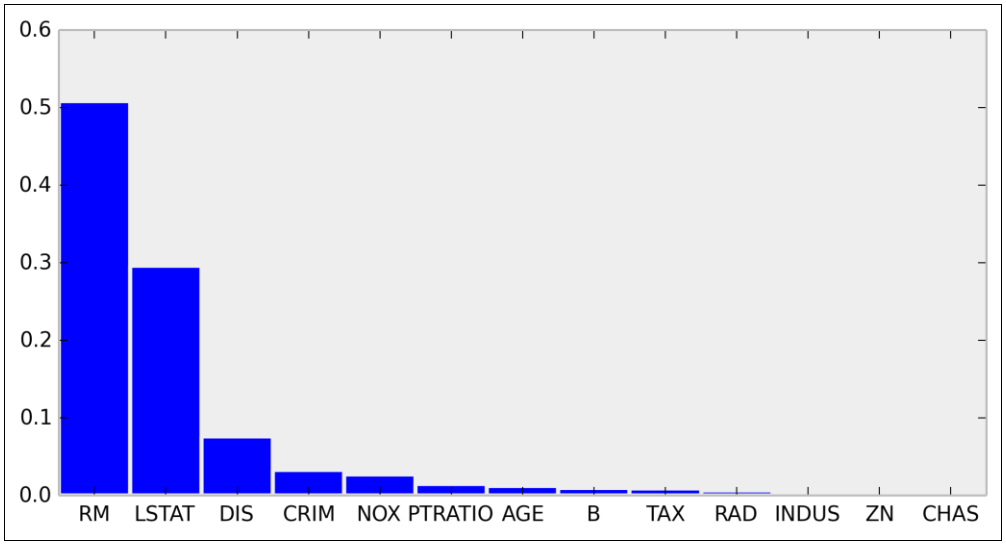


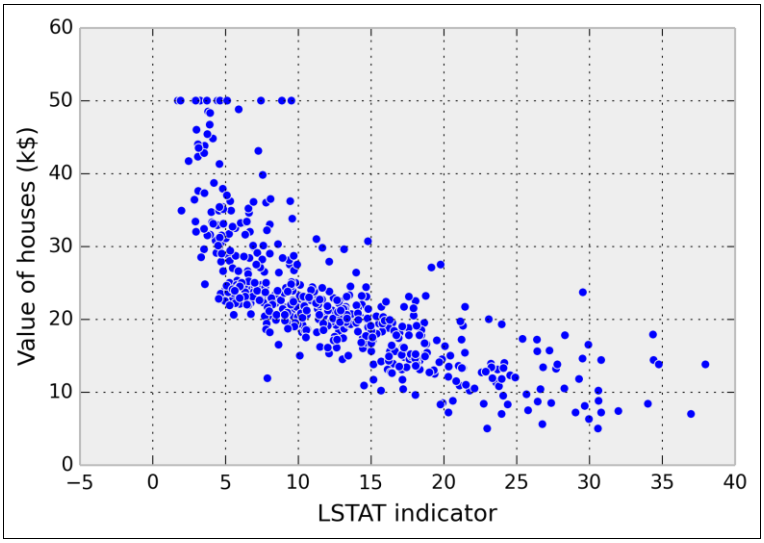

Linearly separable, linear SVC

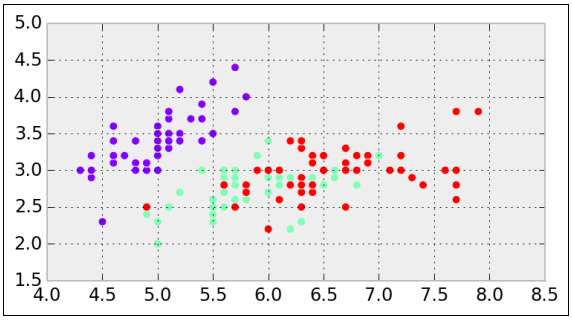

XOR, linear SVC

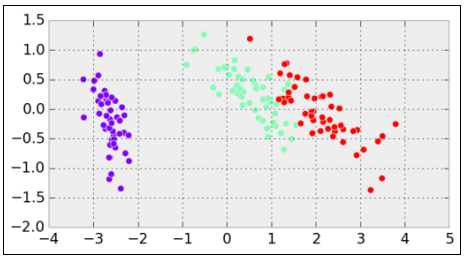

XOR, non-linear SVC

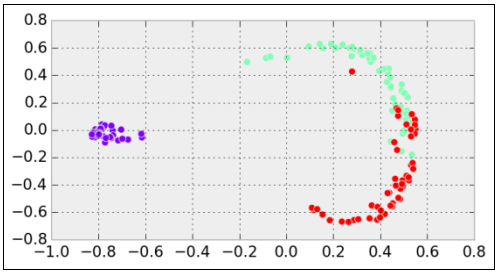


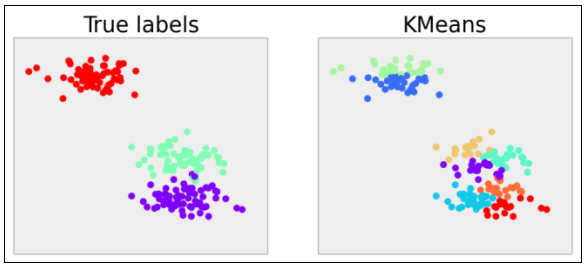

0.6
0.5
0.4
0.3
0.2
0.1
0.0
RM
LSTAT
DIS
CRIM
NOX
PTRATIO
AGE
B
TAX
RAD
INDUS
ZN
CHAS

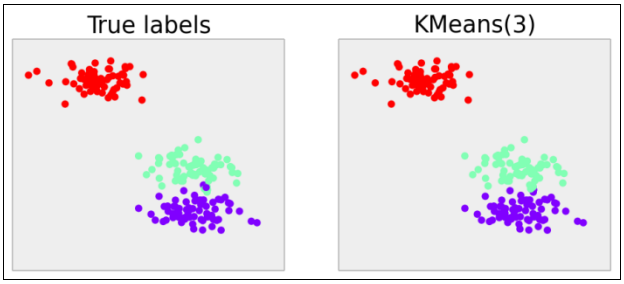

Value of houses (k$)
LSTAT indicator
60
50
40
30
20
10
0
−5
0
5
10
15
20
25
30
35
40

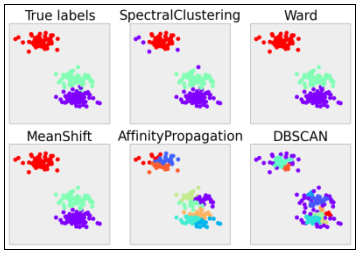

5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5


1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−4
−3
−2
−1
0
1
2
3
4
5

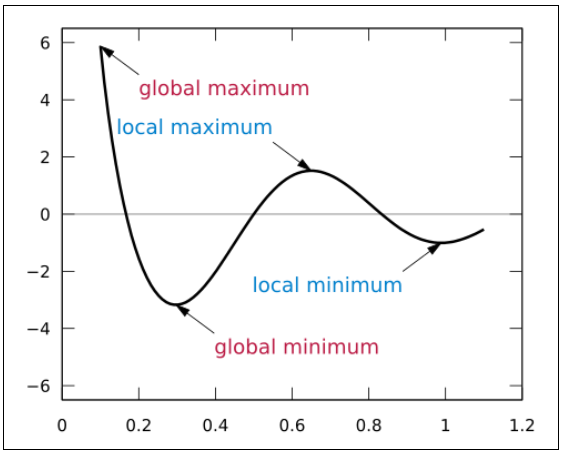

0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
0.8

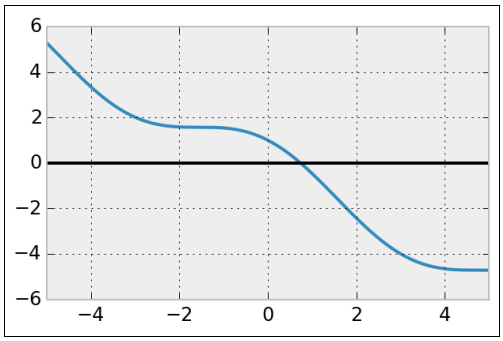

True labels
KMeans

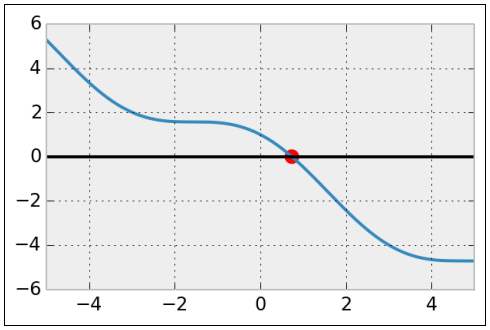

True labels
KMeans(3)

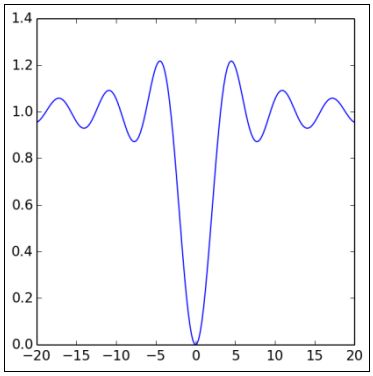

True labels
SpectralClustering
Ward
MeanShift
AffinityPropagation
DBSCAN

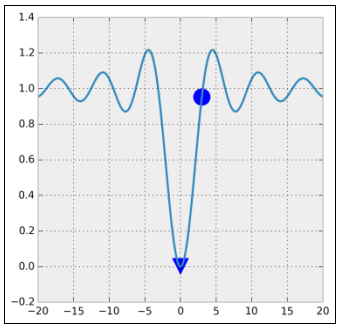
Chapter 9, Numerical Optimization

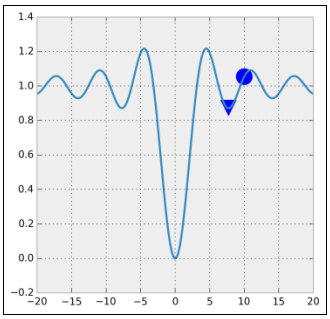


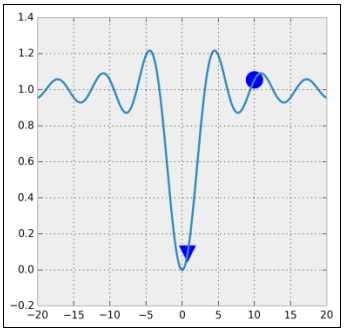


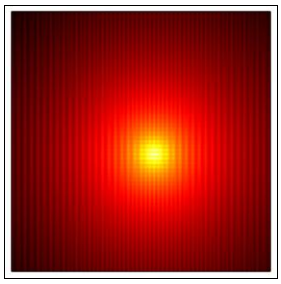


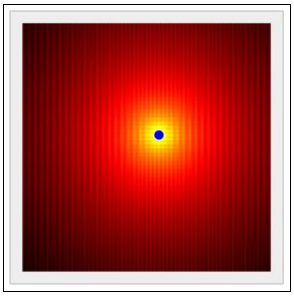


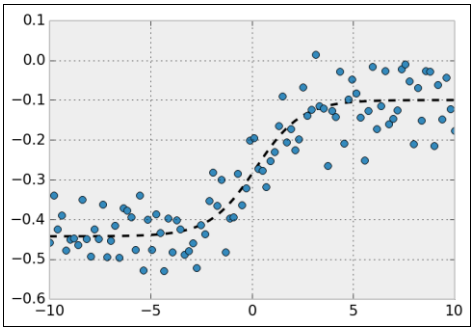

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−20 −15 −10 −5 0 5 10 15 20


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−20 −15 −10 −5 0 5 10 15 20


1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−20 −15 −10 −5 0 5 10 15 20



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−0.1
−0.2
−0.3
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−0.5
−0.6
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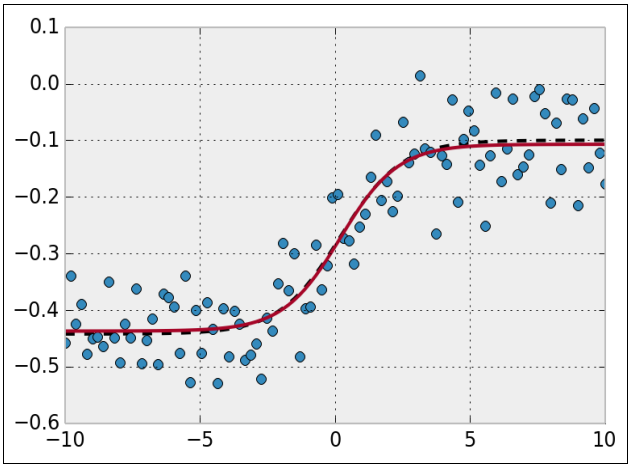
−5
0
5
10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0.0
−0.1
−0.2
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−0.6
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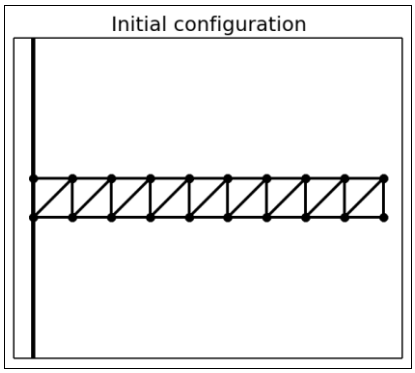
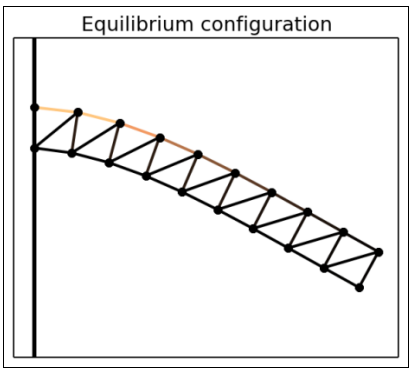
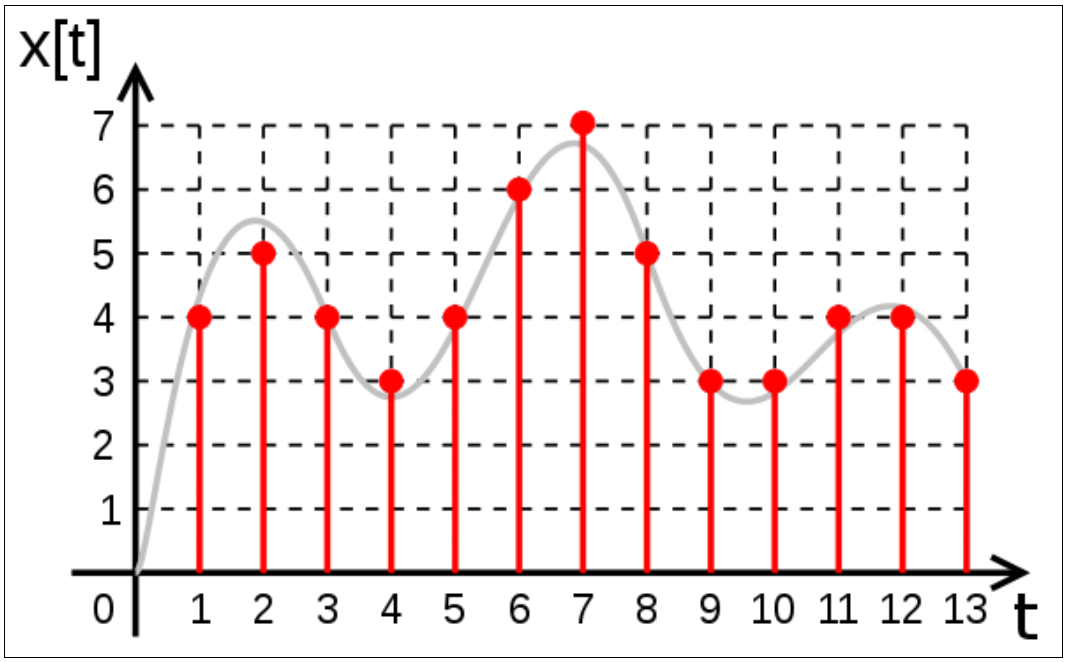
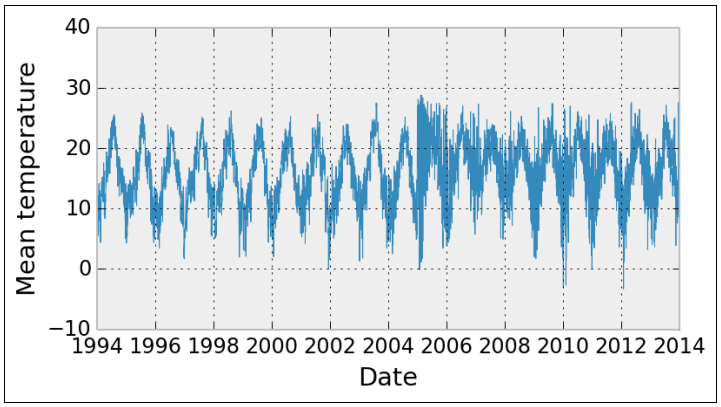
−5
0
5
10

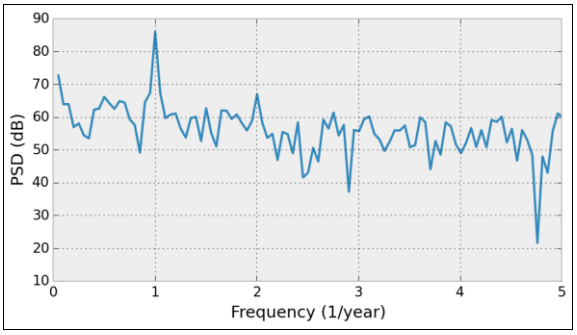

Initial configuration

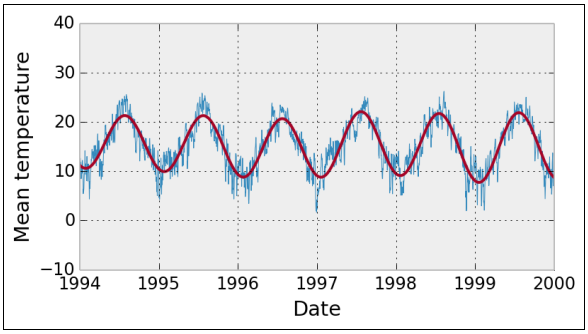

Equilibrium configuration

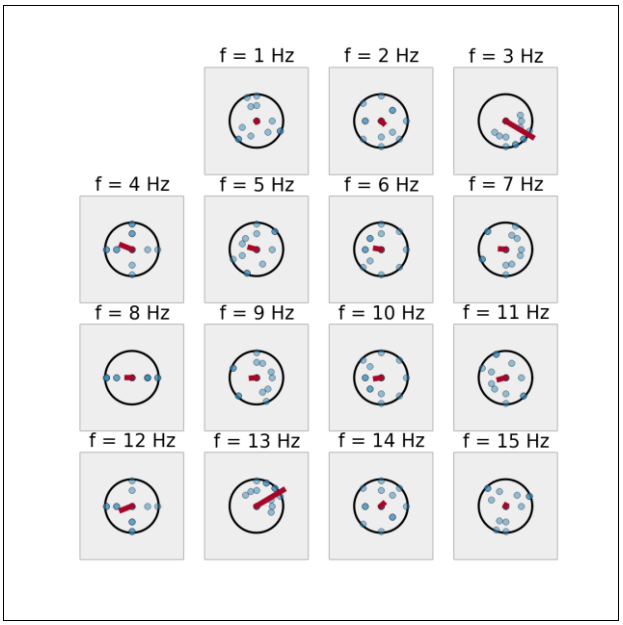
Chapter 10, Signal Processing

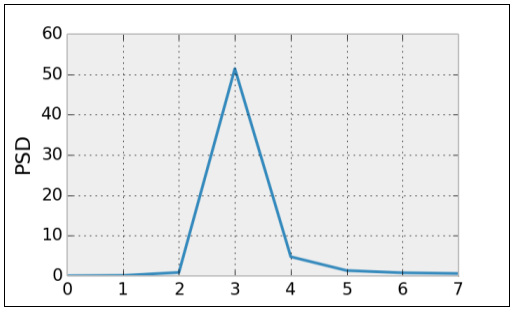






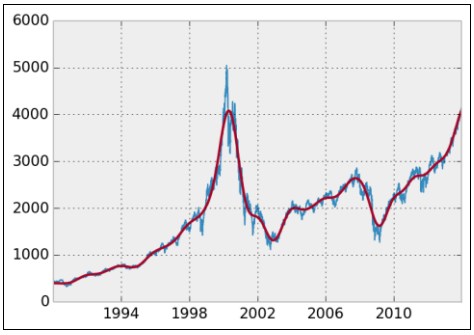

Mean temperature
Date
40
30
20
10
0
−10
1994
1995
1996
1997
1998
1999
2000

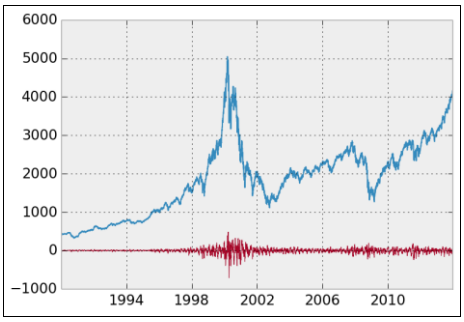

f = 1 Hz
f = 2 Hz
f = 3 Hz
f = 4 Hz
f = 5 Hz
f = 6 Hz
f = 7 Hz
f = 8 Hz
f = 9 Hz
f = 10 Hz
f = 11 Hz
f = 12 Hz
f = 13 Hz
f = 14 Hz
f = 15 Hz


PSD
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7

6000
5000
4000
3000
2000
1000
0
1994
1998
2002
2006
2010

6000
5000
4000
3000
2000
1000
0
1994
1998
2002
2006
2010


6000
5000
4000
3000
2000
1000
0
1994
1998
2002
2006
2010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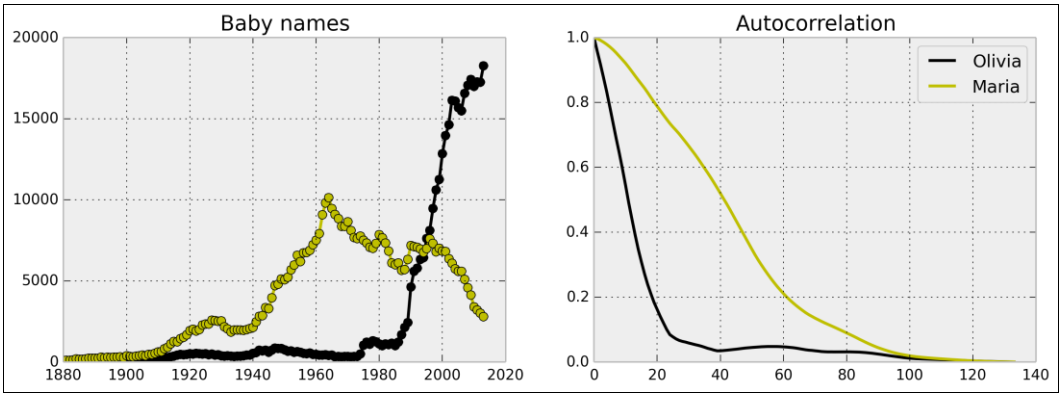
5000
4000
3000
2000
1000
0
−1000
1994
1998
2002
2006
2010


Baby names
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15000
10000
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0
1880
1900
1920
1940
1960
1980
2000
2020
Autocorrelation
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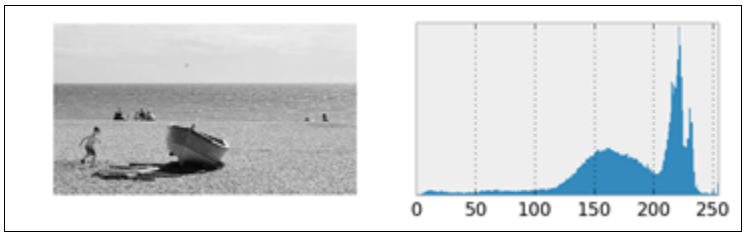
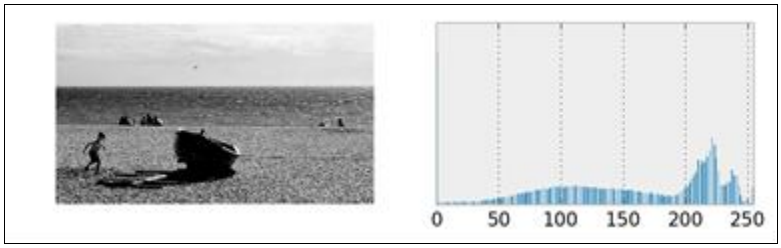
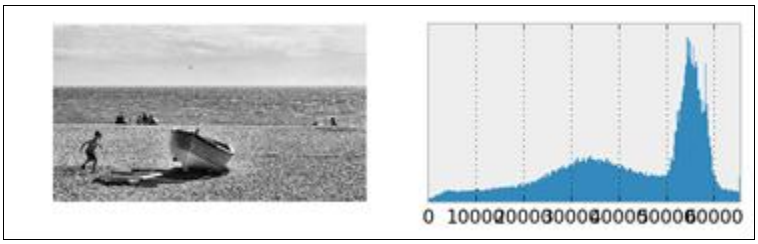
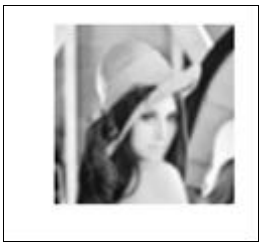
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
100
120
140
Olivia
Maria

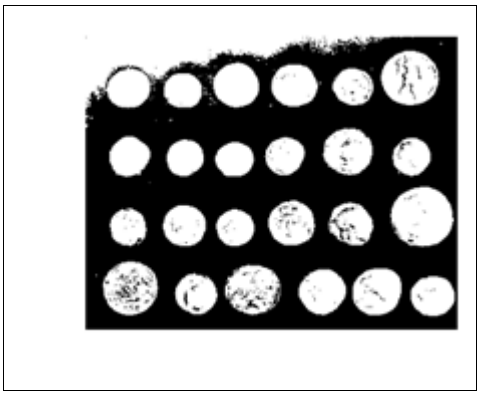
Chapter 11, Image and Audio Processing

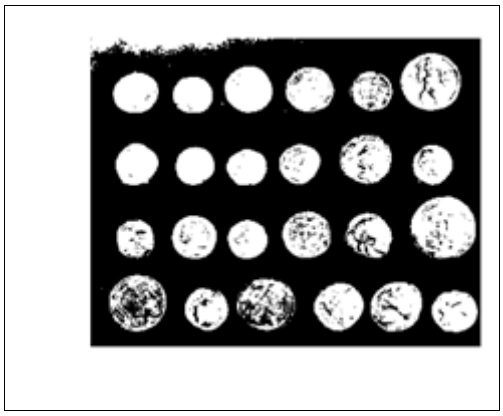


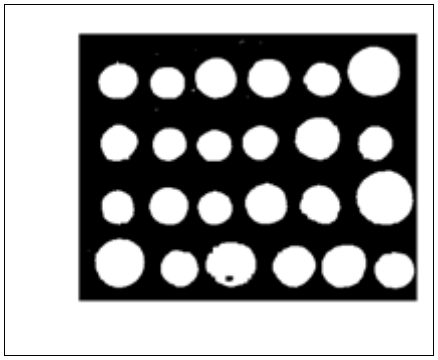


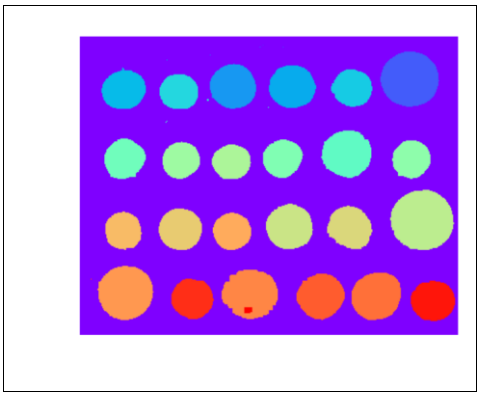












3
5
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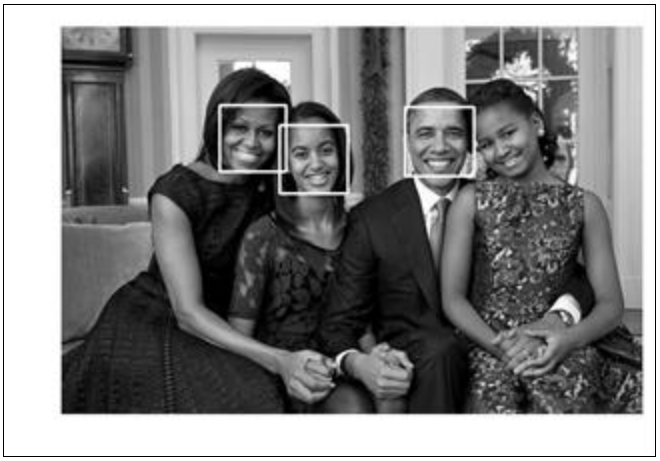
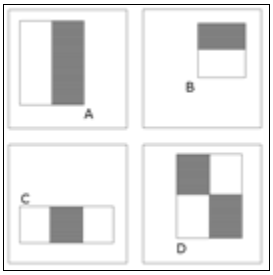
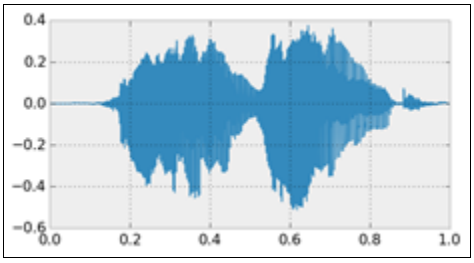
23




A
B
C
D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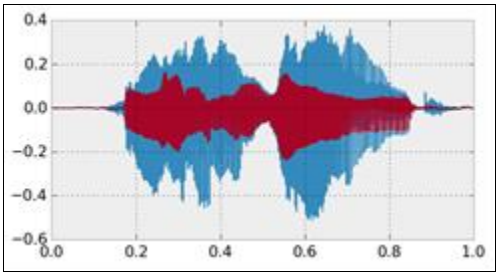
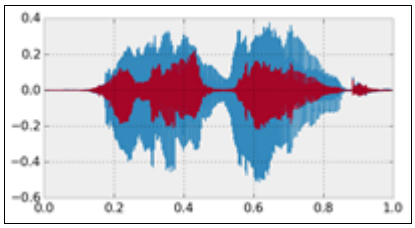
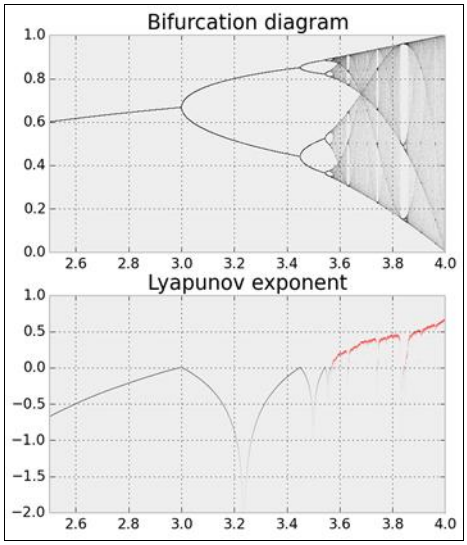
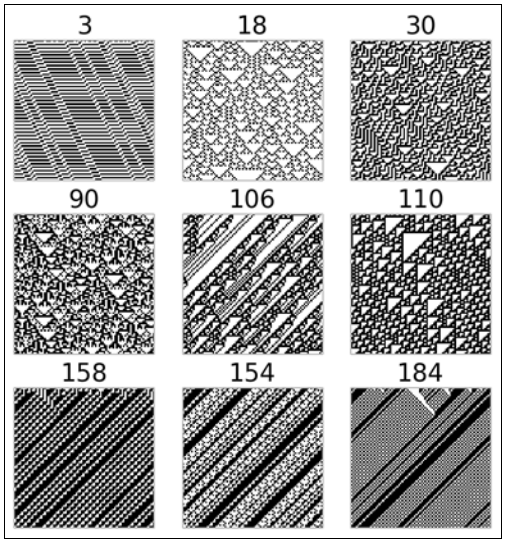
−0.2
−0.4
−0.6
0.0
0.2
0.4
0.6
0.8
1.0

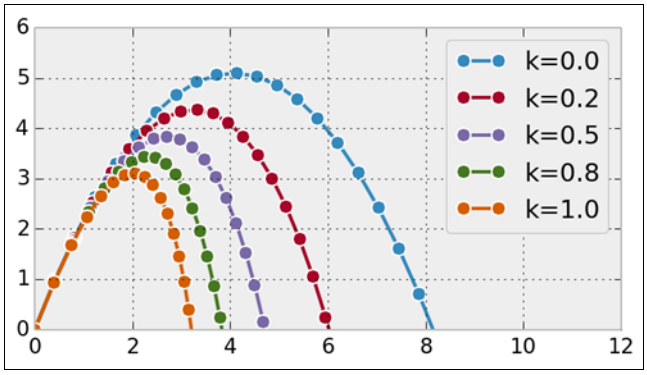

0.4
0.2
0.0
−0.2
−0.4
−0.6
0.0
0.2
0.4
0.6
0.8
1.0

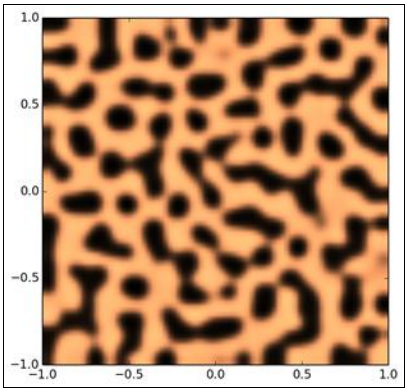


Chapter 12, Deterministic Dynamical Systems

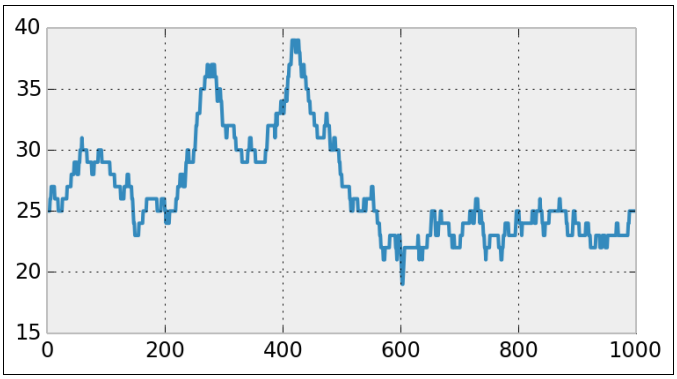


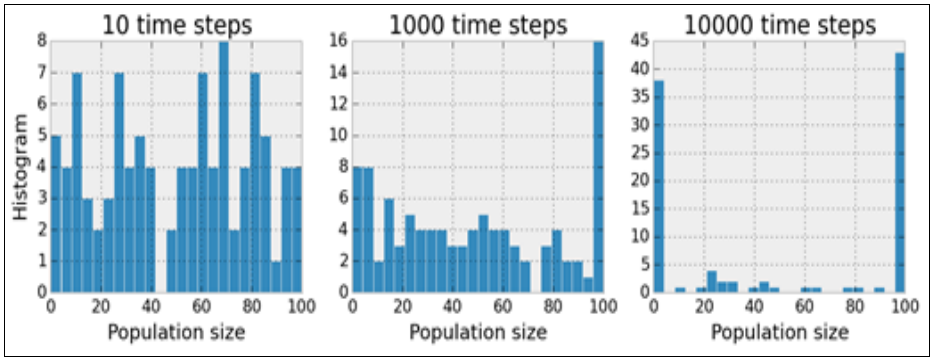


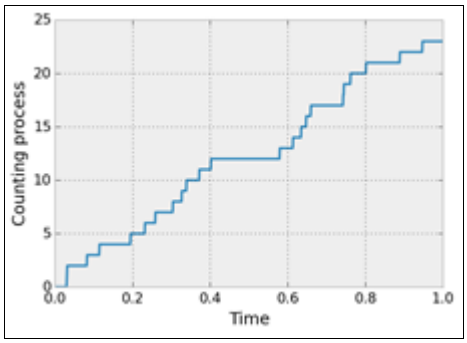




Chapter 13, Stochastic Dynamical Systems



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Time
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10
15
20
25
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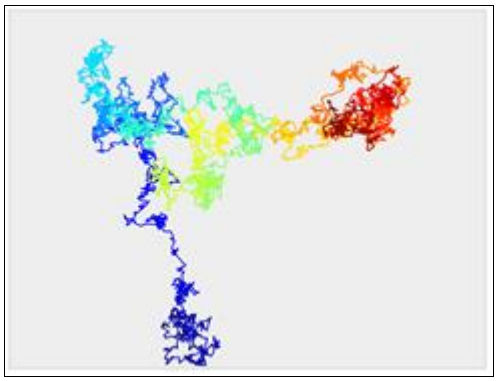
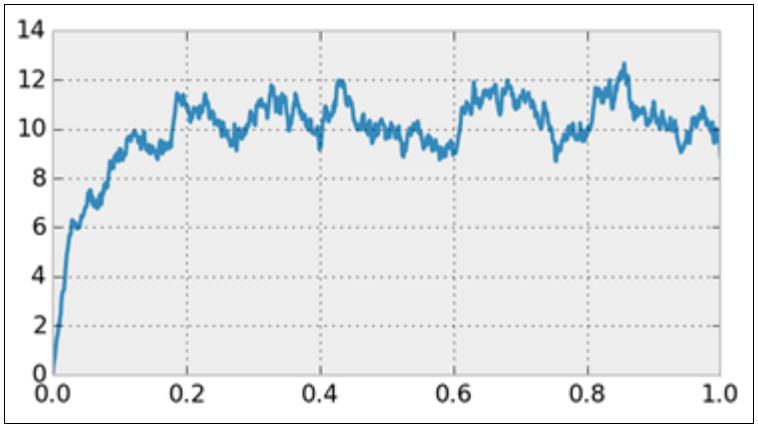
0.2
0.4
0.6
0.8
1.0

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0.4
0.6
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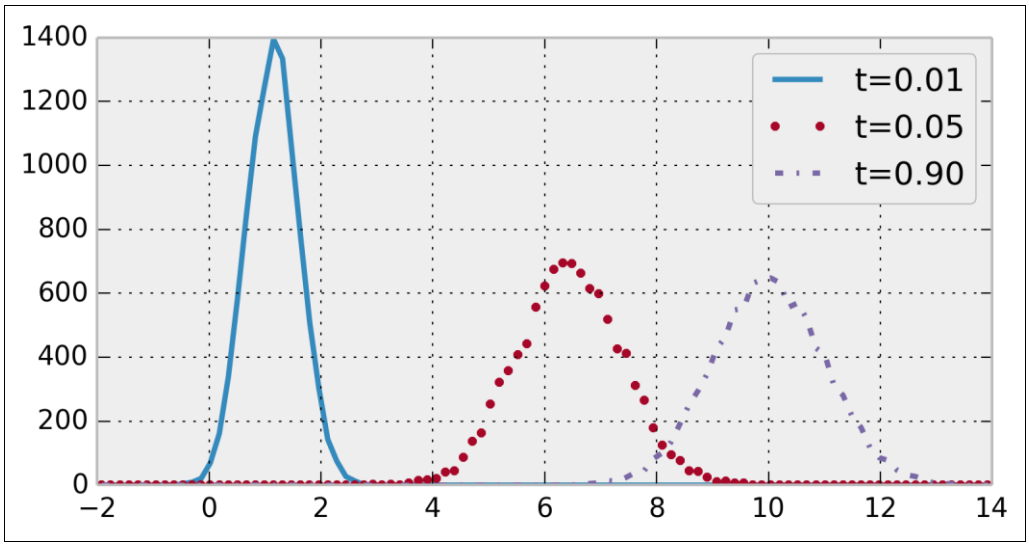
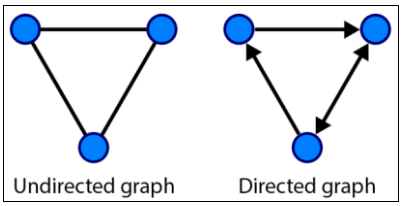
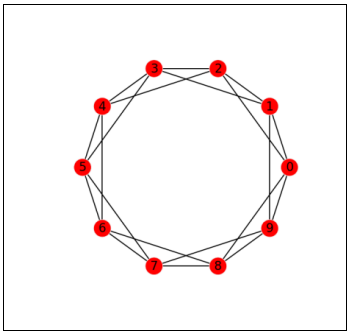
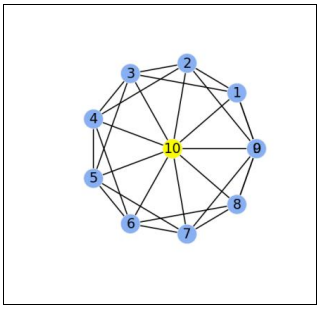
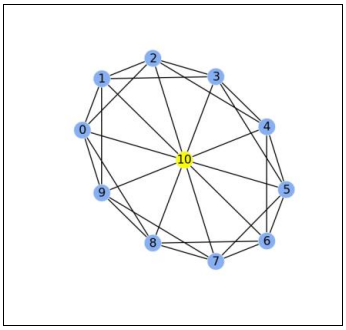


Chapter 14, Graphs, Geometry, and Geographic Information Systems








2
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9
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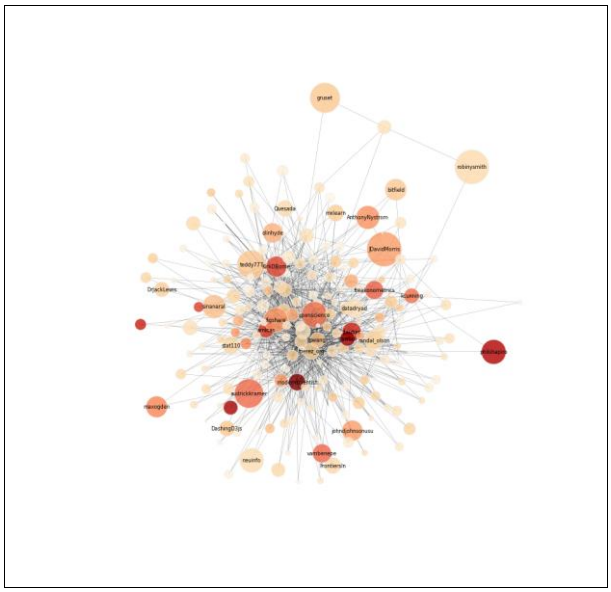
8
6
7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bitfield
Quesada
melsam
AntonyRyttrom
dinhyde
DavidMorris
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DrackLewis
sinanaral
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scanning
datadryad
fosfuel
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johnsjohnsonusu
vanbenepe
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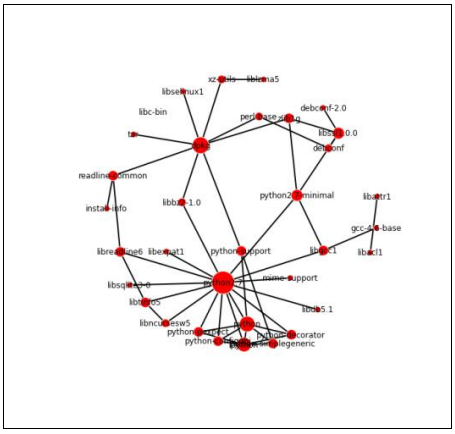
reuinfo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debconf-2.0
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libsqlite3.0
debconf
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gcc-4.6-base
libreadline6
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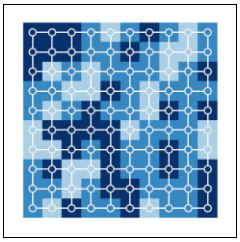
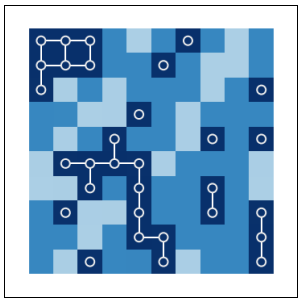
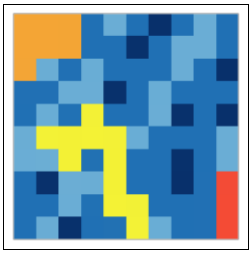
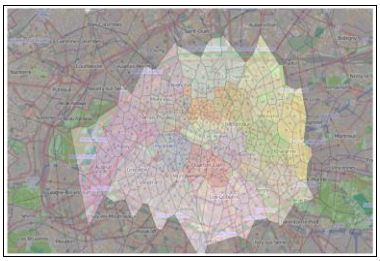
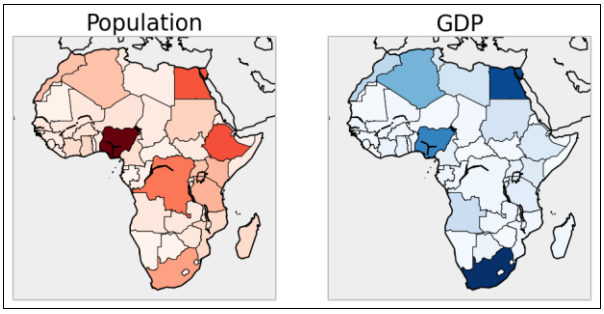
python-decorator
python-pkg-resources
pkgenerics










Population
GDP

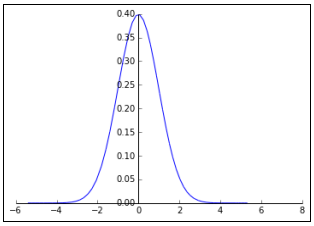
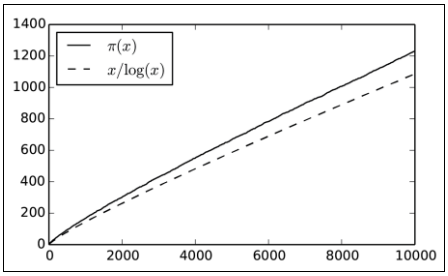
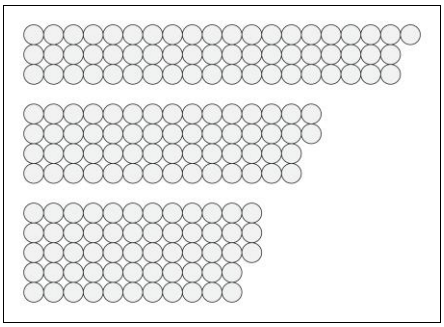
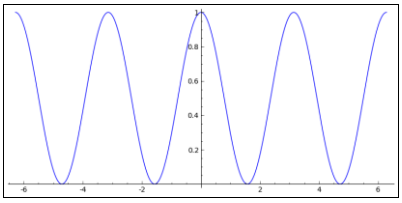
Chapter 15, Symbolic and Numerical Mathematics

```
In [7]: expr1.subs(x, expr1)
```

Out[7]:

$$\left((x+1)^2+1\right)^2$$

```
In [8]: expr1.subs(x, pi)
```

Out[8]:

$$(1+\pi)^2$$