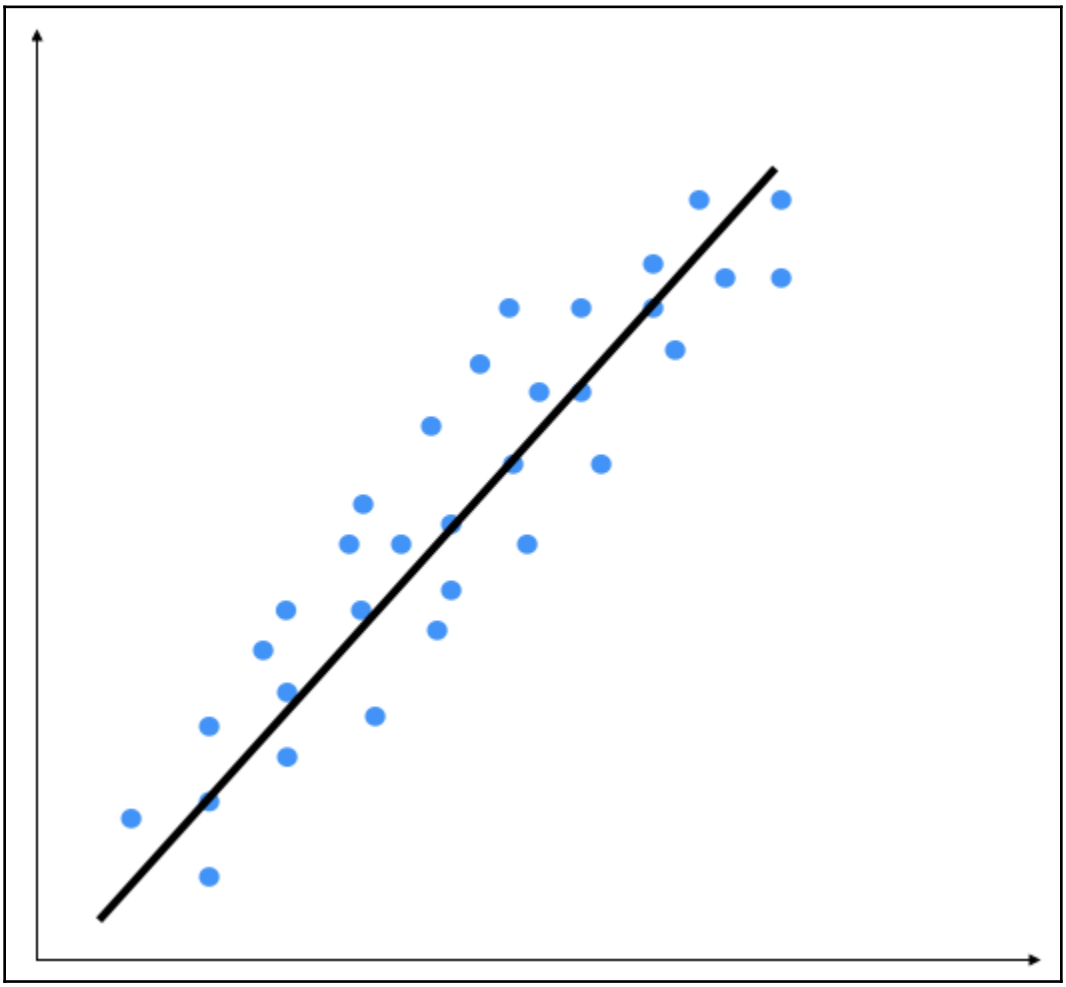
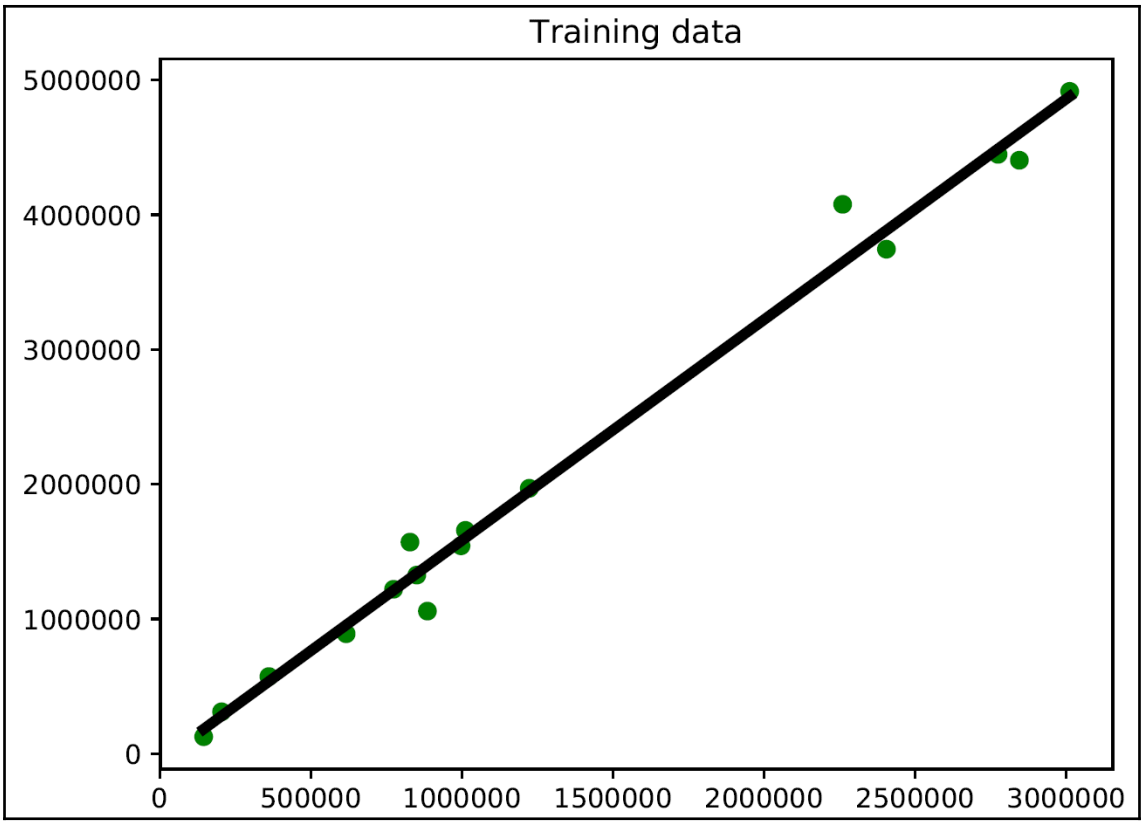
Chapter 1: The Realm of Supervised Learning

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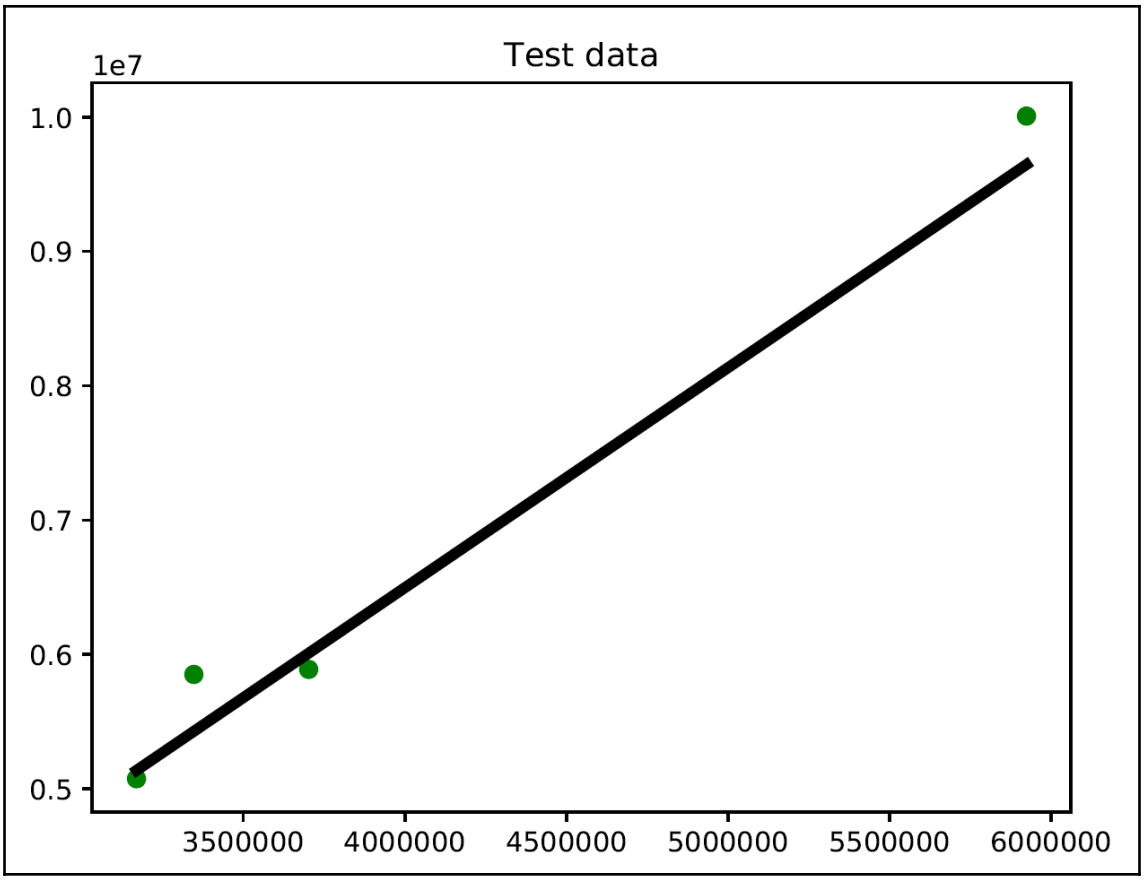
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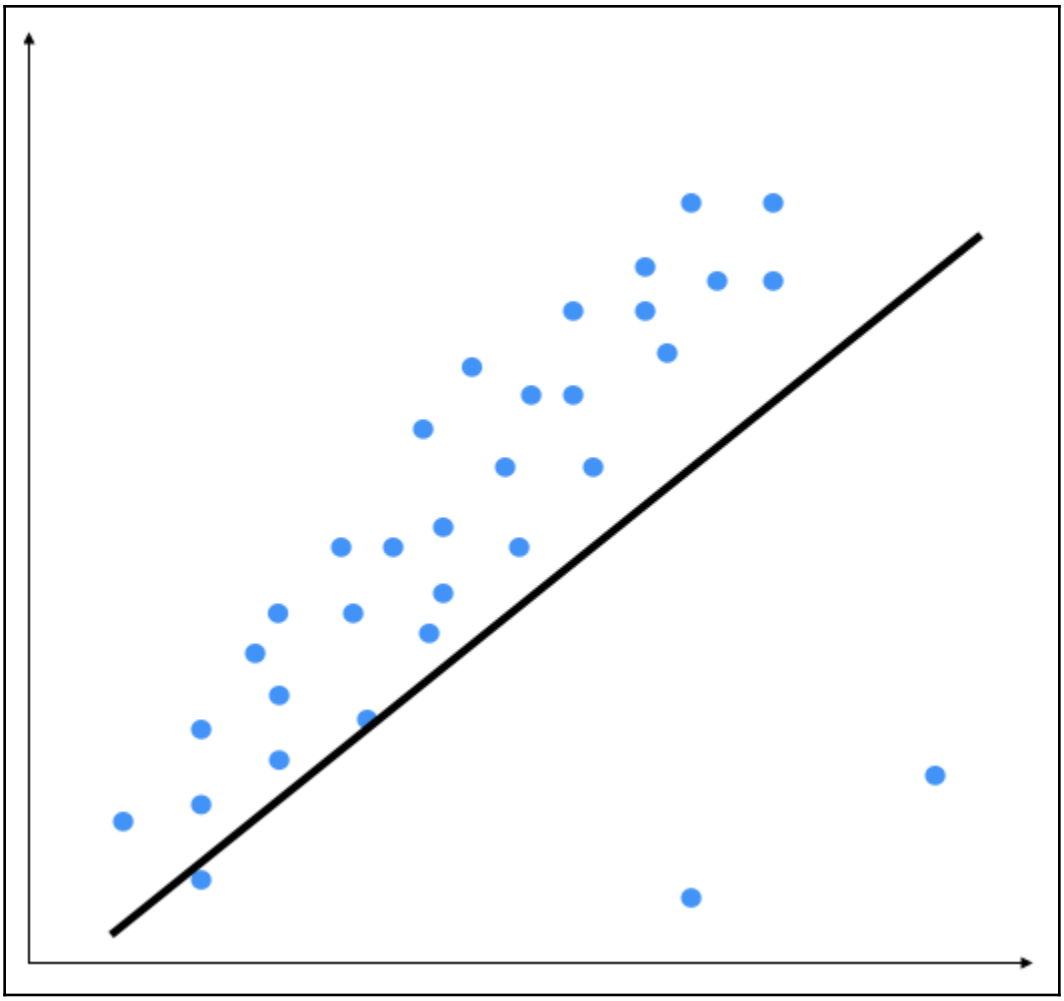
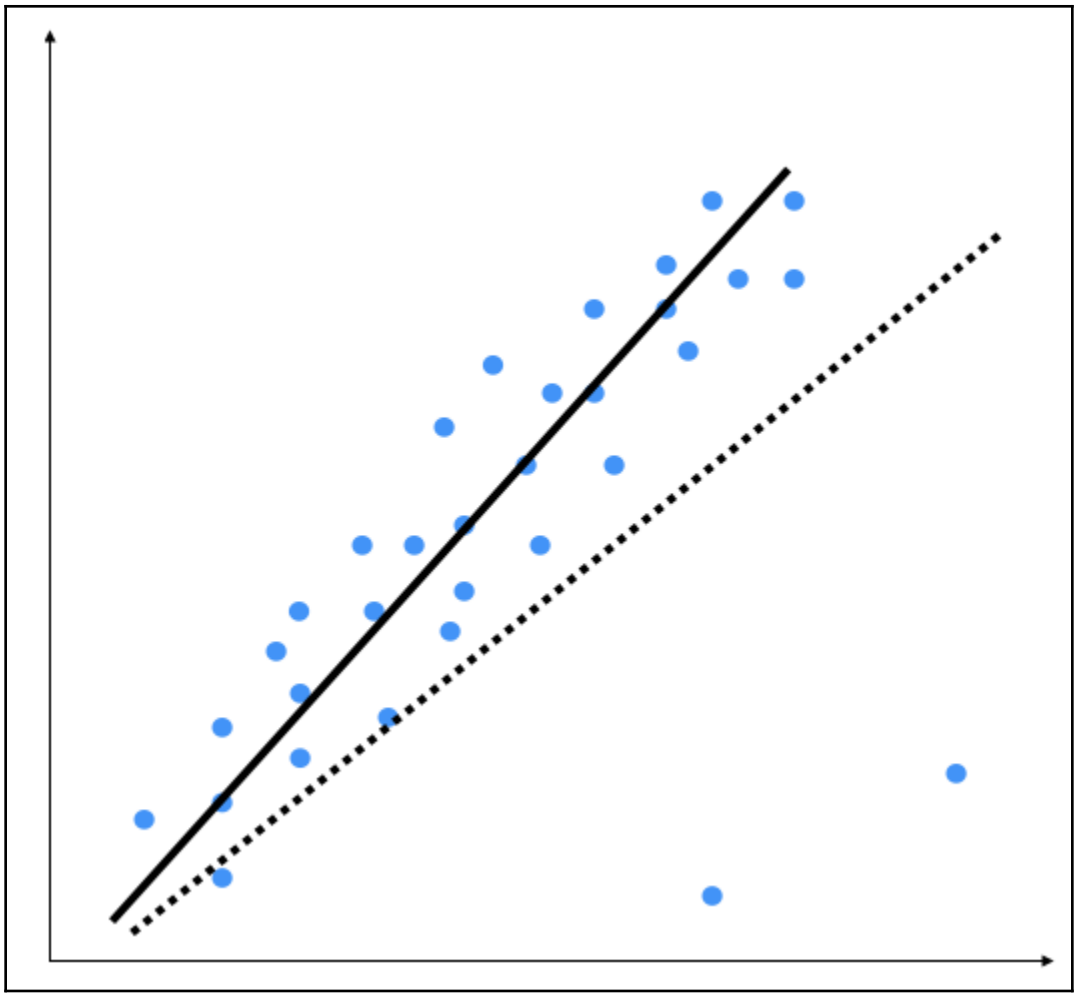
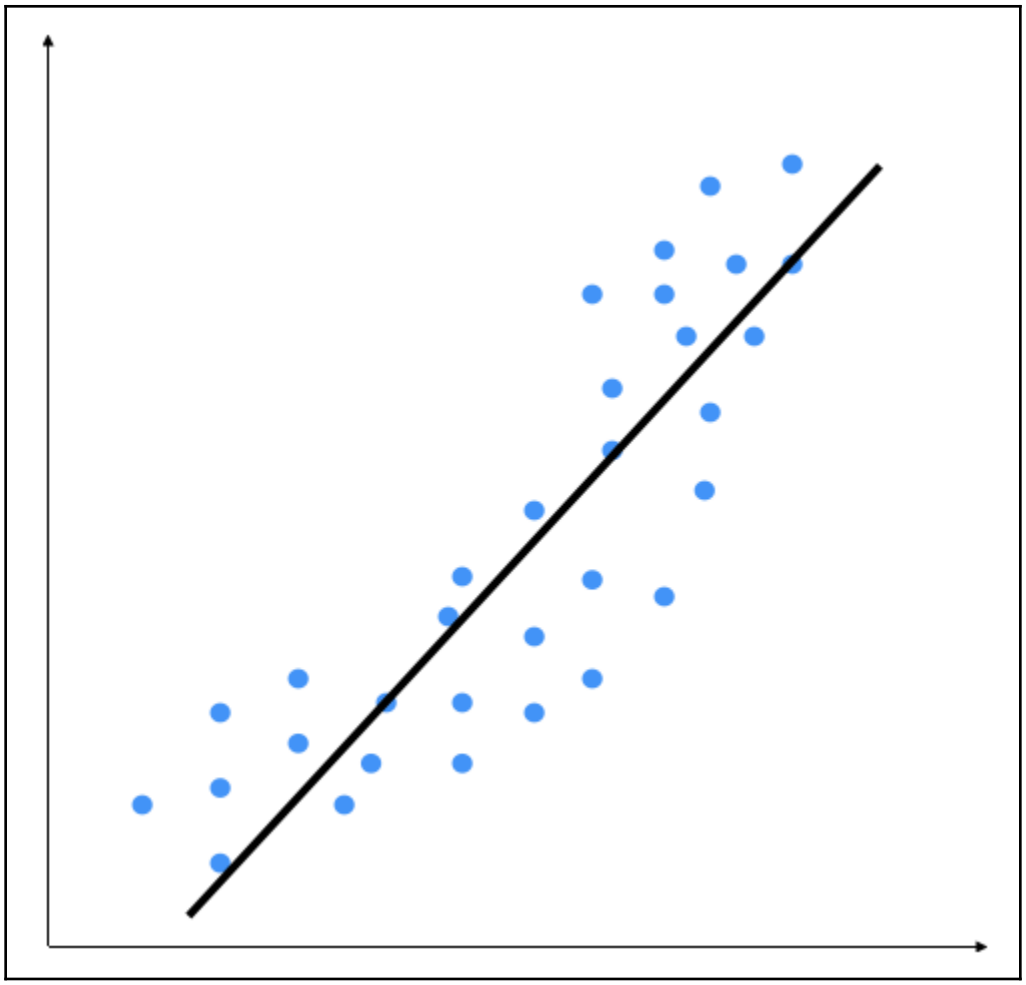
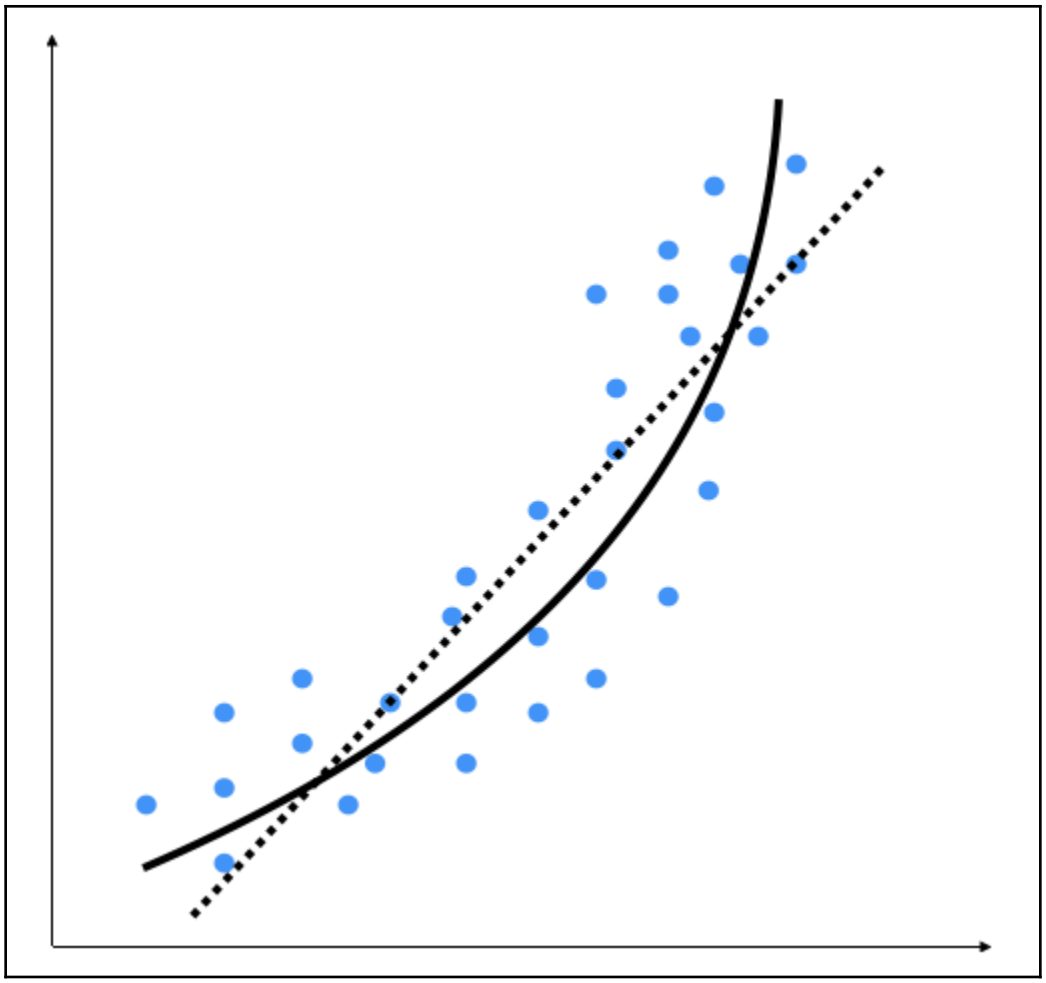
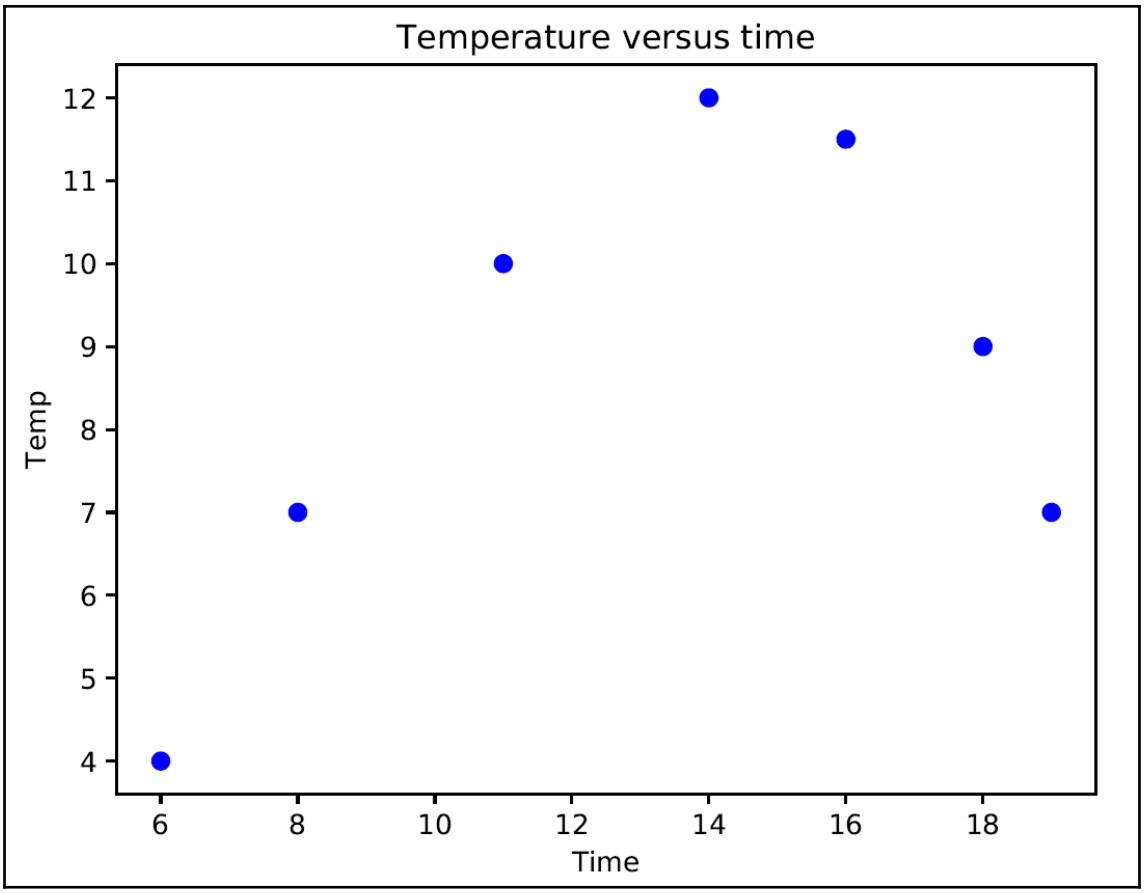
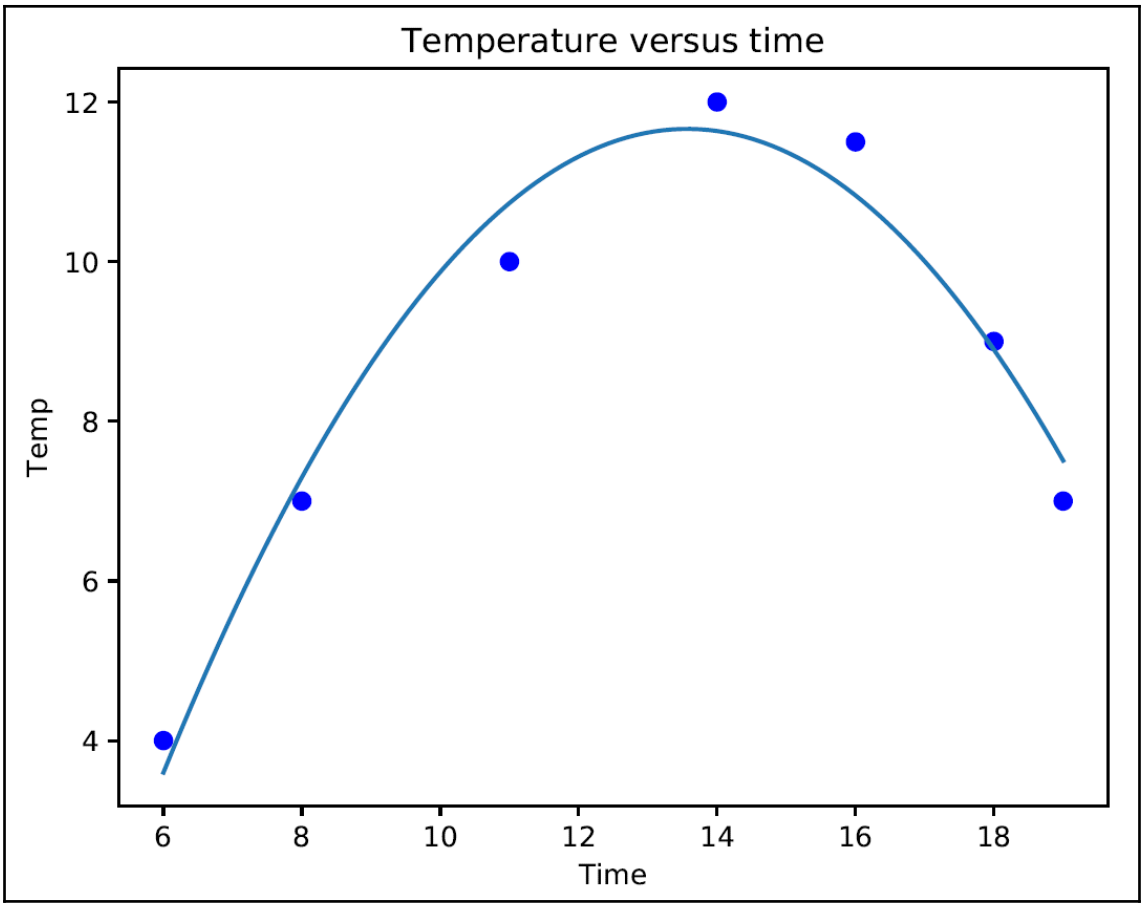









Temperature versus time
Temp
Time
12
11
10
9
8
7
6
5
4
6
8
10
12
14
16
18


Temperature versus time
Temp
Time
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10
8
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4
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12
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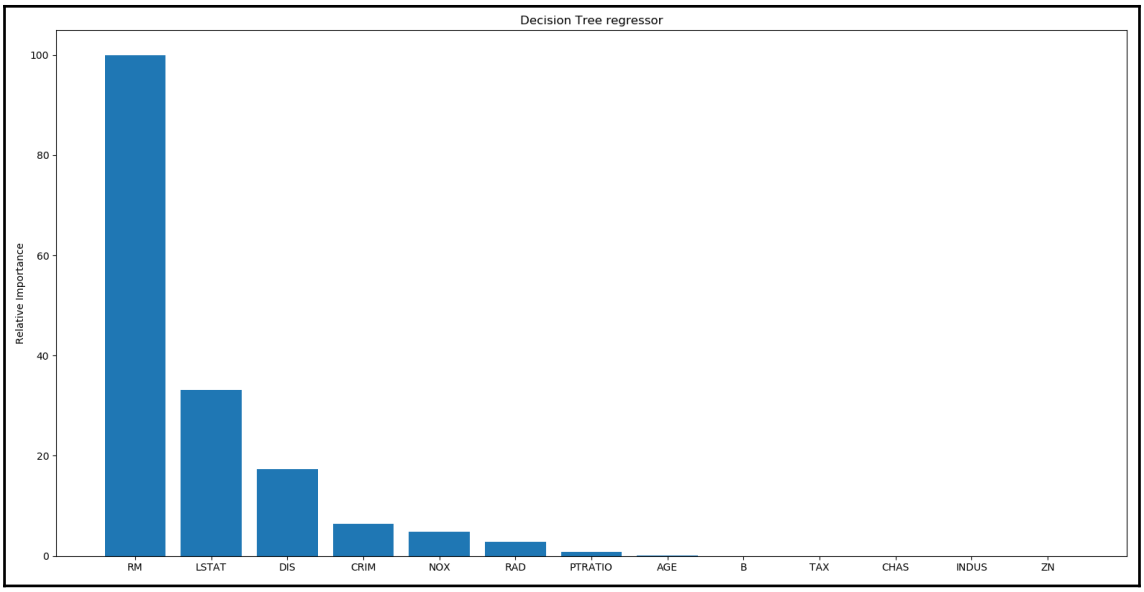
16
18


Decision Tree regressor
Relative Importance
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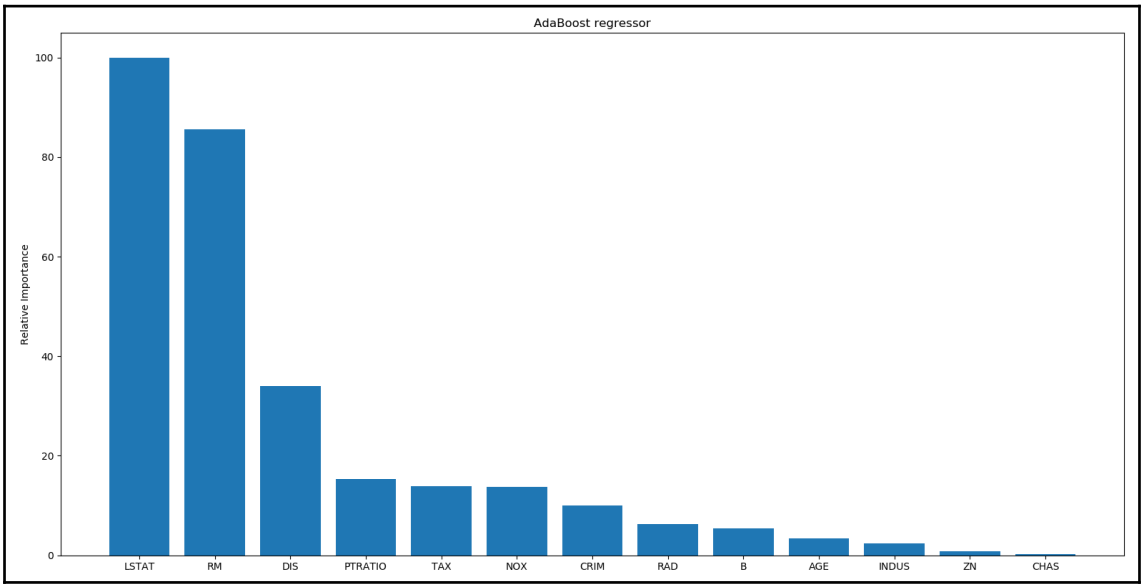
40
60
80
100
RM
LSTAT
DIS
CRIM
NOX
RAD
PTRATIO
AGE
B
TAX
CHAS
INDUS
ZN


AdaBoost regressor
Relative Importance
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LSTAT
RM
DIS
PTRATIO
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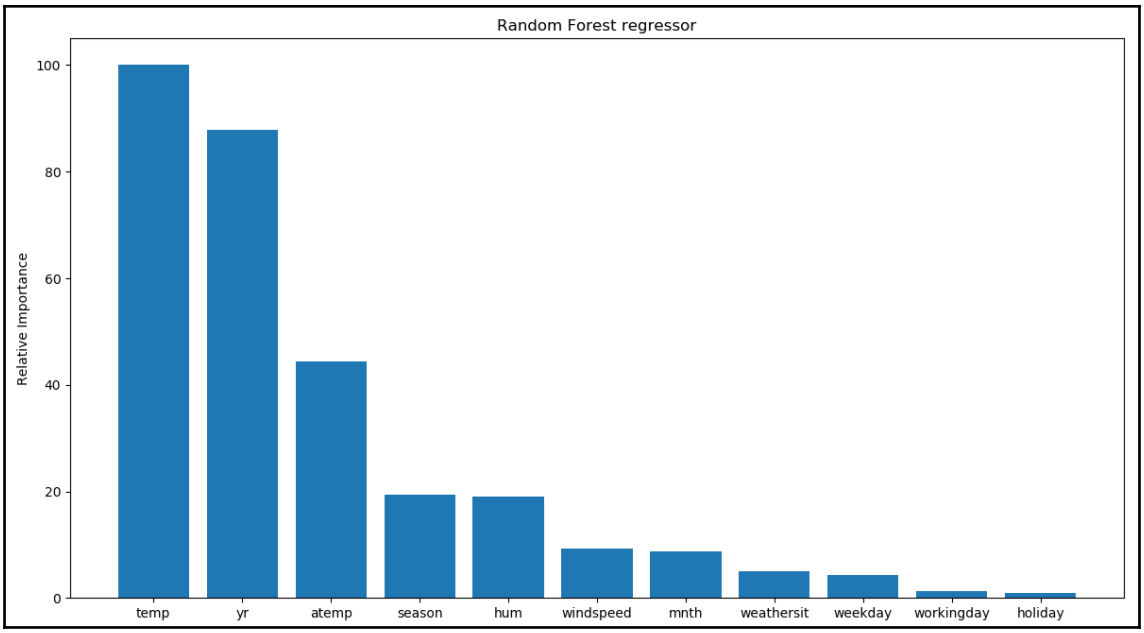
CRIM
RAD
B
AGE
INDUS
ZN
CHAS


Random Forest regressor
Relative Importance
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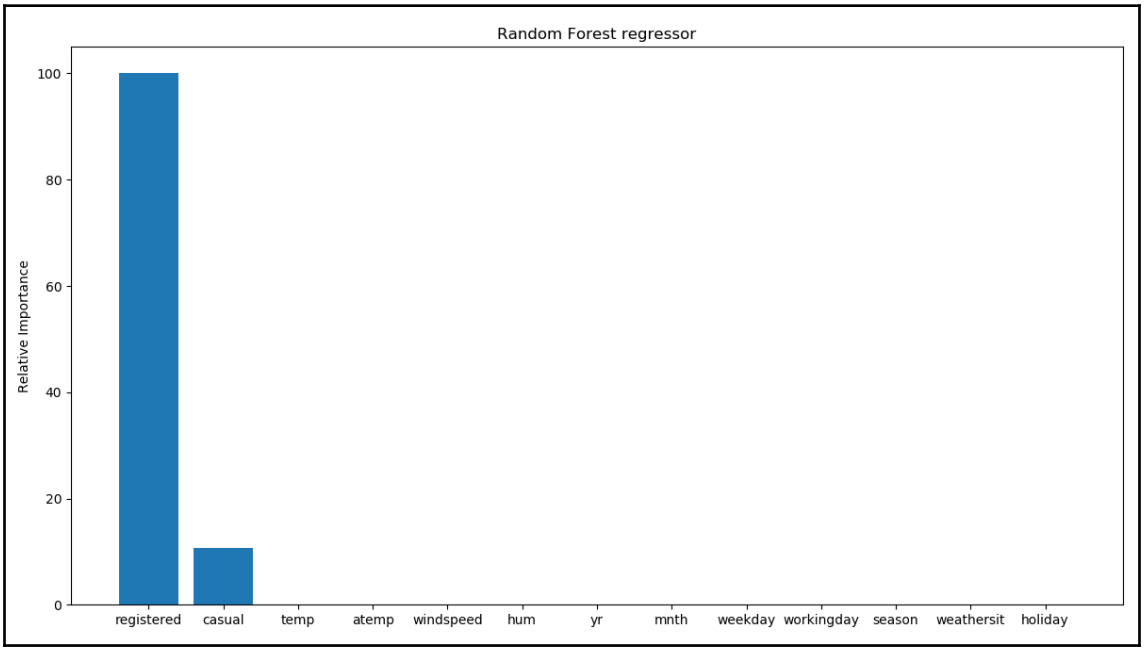
20
40
60
80
100
temp
yr
atemp
season
hum
windspeed
mnth
weathersit
weekday
workingday
holiday


Random Forest regressor
Relative Importance
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windspeed
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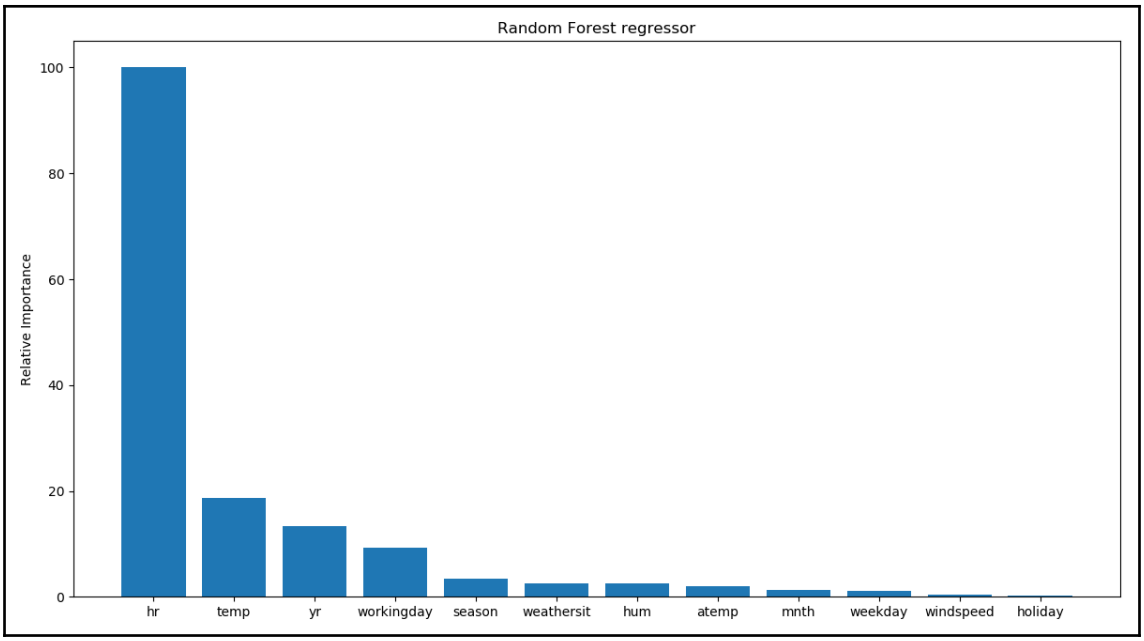
yr
mnth
weekday
workingday
season
weathersit
holiday


Random Forest regressor
Relative Importance
100
80
60
40
20
0
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yr
workingday
season
weathersit
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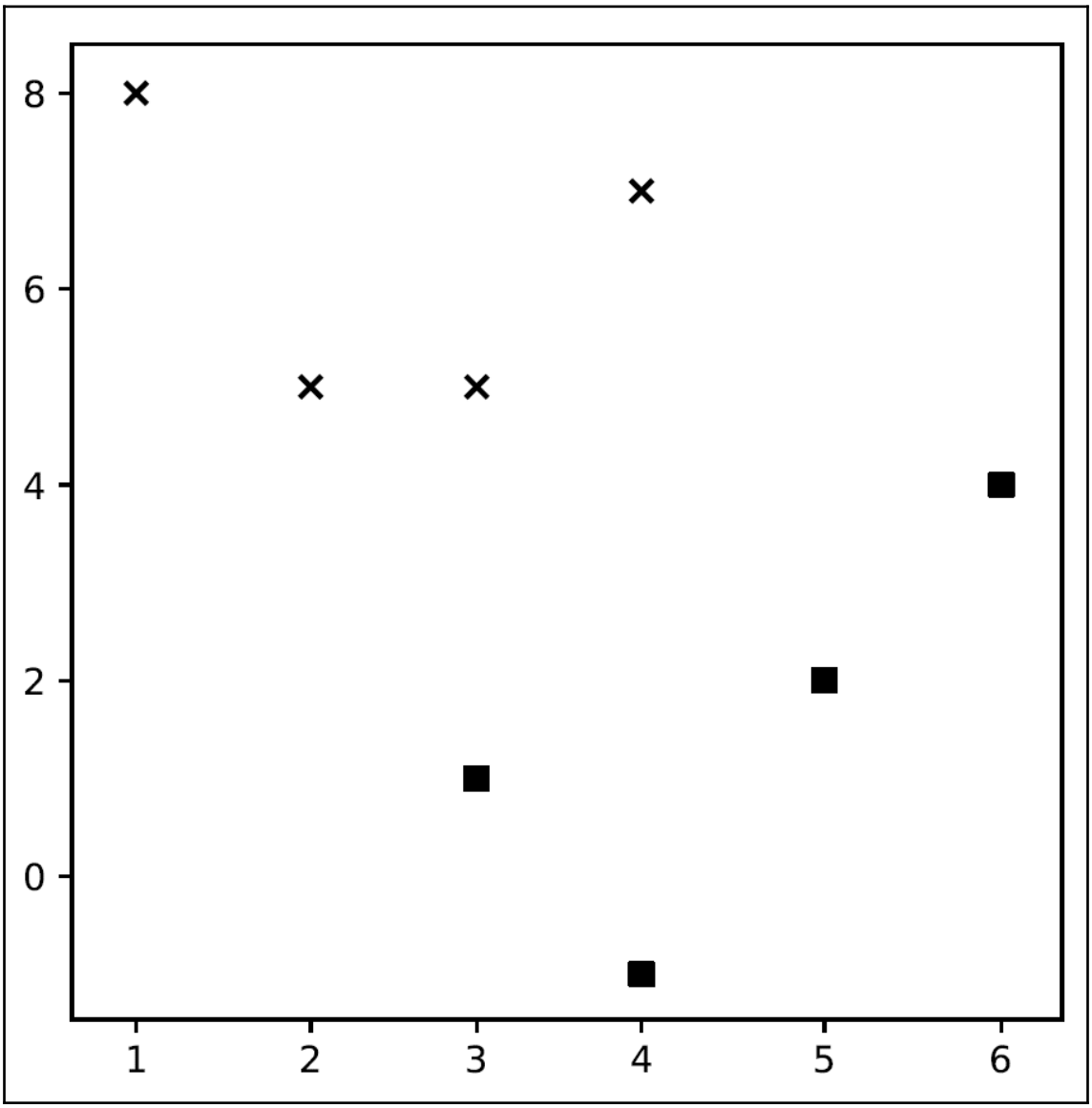
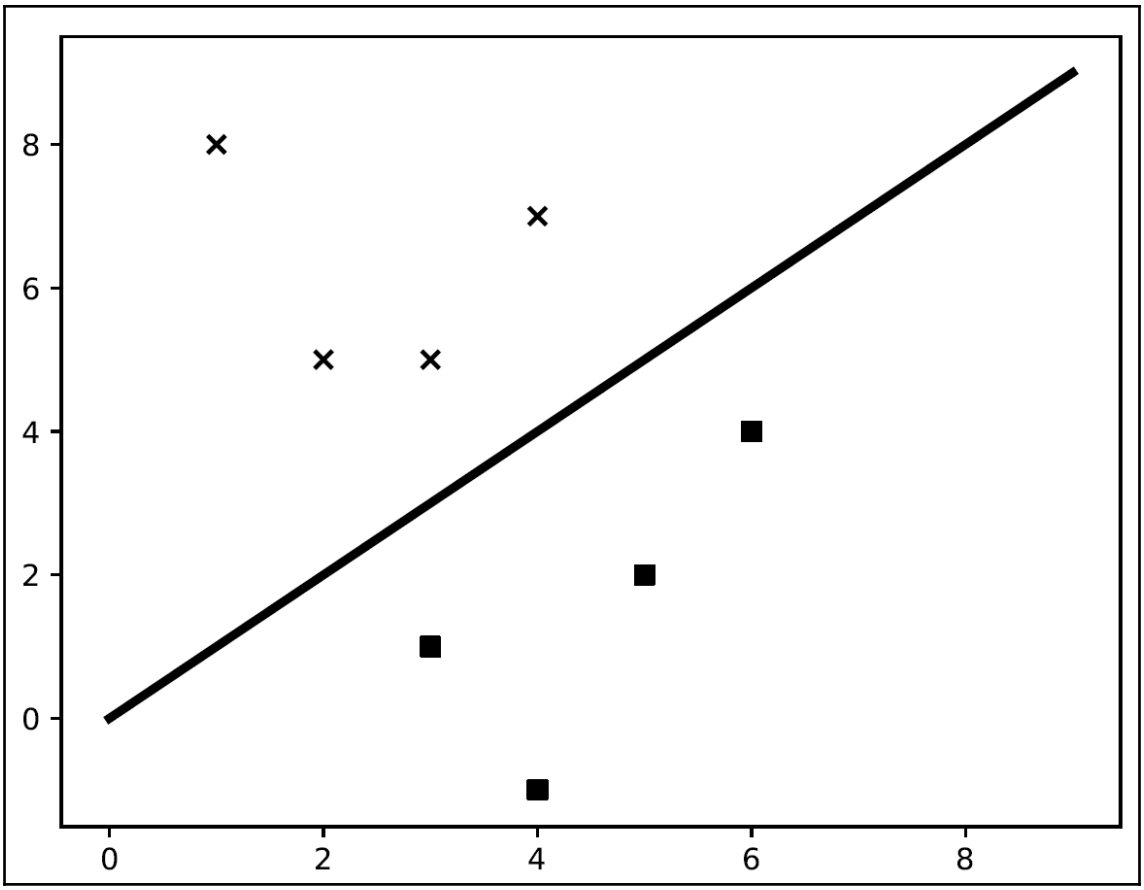
atemp
mnth
weekday
windspeed
holiday

Chapter 2: Constructing a Classifier

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4
2
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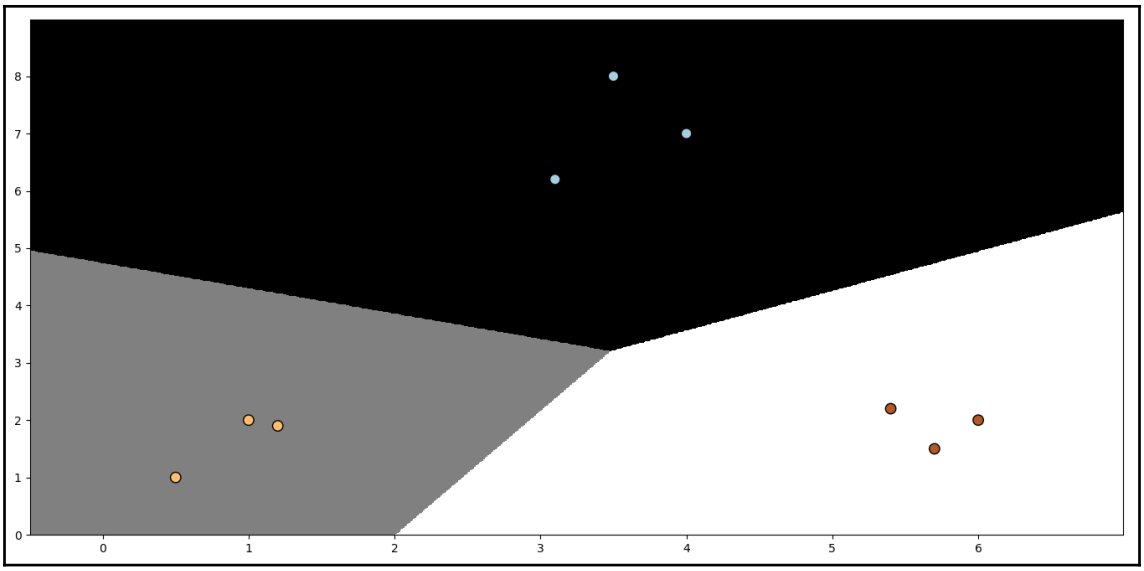
0
2
4
6
8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4
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6
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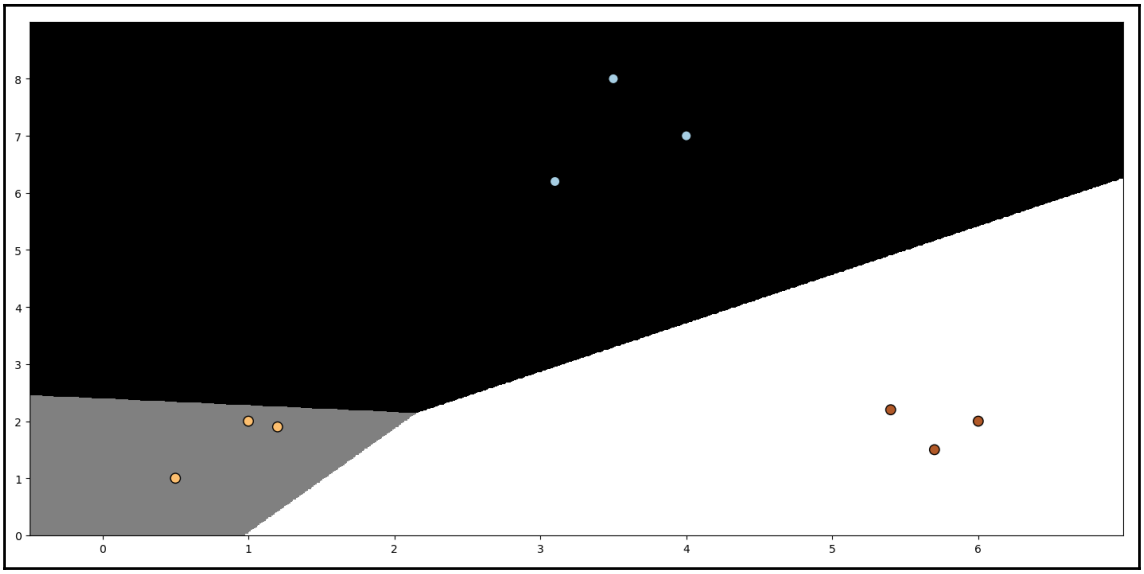
8
0
1
2
3
4
5
6


0
1
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6
7
8
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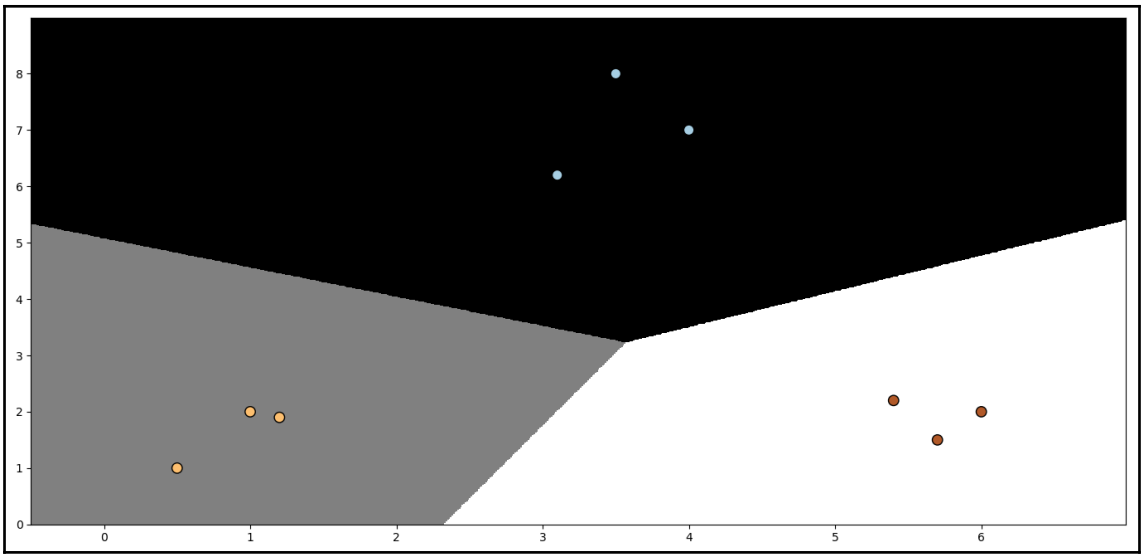
3
4
5
6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8
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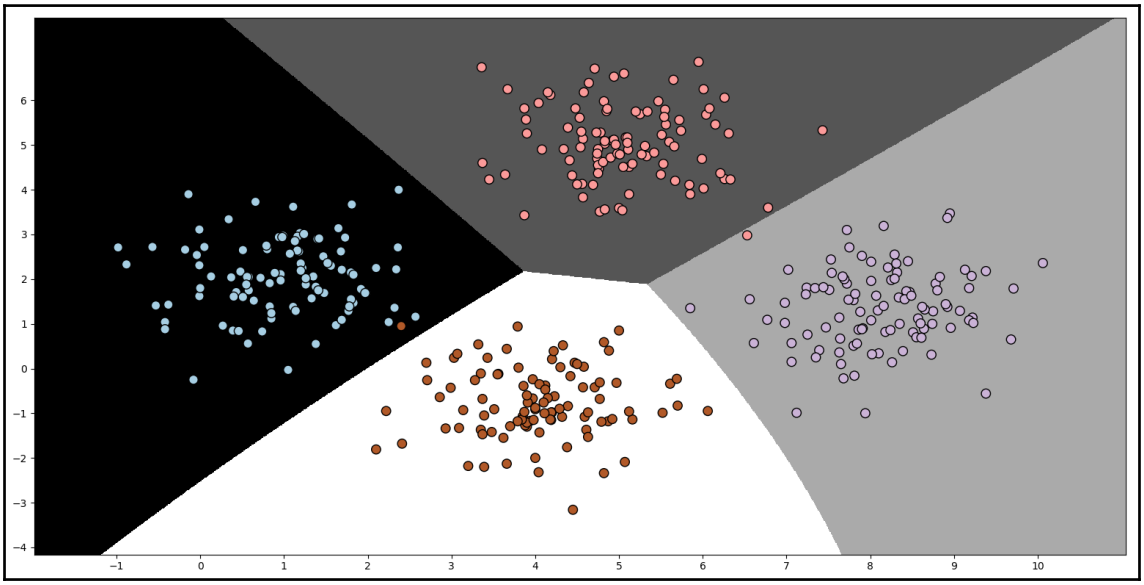
3
4
5
6


−4
−3
−2
−1
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4
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6
−1
0
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2
3
4
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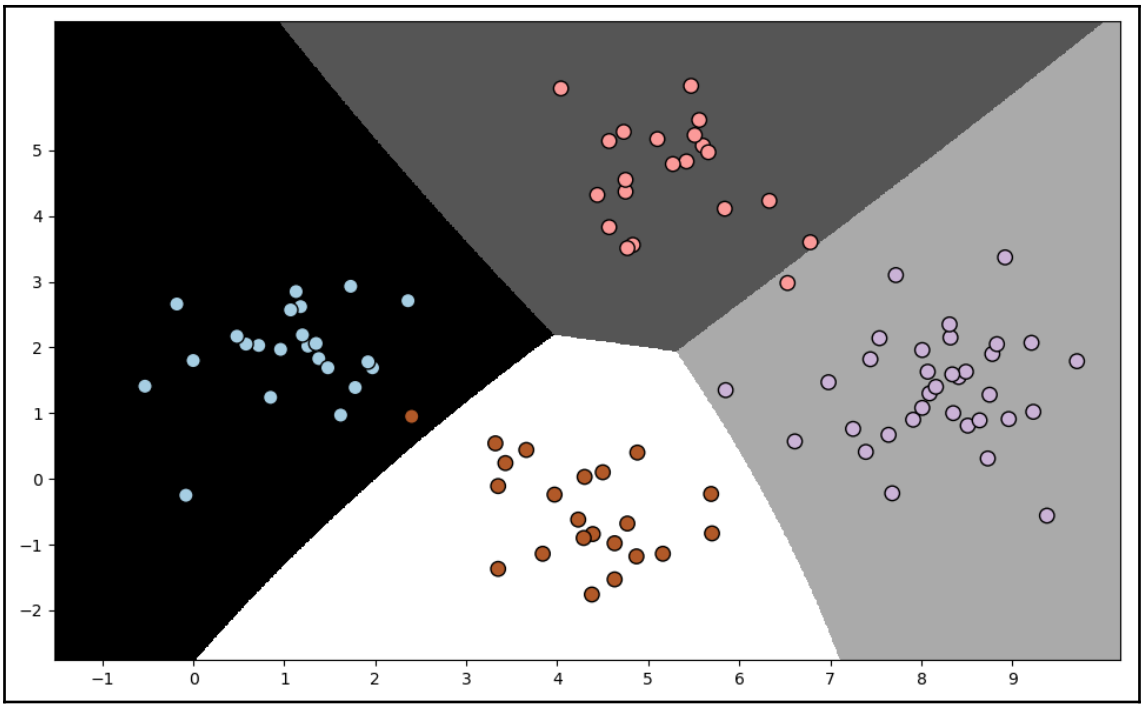
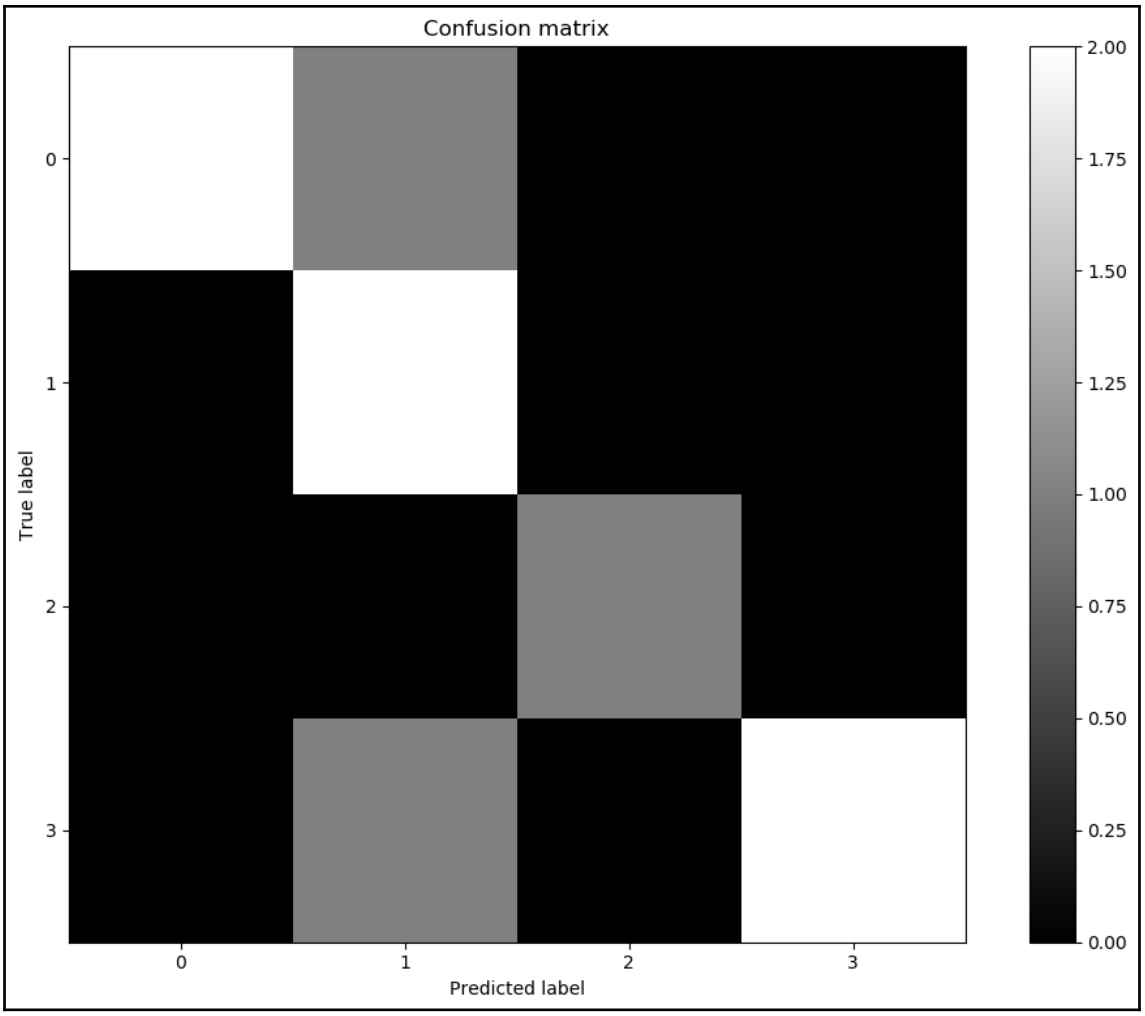
7
8
9
10

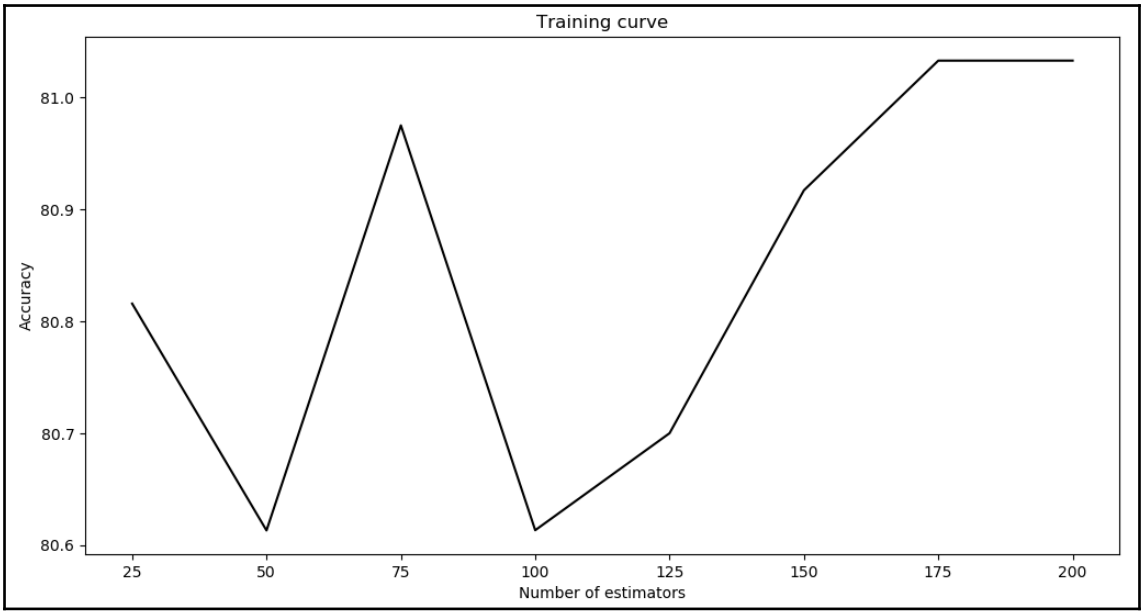

5
4
3
2
1
0
−1
−2
−1
0
1
2
3
4
5
6
7
8
9

	Predicted class 0	Predicted class 1	Predicted class 2
True class 0	45	4	3
True class 1	11	56	2
True class 2	5	6	49

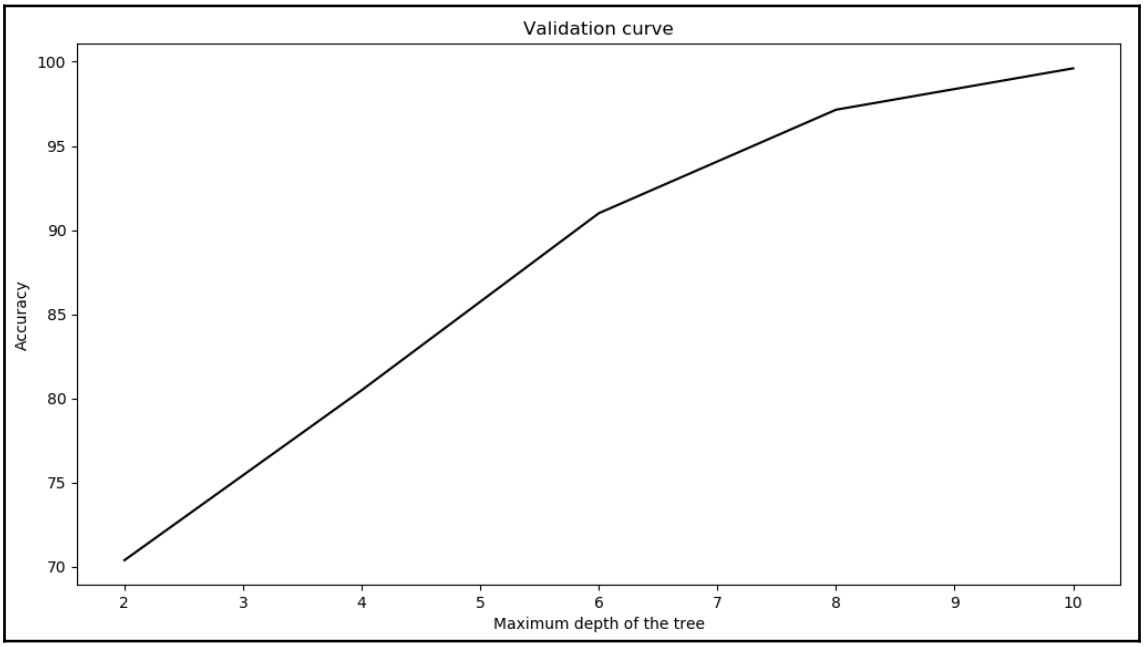


	precision	recall	f1-score	support
class-0	1.00	0.67	0.80	3
class-1	0.50	1.00	0.67	2
class-2	1.00	1.00	1.00	1
class-3	1.00	0.67	0.80	3
avg / total	0.89	0.78	0.79	9

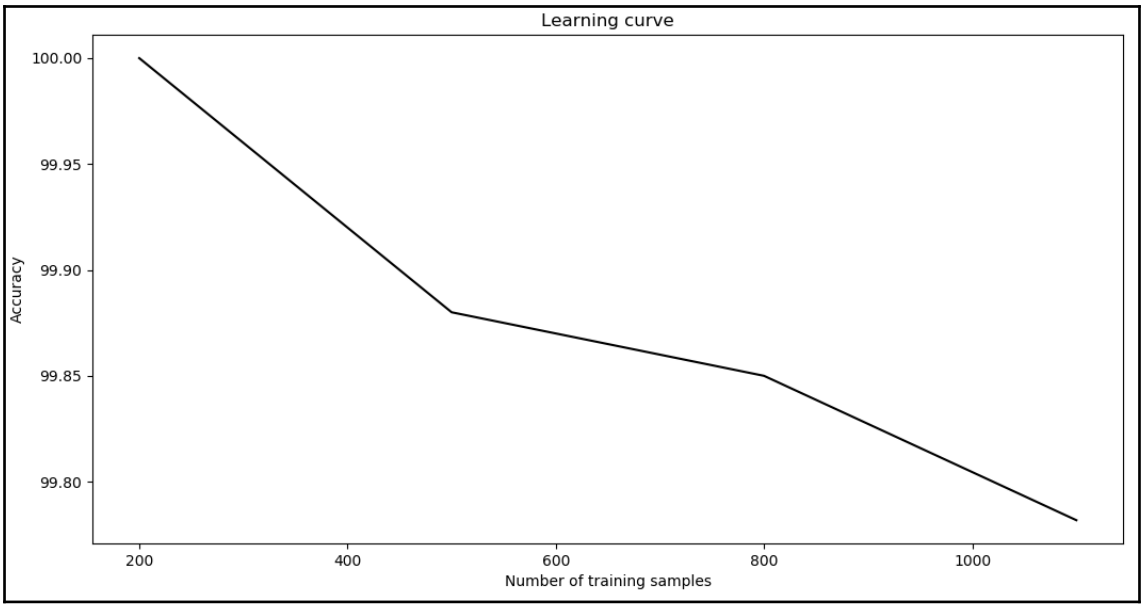
```
##### VALIDATION CURVES #####

Param: n_estimators
Training scores:
[[0.80680174 0.80824891 0.80752533 0.80463097 0.81358382]
[0.79522431 0.80535456 0.81041968 0.8089725  0.81069364]
[0.80101302 0.80680174 0.81114327 0.81476122 0.8150289 ]
[0.8024602  0.80535456 0.81186686 0.80752533 0.80346821]
[0.80028944 0.80463097 0.81114327 0.80824891 0.81069364]
[0.80390738 0.80535456 0.81041968 0.80969609 0.81647399]
[0.80390738 0.80463097 0.81114327 0.81476122 0.81719653]
[0.80390738 0.80607815 0.81114327 0.81403763 0.81647399]]

Param: n_estimators
Validation scores:
[[0.71098266 0.76589595 0.72543353 0.76300578 0.75290698]
[0.71098266 0.75433526 0.71965318 0.75722543 0.74127907]
[0.71098266 0.72254335 0.71965318 0.75722543 0.74418605]
[0.71098266 0.71387283 0.71965318 0.75722543 0.72674419]
[0.71098266 0.74277457 0.71965318 0.75722543 0.74127907]
[0.71098266 0.74277457 0.71965318 0.75722543 0.74127907]
[0.71098266 0.74566474 0.71965318 0.75722543 0.74418605]
[0.71098266 0.75144509 0.71965318 0.75722543 0.74127907]]
```



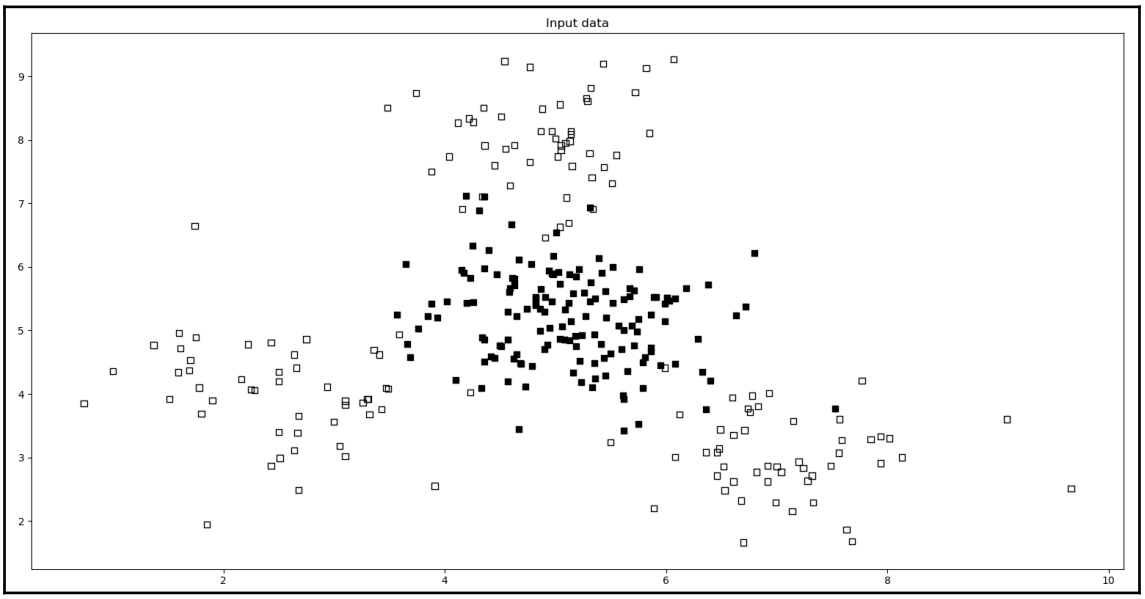
```
Param: max_depth
Training scores:
[[0.71852388 0.70043415 0.70043415 0.70043415 0.69942197]
[0.80607815 0.80535456 0.80752533 0.79450072 0.81069364]
[0.90665702 0.91027496 0.92836469 0.89797395 0.90679191]
[0.97467438 0.96743849 0.96888567 0.97829233 0.96820809]
[0.99421129 0.99710564 0.99782923 0.99855282 0.99277457]]

Param: max_depth
Validation scores:
[[0.71098266 0.76589595 0.72543353 0.76300578 0.75290698]
[0.71098266 0.75433526 0.71965318 0.75722543 0.74127907]
[0.71098266 0.72254335 0.71965318 0.75722543 0.74418605]
[0.71098266 0.71387283 0.71965318 0.75722543 0.72674419]
[0.71098266 0.74277457 0.71965318 0.75722543 0.74127907]
[0.71098266 0.74277457 0.71965318 0.75722543 0.74127907]
[0.71098266 0.74566474 0.71965318 0.75722543 0.74418605]
[0.71098266 0.75144509 0.71965318 0.75722543 0.74127907]]
```

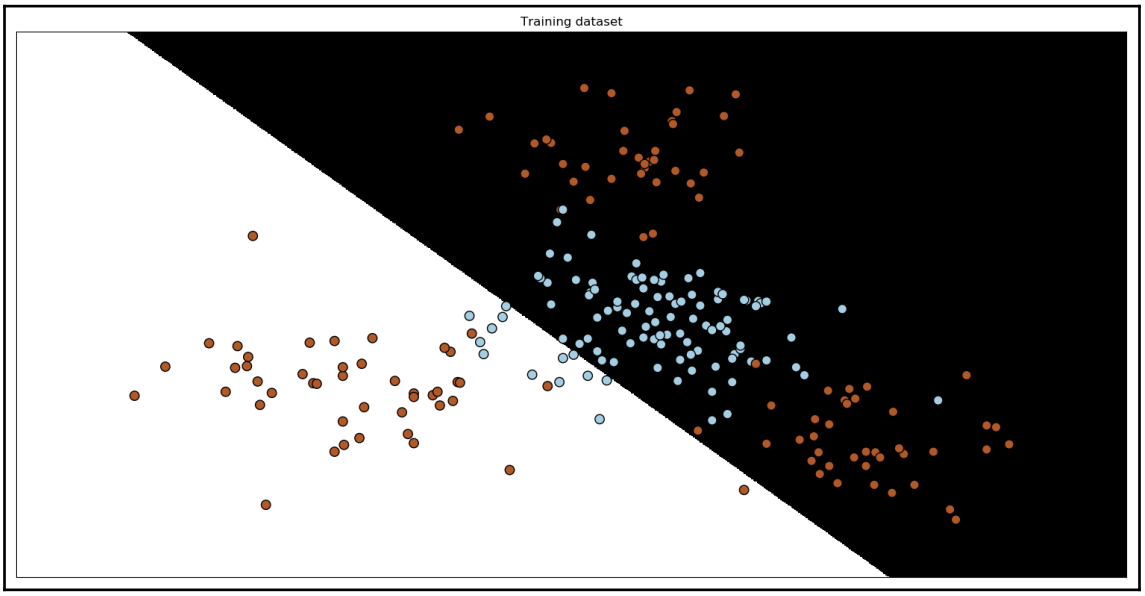


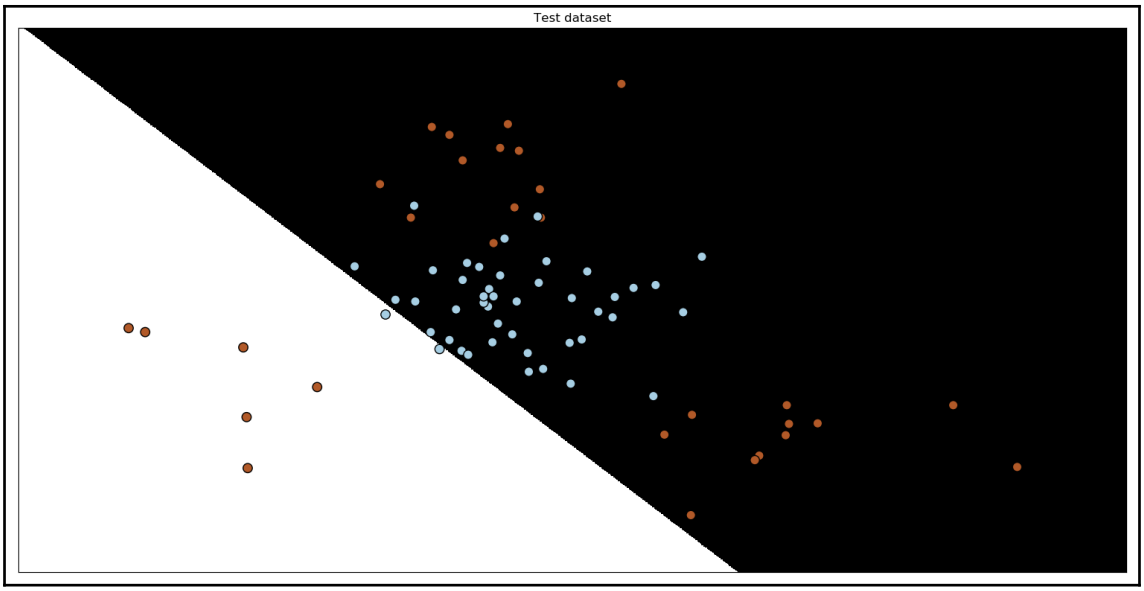
```
##### LEARNING CURVES #####

Training scores:
[[1.         1.         1.         1.         1.        ]
[1.         1.         0.998      0.998      0.998     ]
[0.99875    0.9975     0.99875    0.99875    0.99875   ]
[0.99818182 0.99545455 0.99909091 0.99818182 0.99818182]]

Validation scores:
[[0.69942197 0.69942197 0.69942197 0.69942197 0.70348837]
[0.74855491 0.65028902 0.76878613 0.76589595 0.70348837]
[0.70520231 0.78612717 0.52312139 0.76878613 0.77034884]
[0.65028902 0.75433526 0.65317919 0.75433526 0.76744186]]
```



Chapter 3: Predictive Modeling





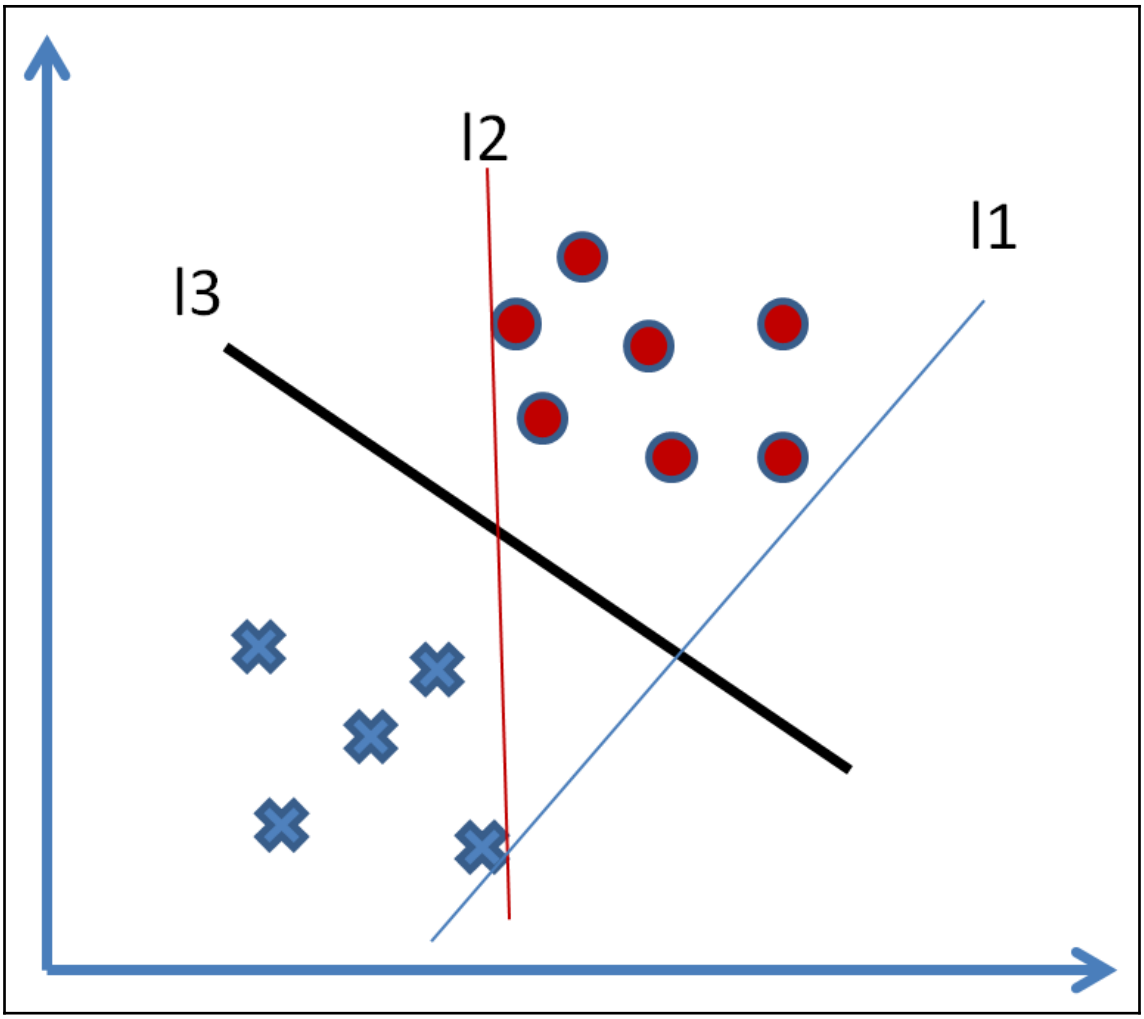


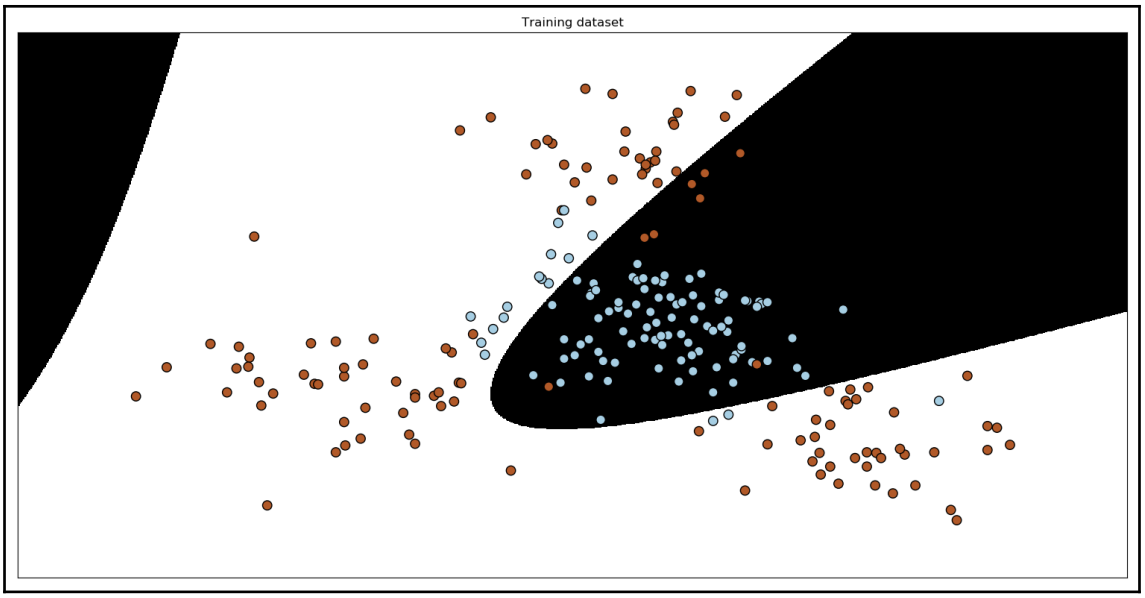
Classifier performance on training dataset

	precision	recall	f1-score	support
Class-0	0.55	0.88	0.68	105
Class-1	0.78	0.38	0.51	120
avg / total	0.67	0.61	0.59	225

Classification report on test dataset

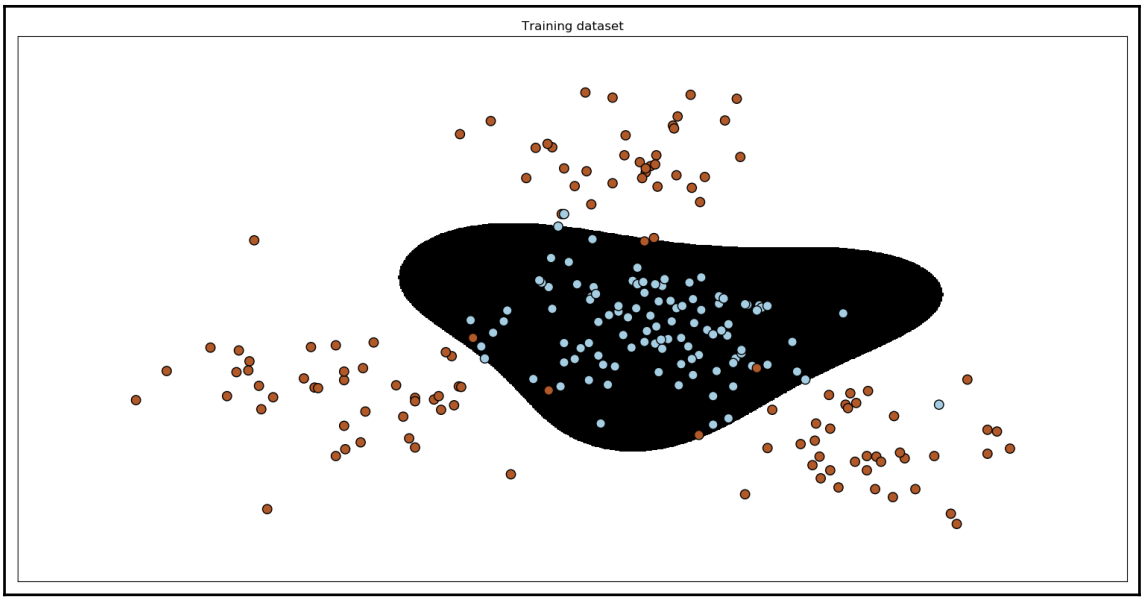
	precision	recall	f1-score	support
Class-0	0.64	0.96	0.77	45
Class-1	0.75	0.20	0.32	30
avg / total	0.69	0.65	0.59	75


l2
l1
l3



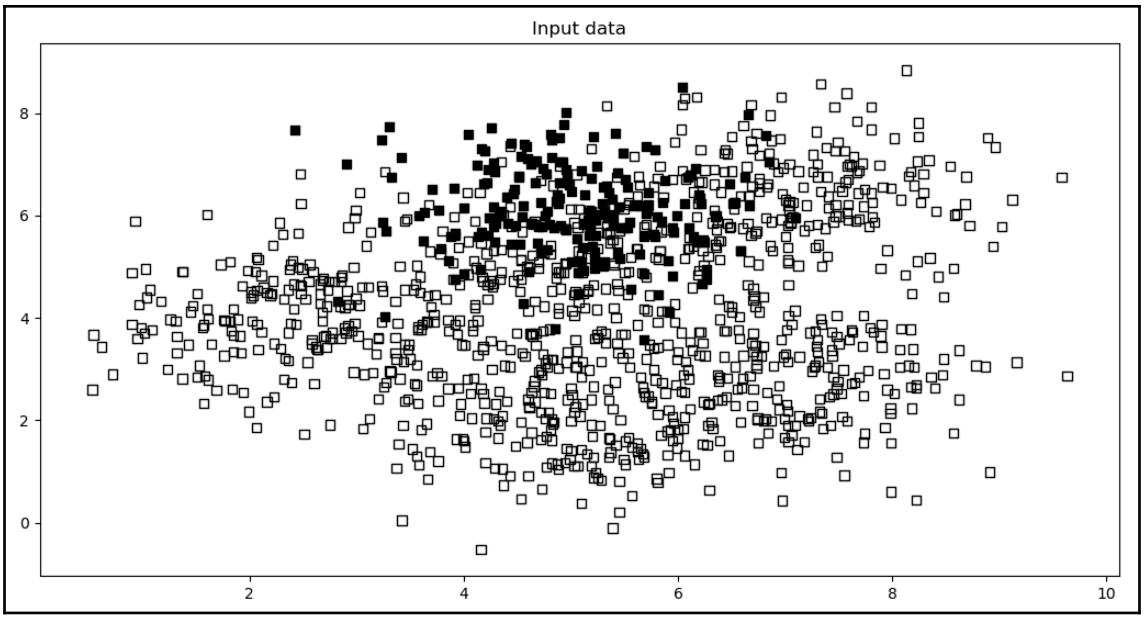
Classifier performance on training dataset

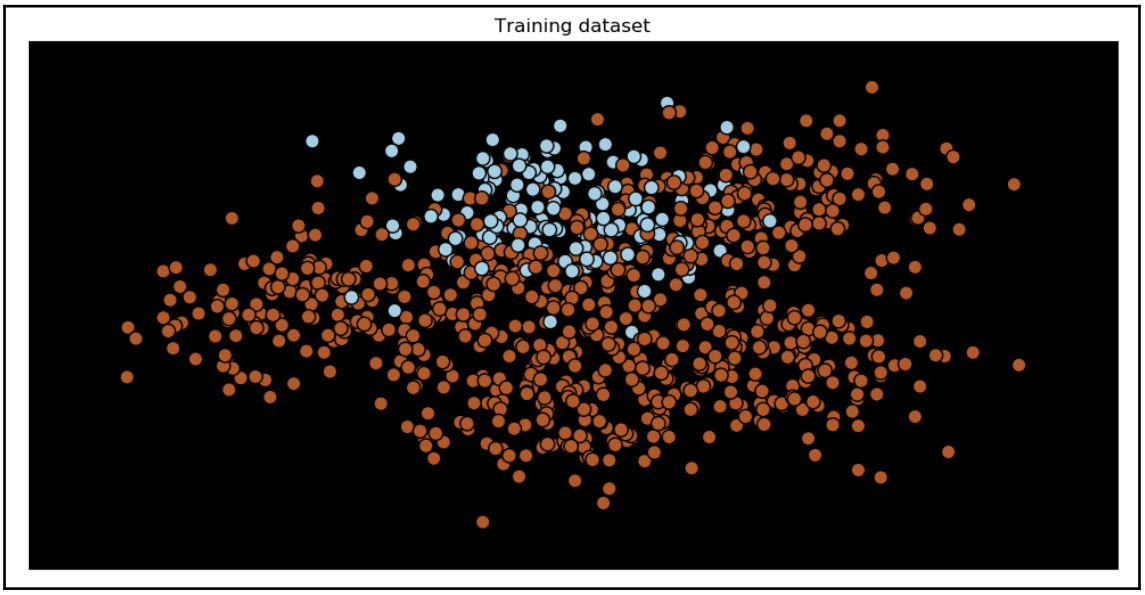
	precision	recall	f1-score	support
Class-0	0.92	0.84	0.88	105
Class-1	0.87	0.93	0.90	120
avg / total	0.89	0.89	0.89	225



Classifier performance on training dataset

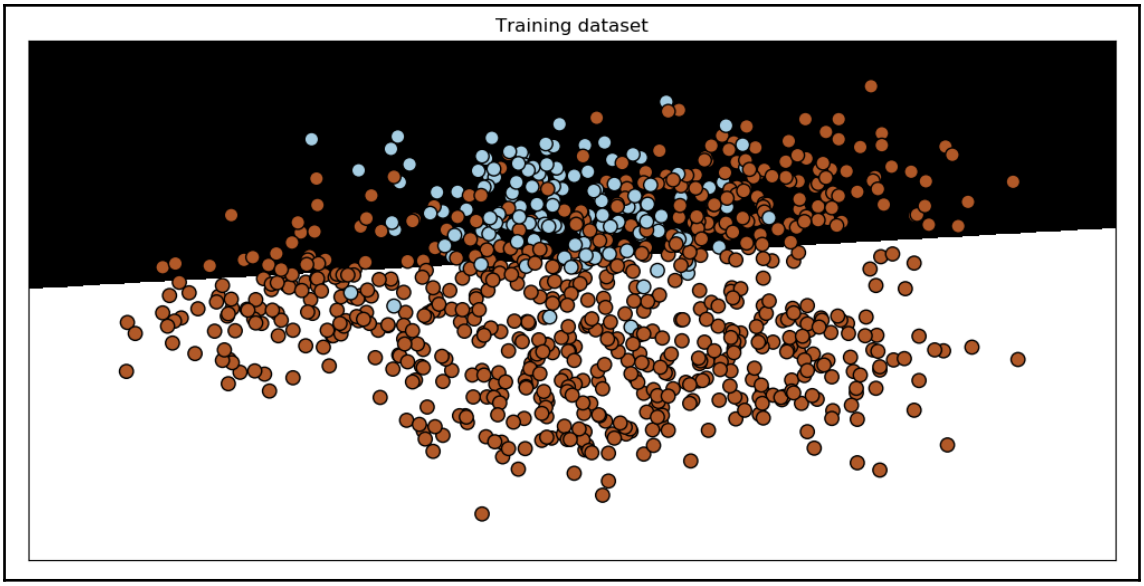
	precision	recall	f1-score	support
Class-0	0.95	0.98	0.97	105
Class-1	0.98	0.96	0.97	120
avg / total	0.97	0.97	0.97	225


Input data
8
6
4
2
0
2
4
6
8
10


Training dataset

Classifier performance on training dataset

	precision	recall	f1-score	support
Class-0	0.00	0.00	0.00	158
Class-1	0.82	1.00	0.90	742
avg / total	0.68	0.82	0.75	900

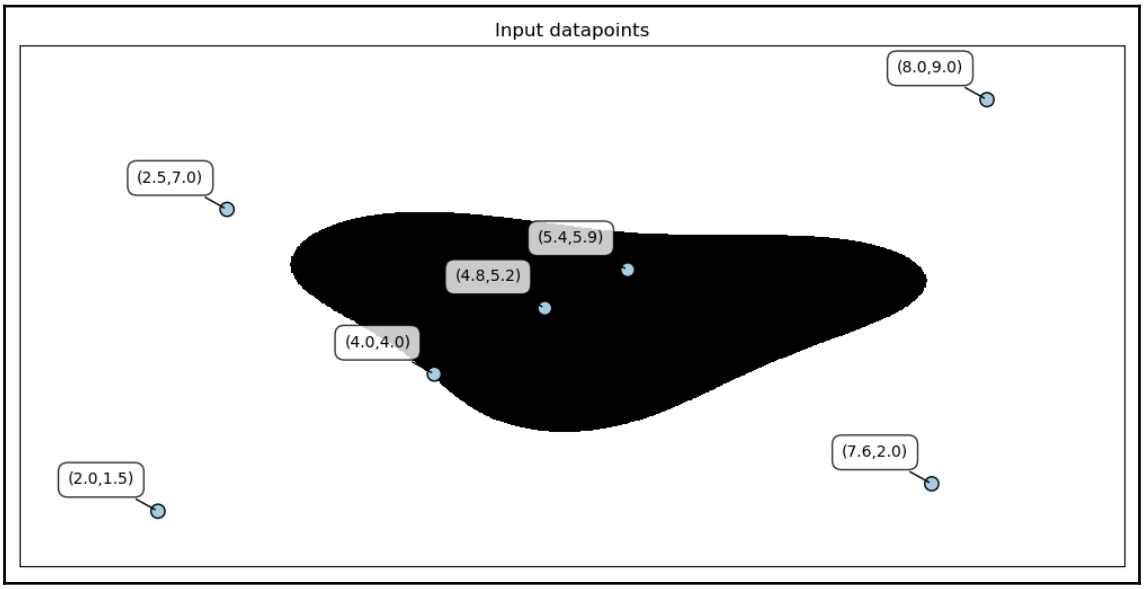


Classifier performance on training dataset

	precision	recall	f1-score	support
Class-0	0.39	0.91	0.54	158
Class-1	0.97	0.69	0.81	742
avg / total	0.87	0.73	0.76	900

```
Distance from the boundary:
[2.  1.5] --> 0.9248968828198472
[8. 9.]   --> 0.6422390024622062
[4.8 5.2] --> -2.035417667930382
[4. 4.]   --> -0.07623172174998727
[2.5 7. ] --> 0.734559329251757 7
[7.6 2. ] --> 1.0982437814537895
[5.4 5.9] --> -1.2114549553124778
```

```
Confidence measure:
[2.  1.5] --> [0.04971101 0.95028899]
[8. 9.]   --> [0.10789695 0.89210305]
[4.8 5.2] --> [0.99707139 0.00292861]
[4. 4.]   --> [0.50519174 0.49480826]
[2.5 7. ] --> [0.08421437 0.91578563]
[7.6 2. ] --> [0.03034752 0.96965248]
[5.4 5.9] --> [0.96642513 0.03357487]
```



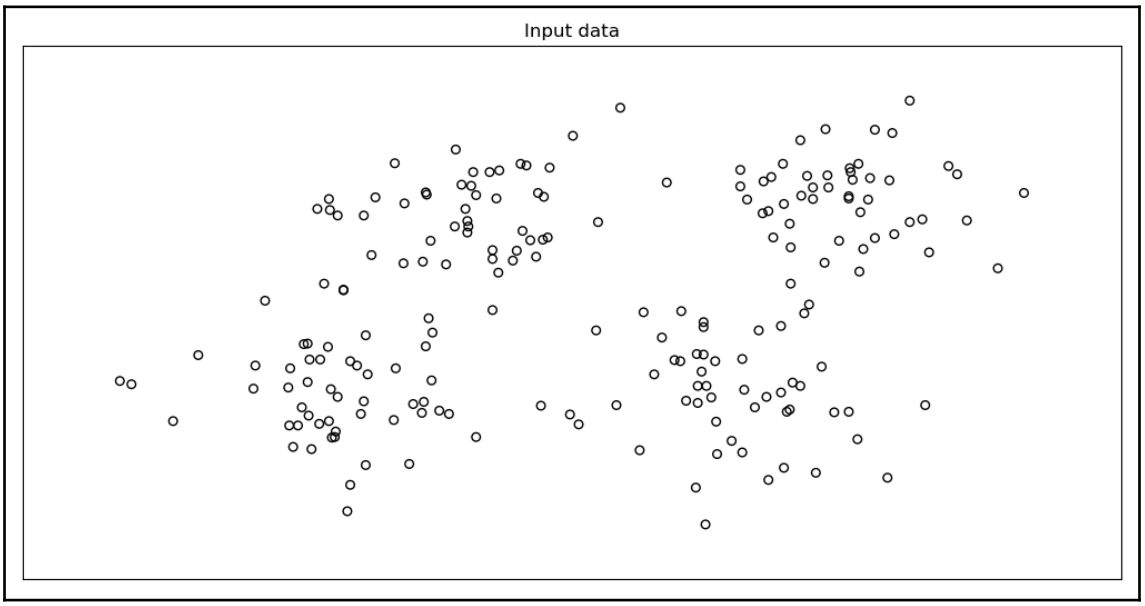
Full performance report:

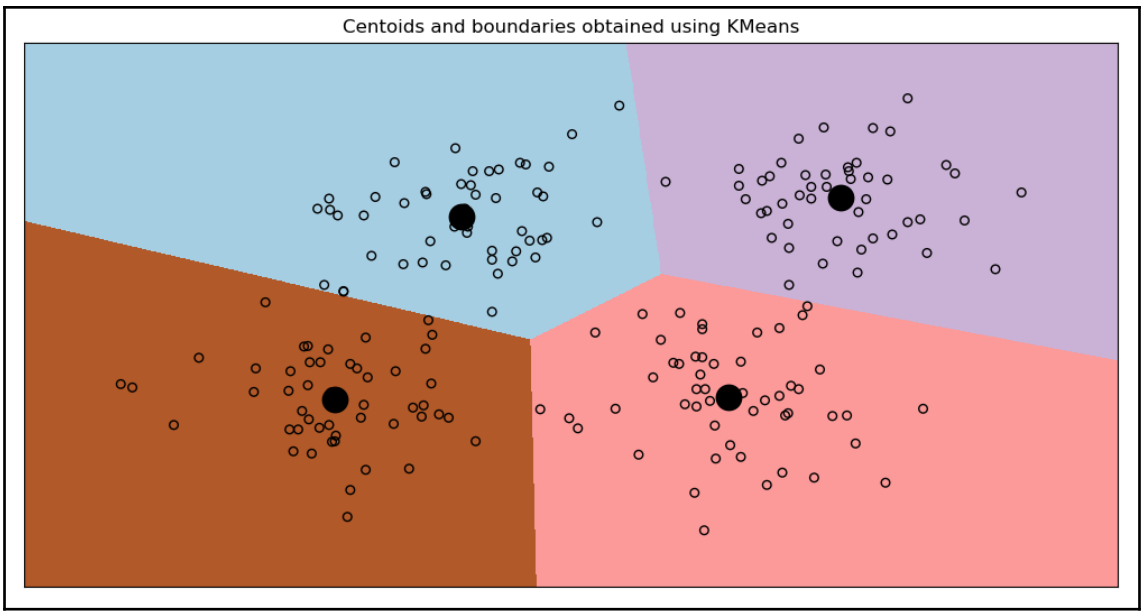
	precision	recall	f1-score	support
0.0	0.92	0.98	0.95	45
1.0	0.96	0.87	0.91	30
avg / total	0.94	0.93	0.93	75

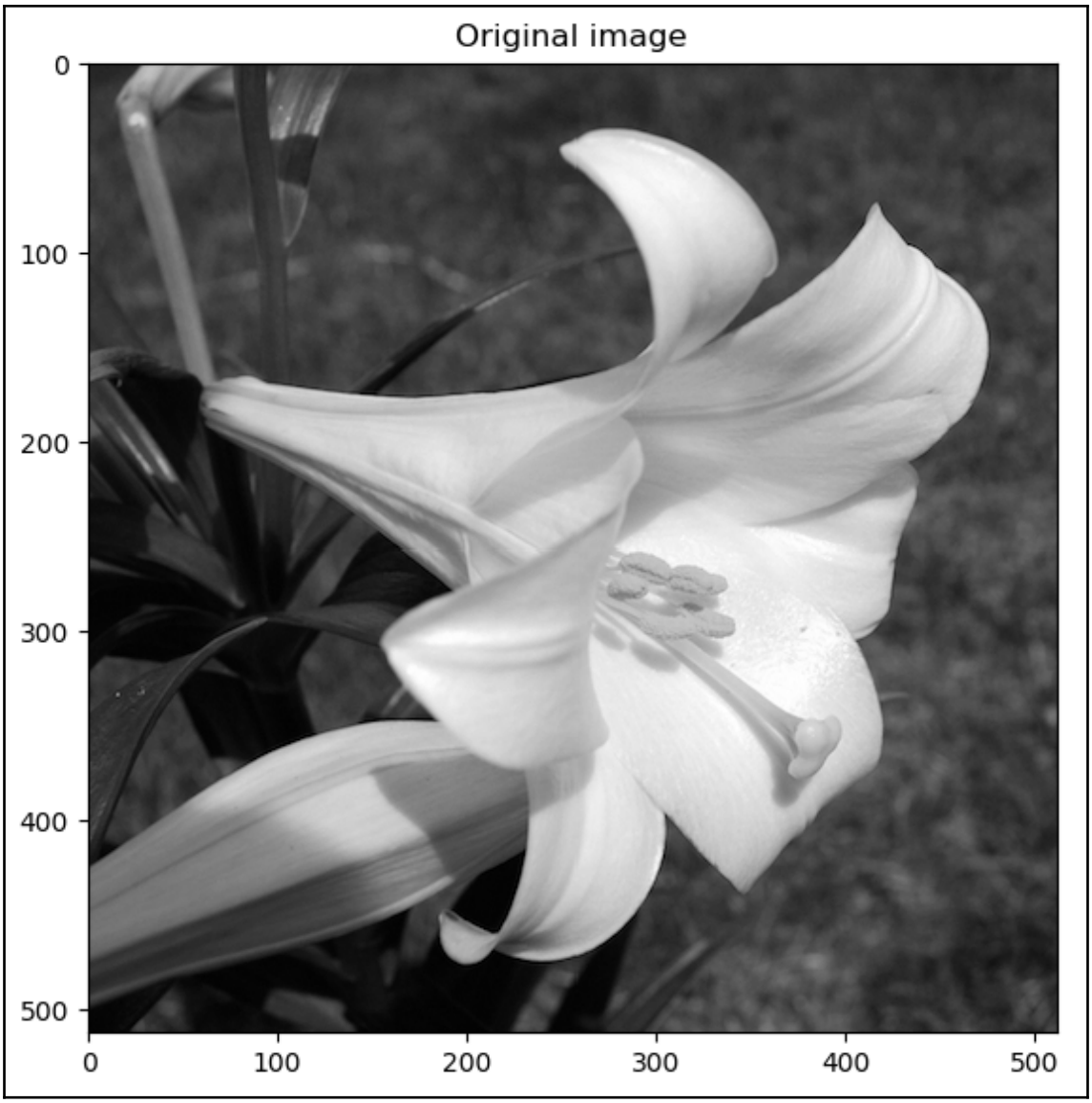
Full performance report:

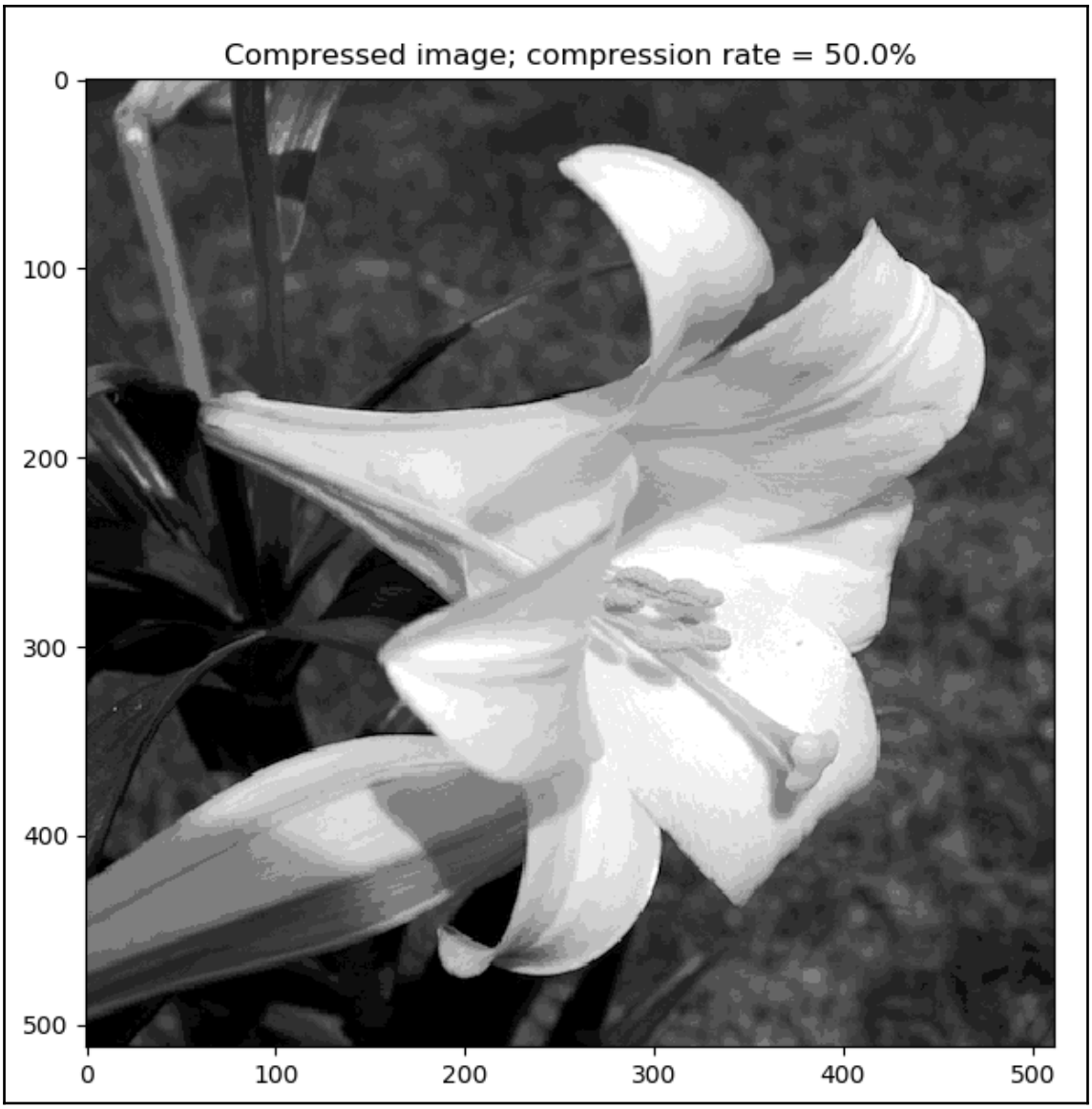
	precision	recall	f1-score	support
0.0	0.98	0.91	0.94	45
1.0	0.88	0.97	0.92	30
avg / total	0.94	0.93	0.93	75

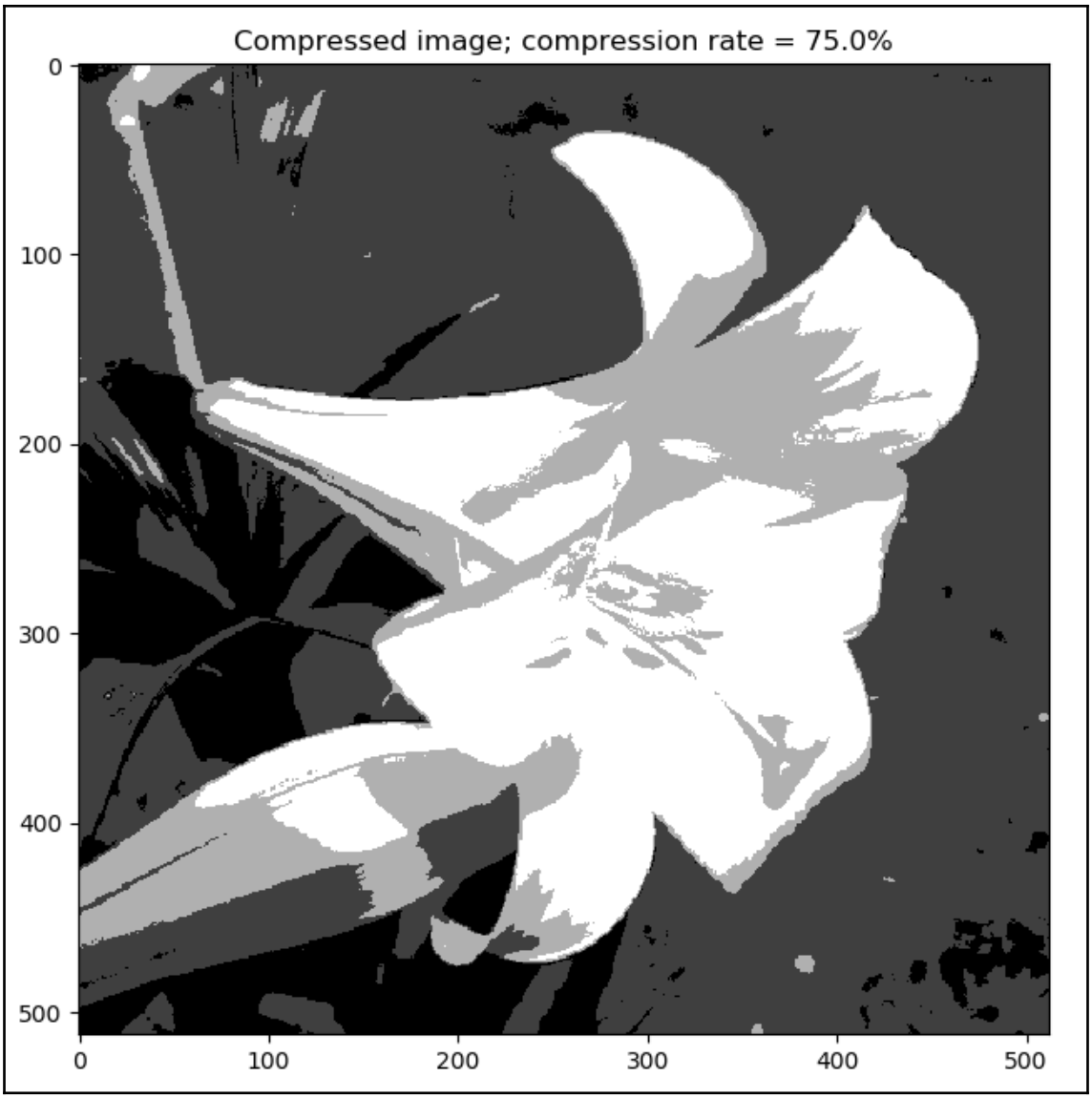
Chapter 4: Clustering with Unsupervised Learning

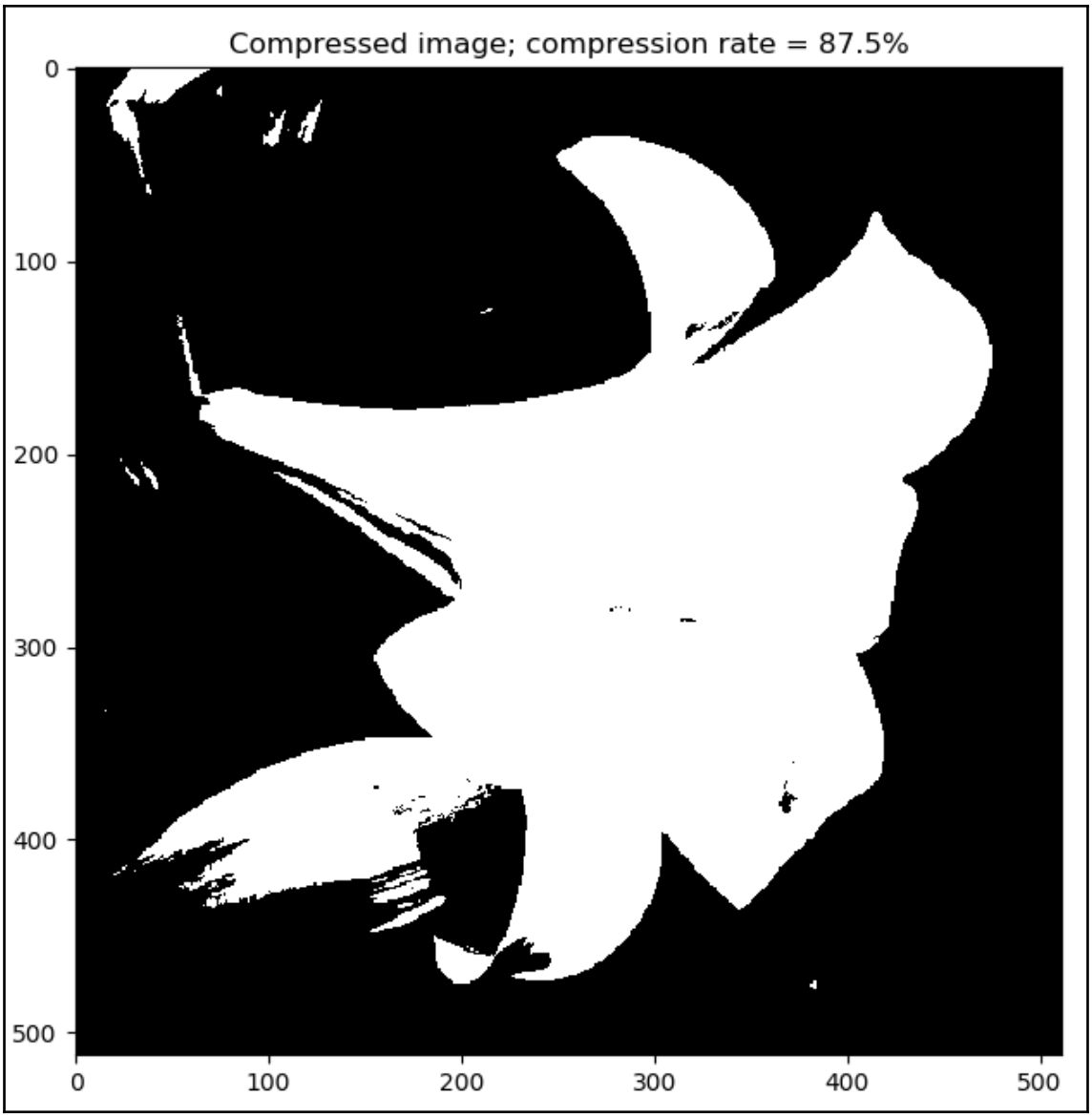


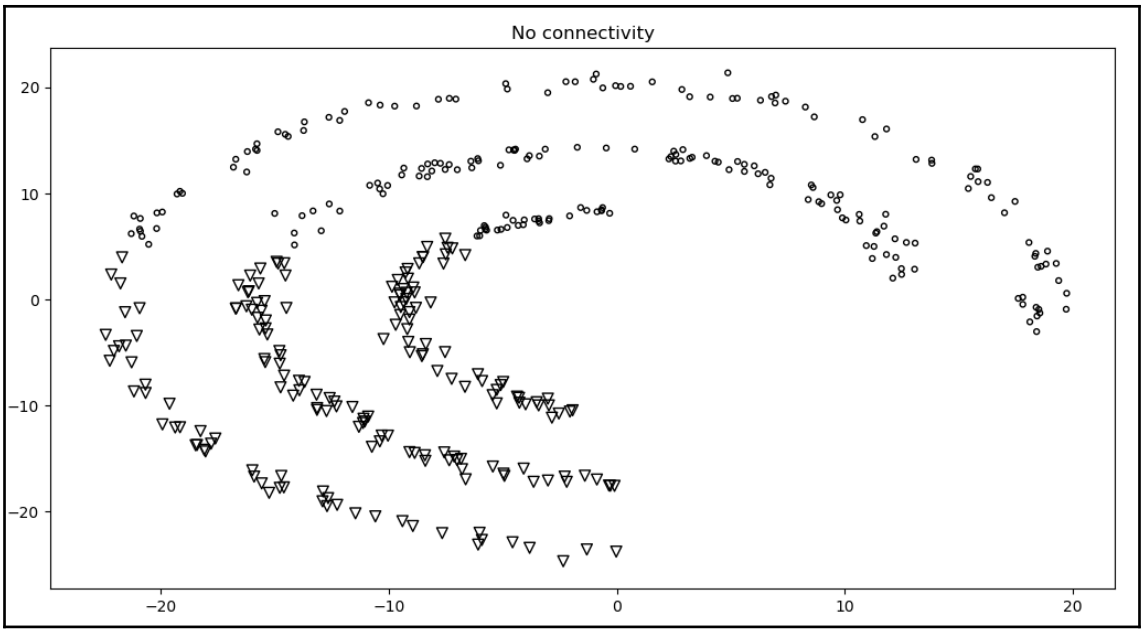


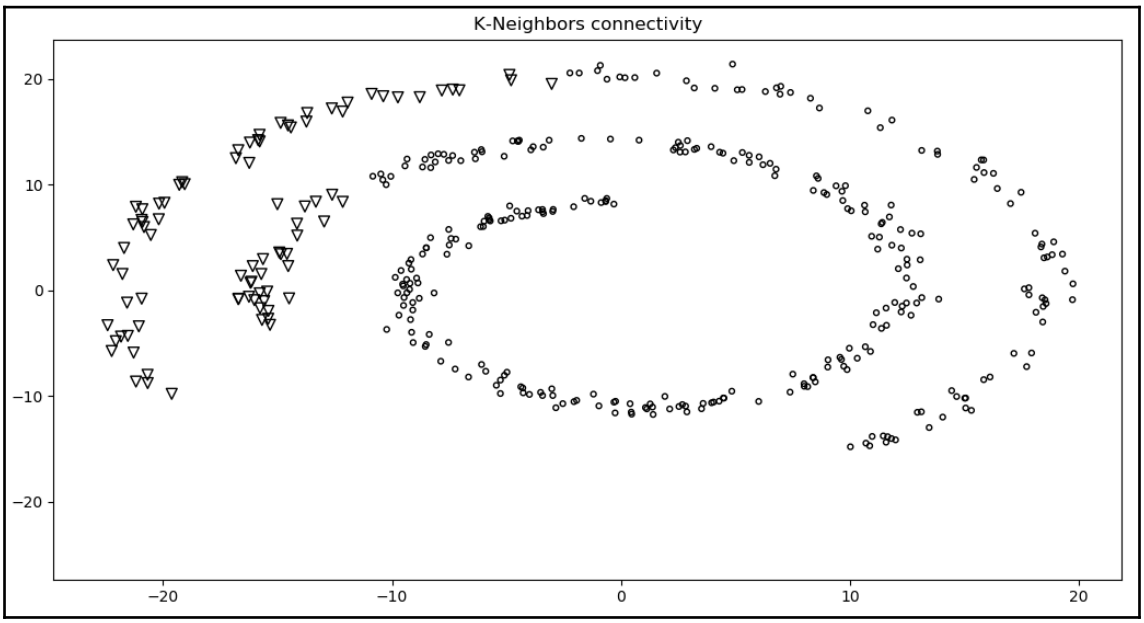

Original image
0
100
200
300
400
500
0
100
200
300
400
500


Compressed image; compression rate = 50.0%
0
100
200
300
400
500
0
100
200
300
400
500

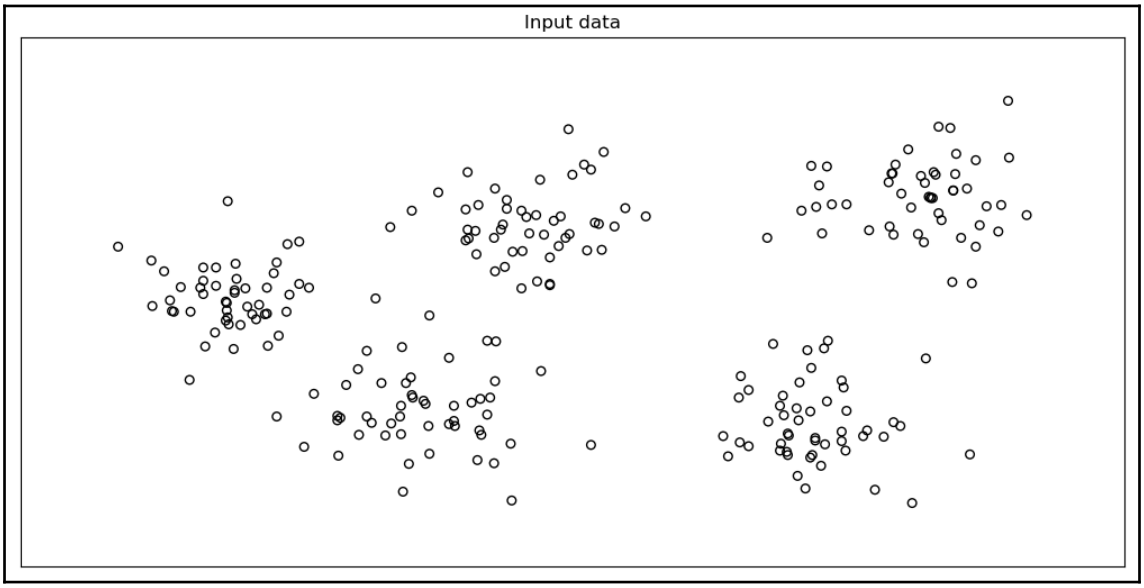

Compressed image; compression rate = 75.0%
0
100
200
300
400
500
0
100
200
300
400
500

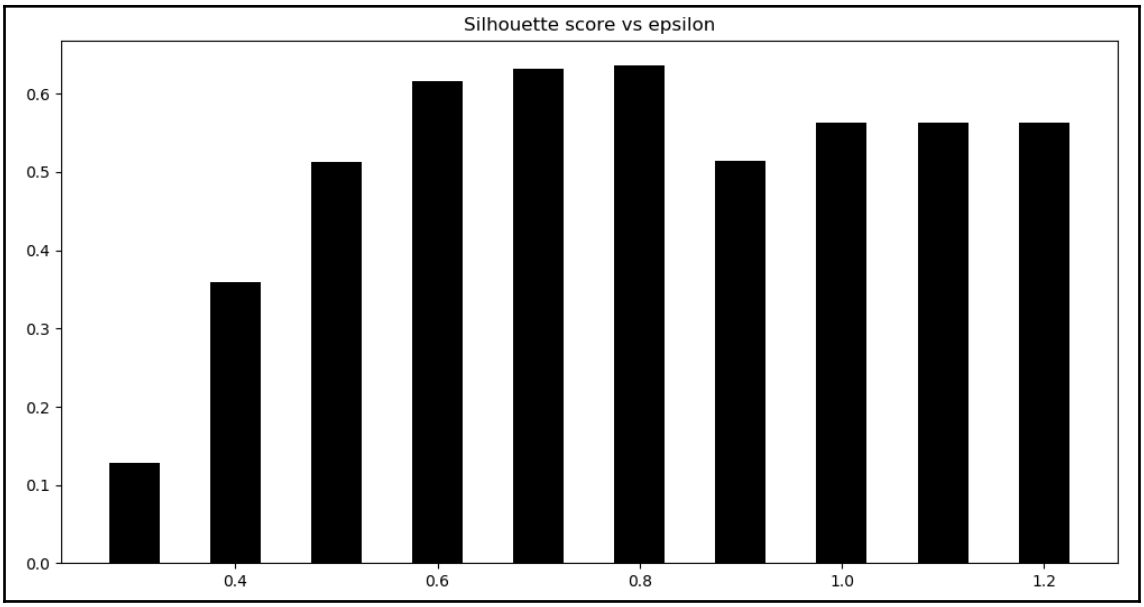

Compressed image; compression rate = 87.5%
0
100
200
300
400
500
0
100
200
300
400
500

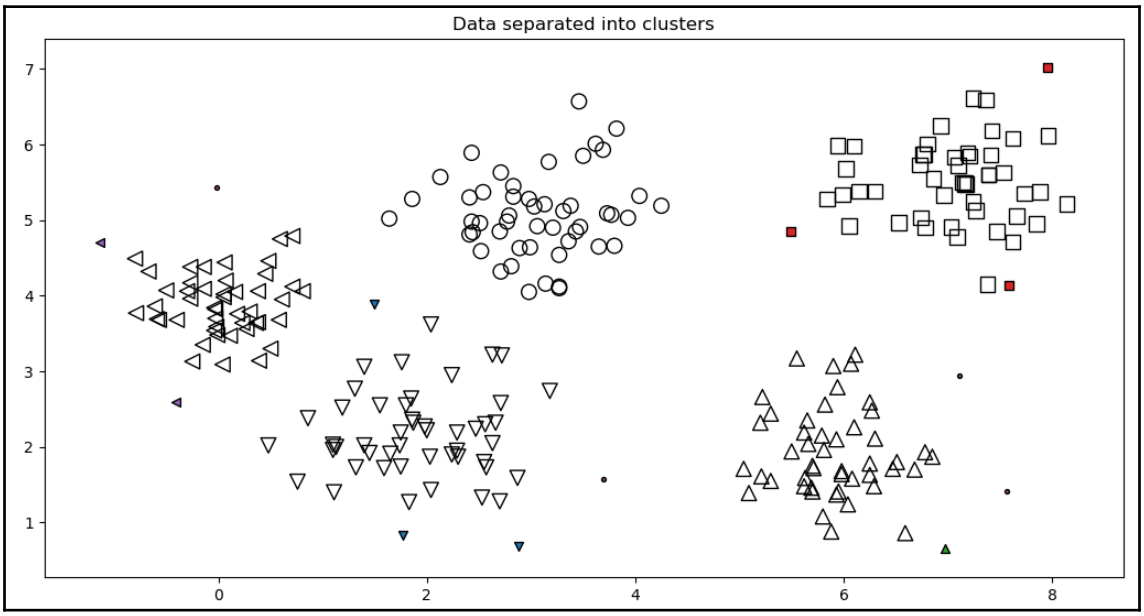

No connectivity
20
10
0
−10
−20
−20
−10
0
10
20


K-Neighbors connectivity
20
10
0
−10
−20
−20
−10
0
10
20

Silhouette score vs number of clusters
0.0
0.1
0.2
0.3
0.4
0.5
0.6
2
3
4
5
6
7
8
9

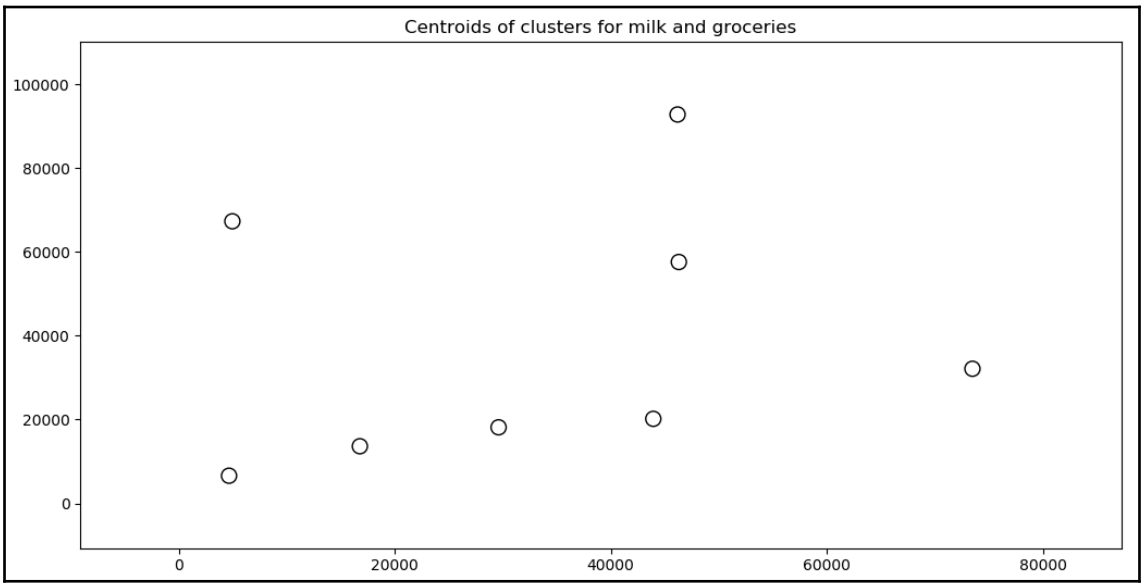

Input data

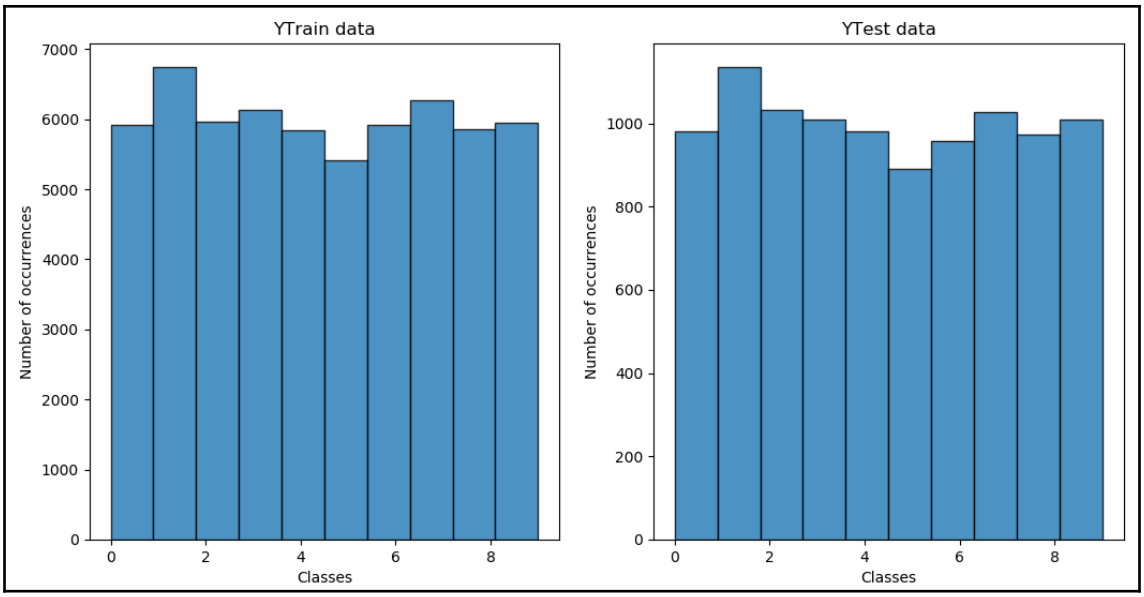

Silhouette score vs epsilon
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.4
0.6
0.8
1.0
1.2


Data separated into clusters
1
2
3
4
5
6
7
0
2
4
6
8

Number of clusters in input data = 8
Centroids of clusters:

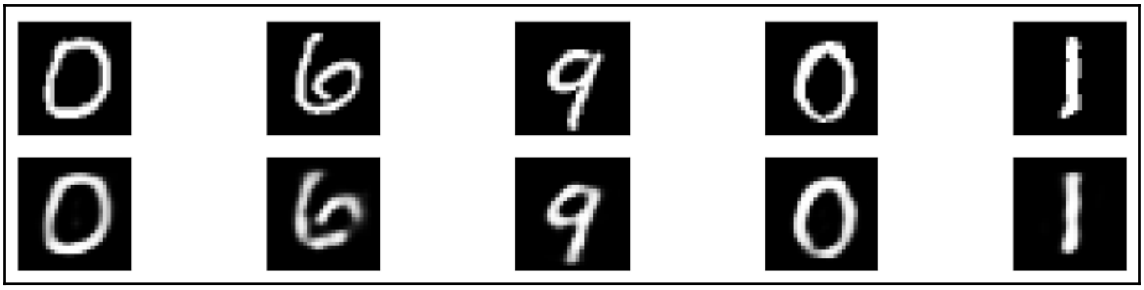
Fre	Mil	Gro	Fro	Det	Del
9632	4671	6593	2570	2296	1248
40204	46314	57584	5518	25436	4241
16117	46197	92780	1026	40827	2944
22925	73498	32114	987	20070	903
112151	29627	18148	16745	4948	8550
36847	43950	20170	36534	239	47943
32717	16784	13626	60869	1272	5609
8565	4980	67298	131	38102	1215



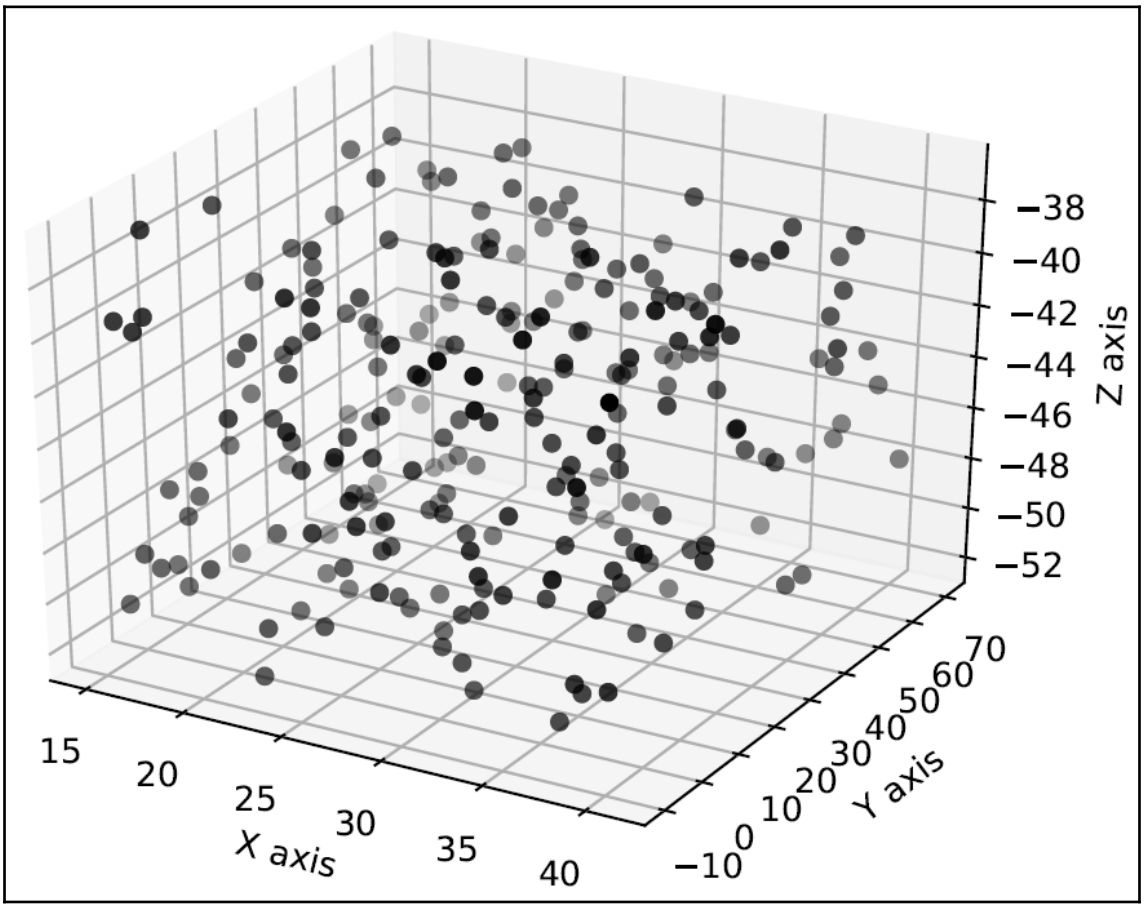


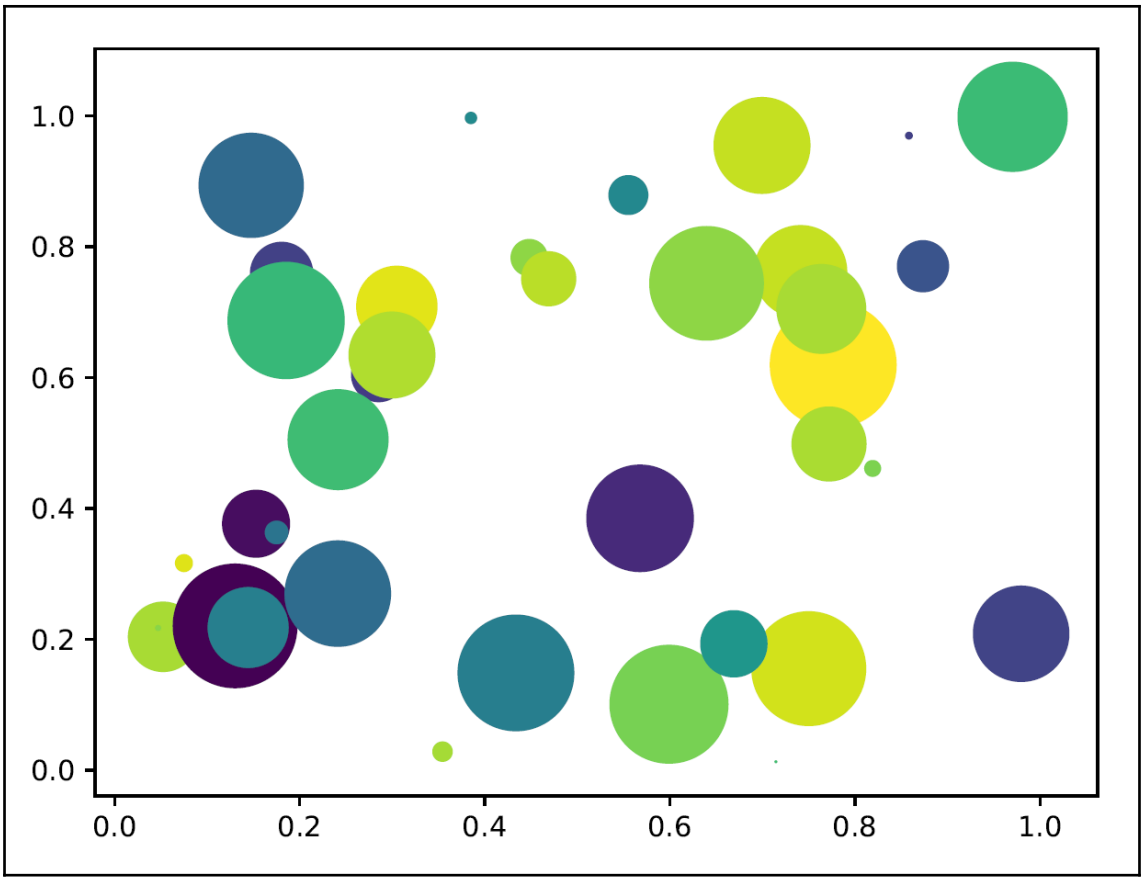
Layer (type)	Output Shape	Param #
input_1 (InputLayer)	(None, 784)	0
dense_1 (Dense)	(None, 32)	25120
dense_2 (Dense)	(None, 784)	25872

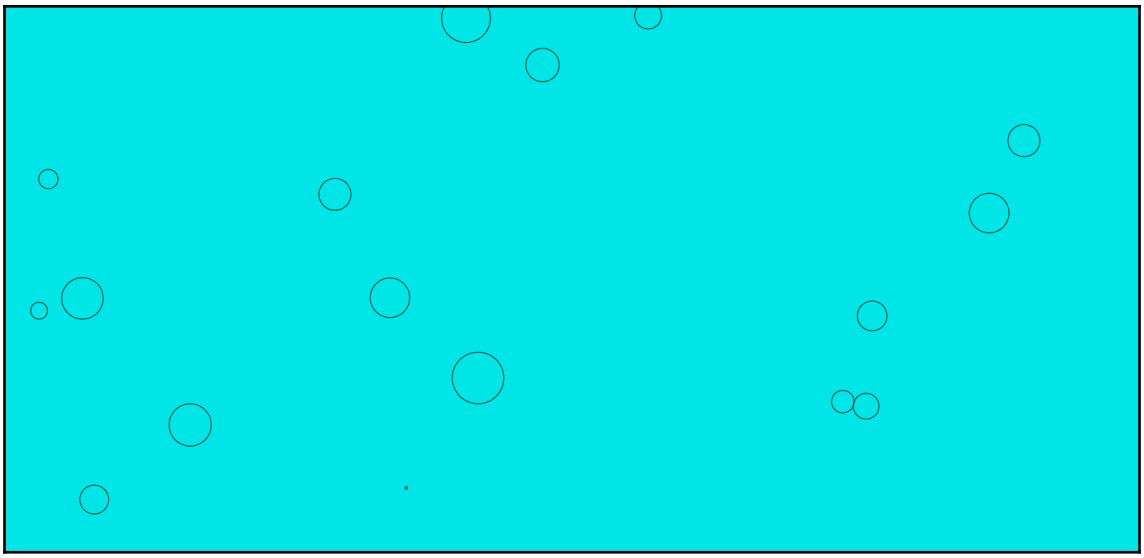
Total params: 50,992
Trainable params: 50,992
Non-trainable params: 0

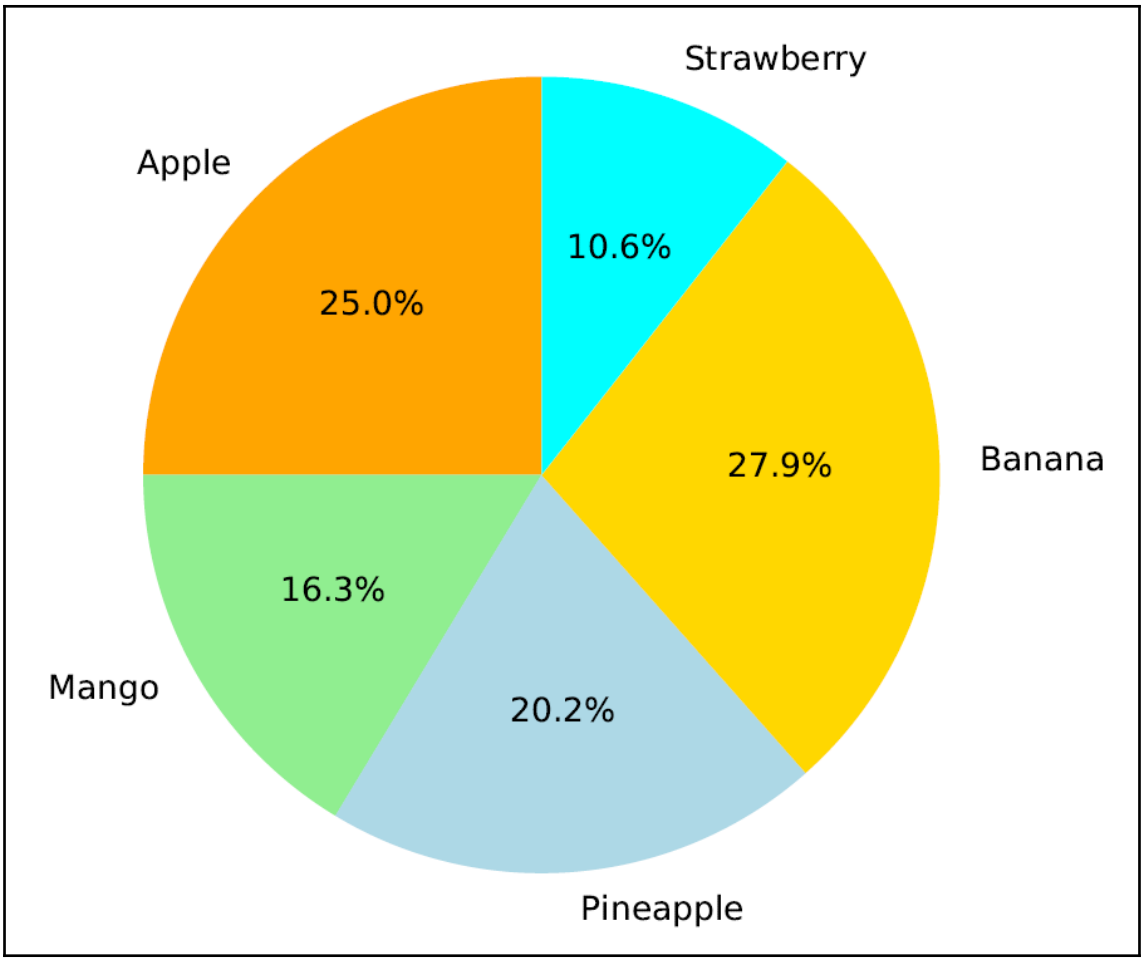


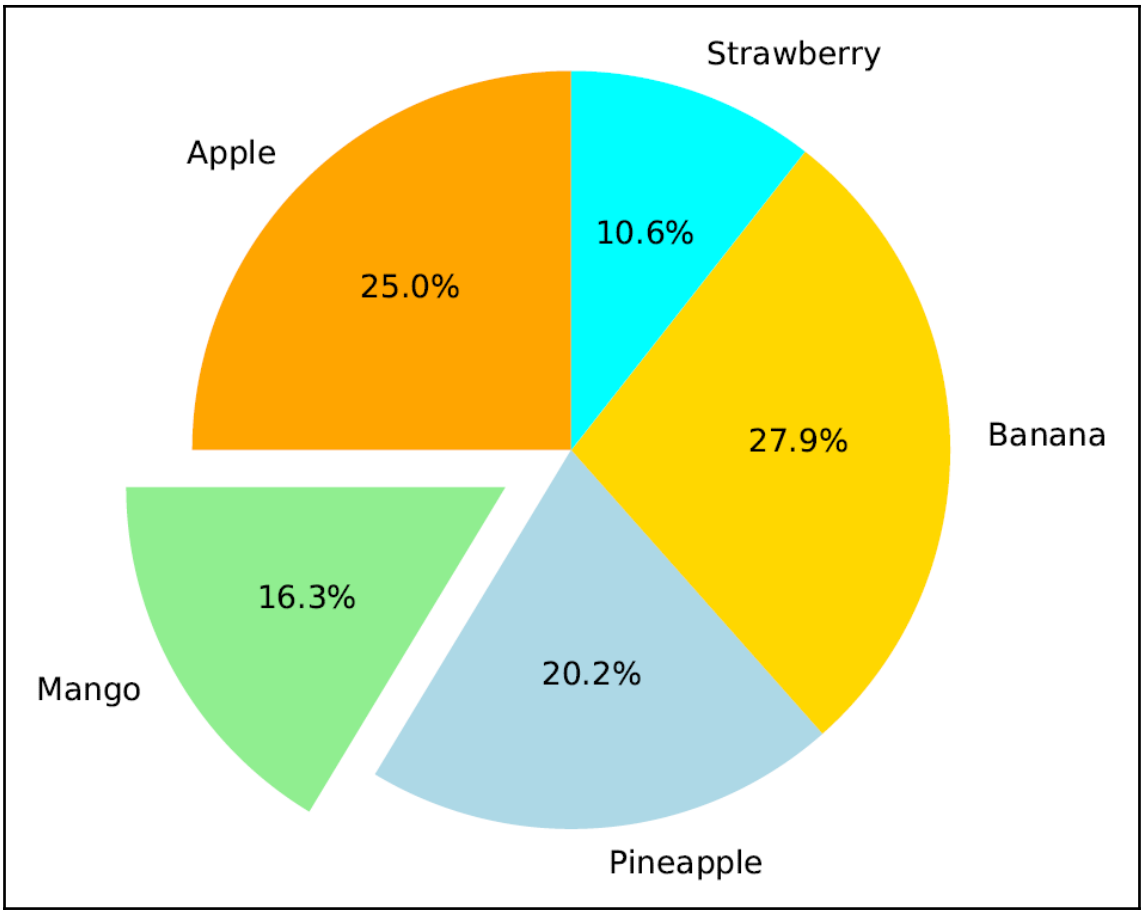
Chapter 5: Visualizing Data

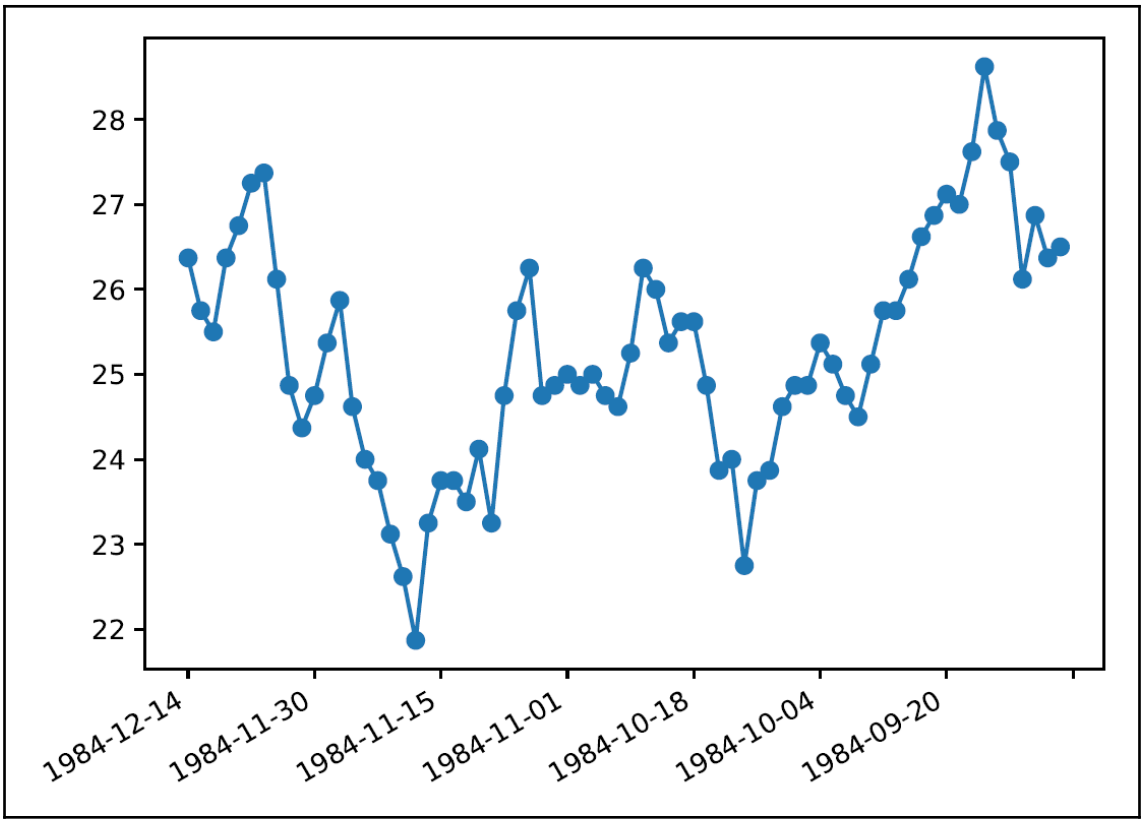


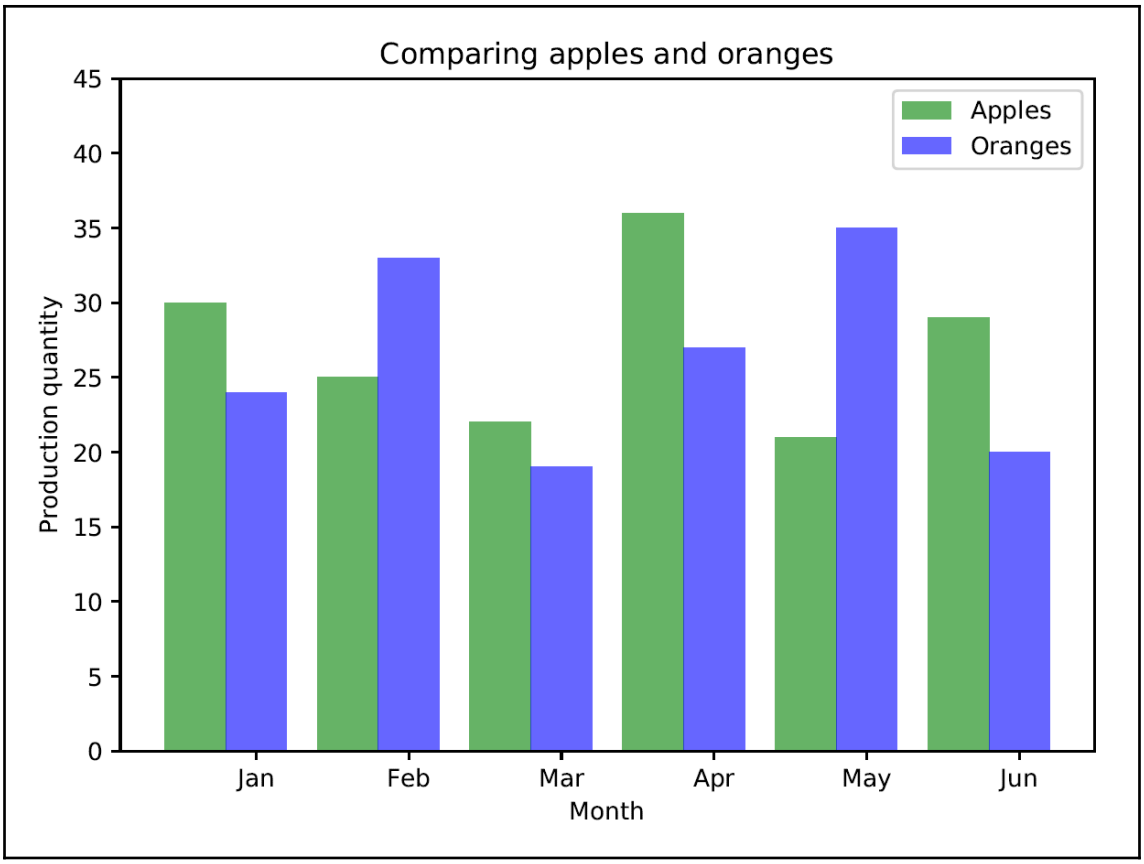

1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0

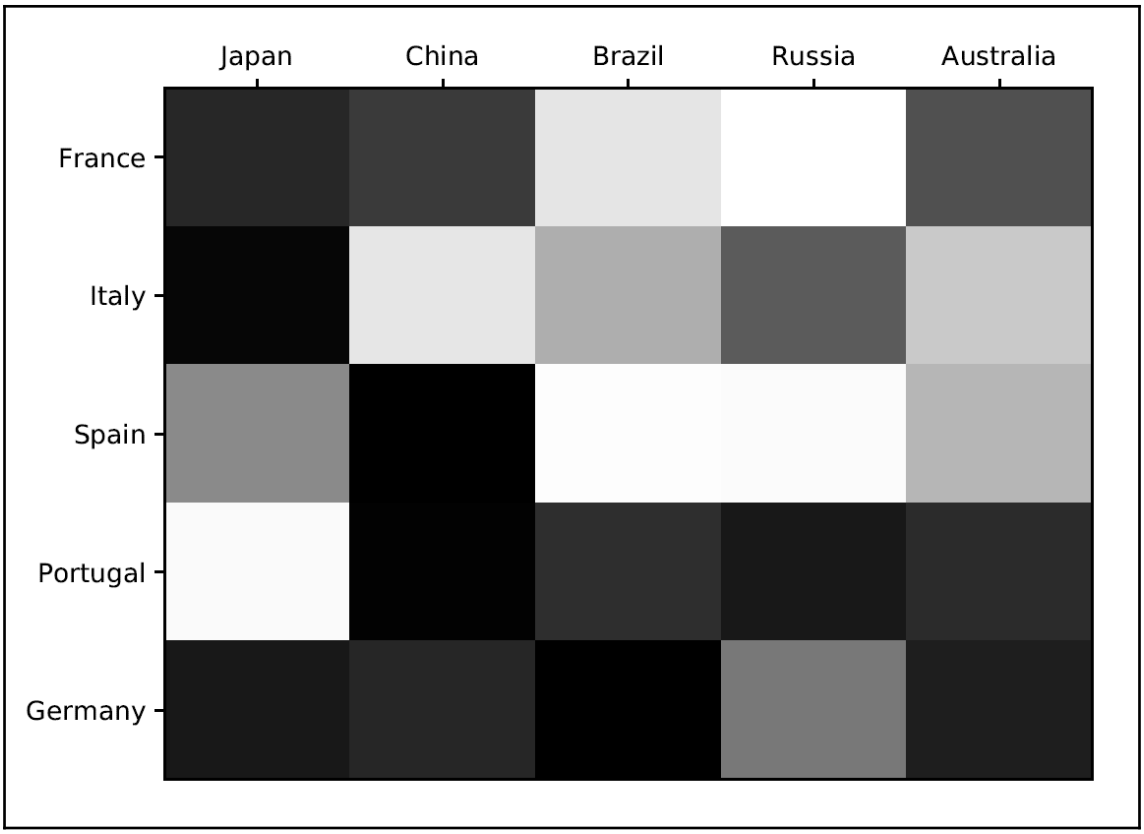


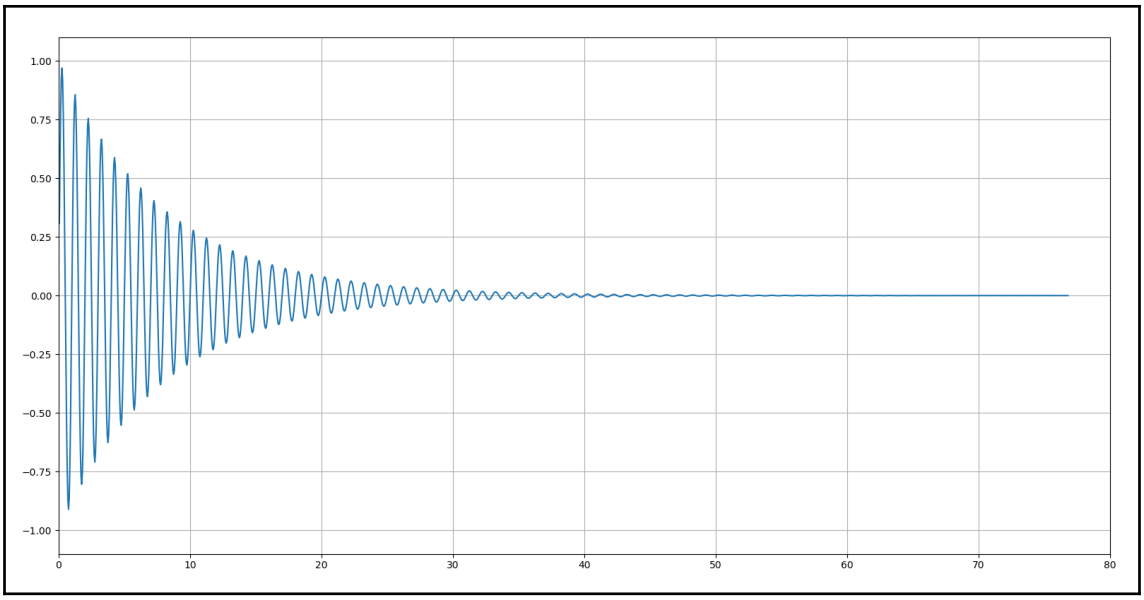

Strawberry
10.6%
Banana
27.9%
Pineapple
20.2%
Mango
16.3%
Apple
25.0%

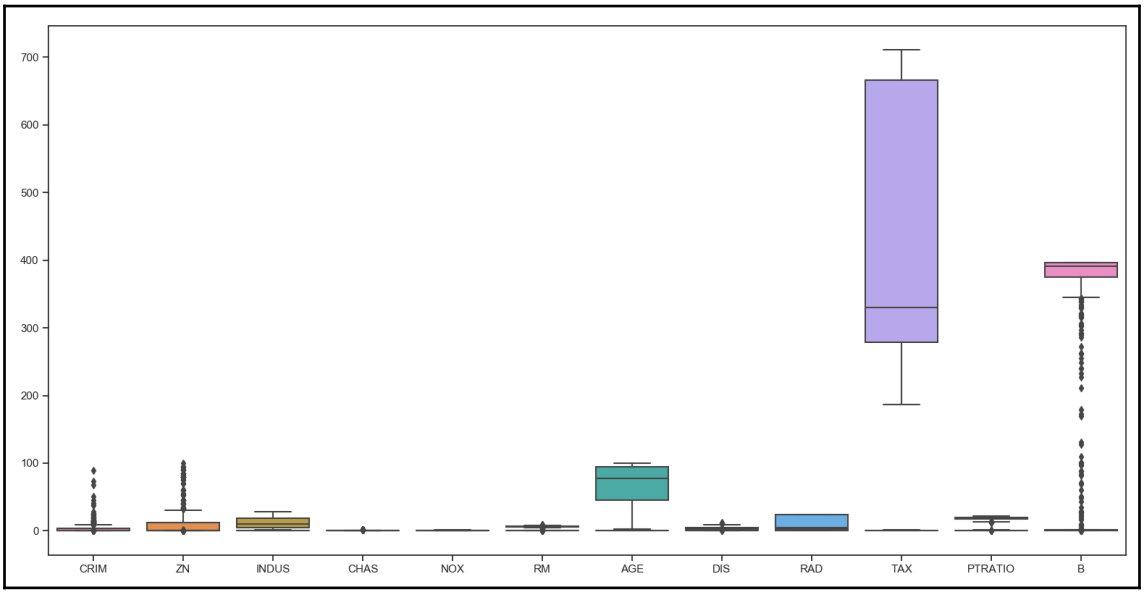

Strawberry
Apple
10.6%
25.0%
27.9%
Banana
16.3%
20.2%
Mango
Pineapple

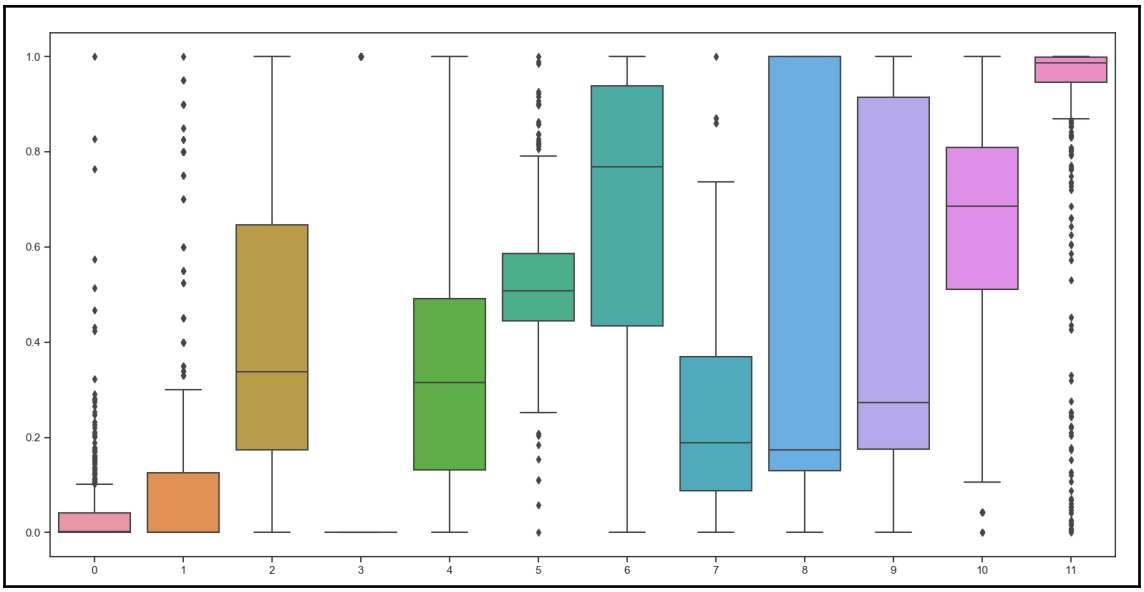

28
27
26
25
24
23
22
1984-12-14
1984-11-30
1984-11-15
1984-11-01
1984-10-18
1984-10-04
1984-09-20


Comparing apples and oranges
Apples
Oranges
Production quantity
0
5
10
15
20
25
30
35
40
45
Jan
Feb
Mar
Apr
May
Jun
Month

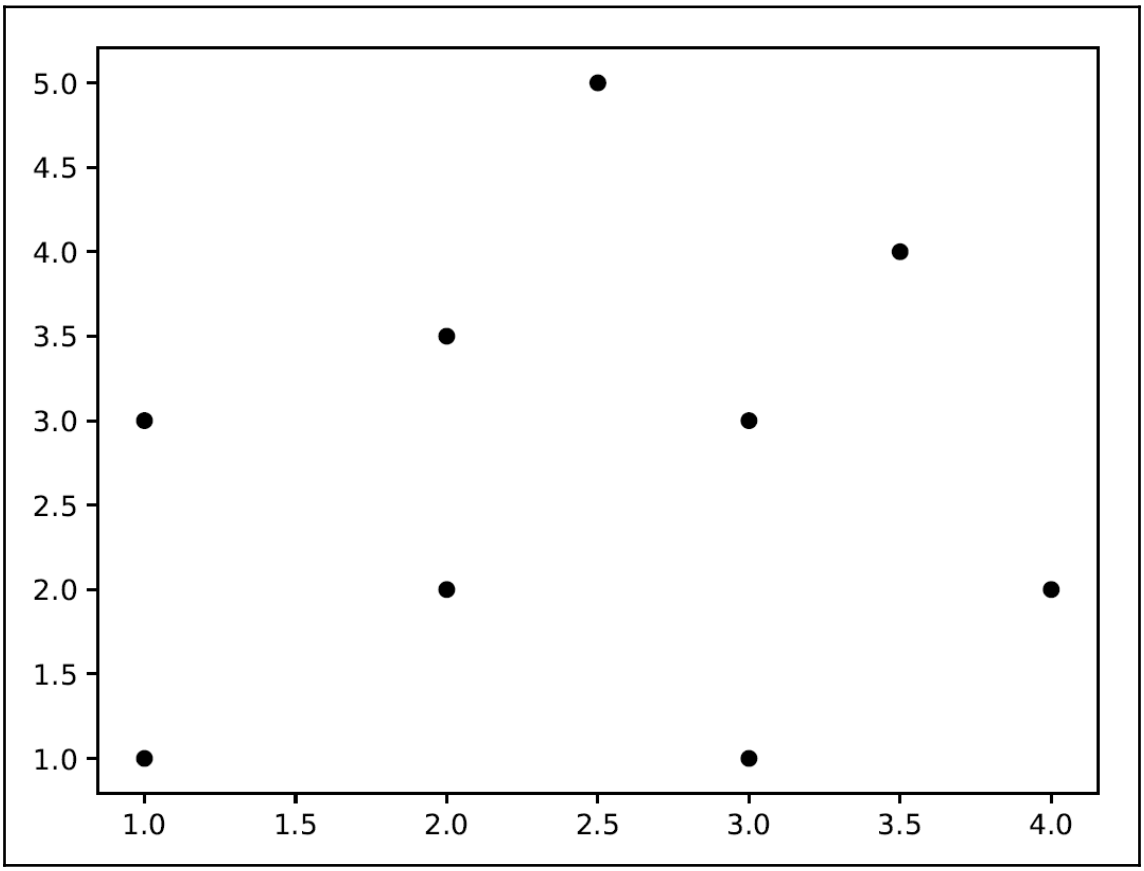

Japan
China
Brazil
Russia
Australia
France
Italy
Spain
Portugal
Germany

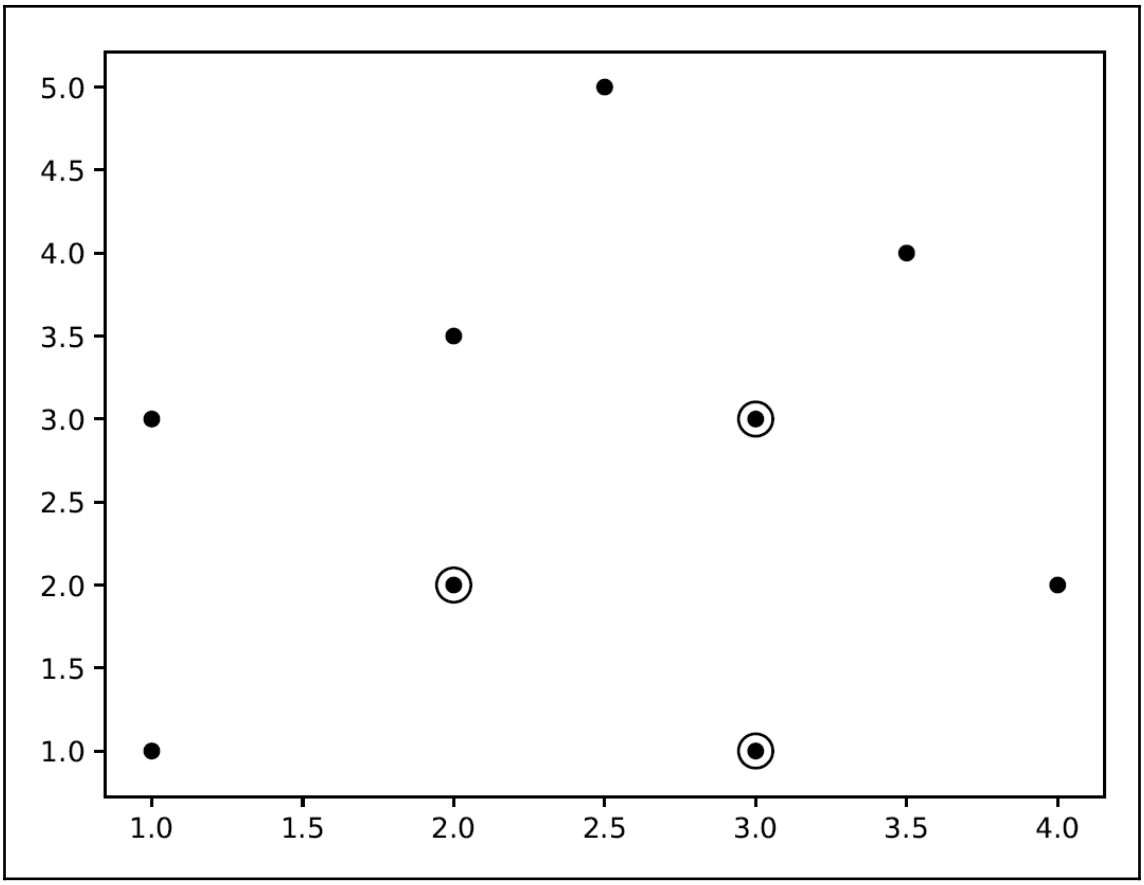

1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
10
20
30
40
50
60
70
80

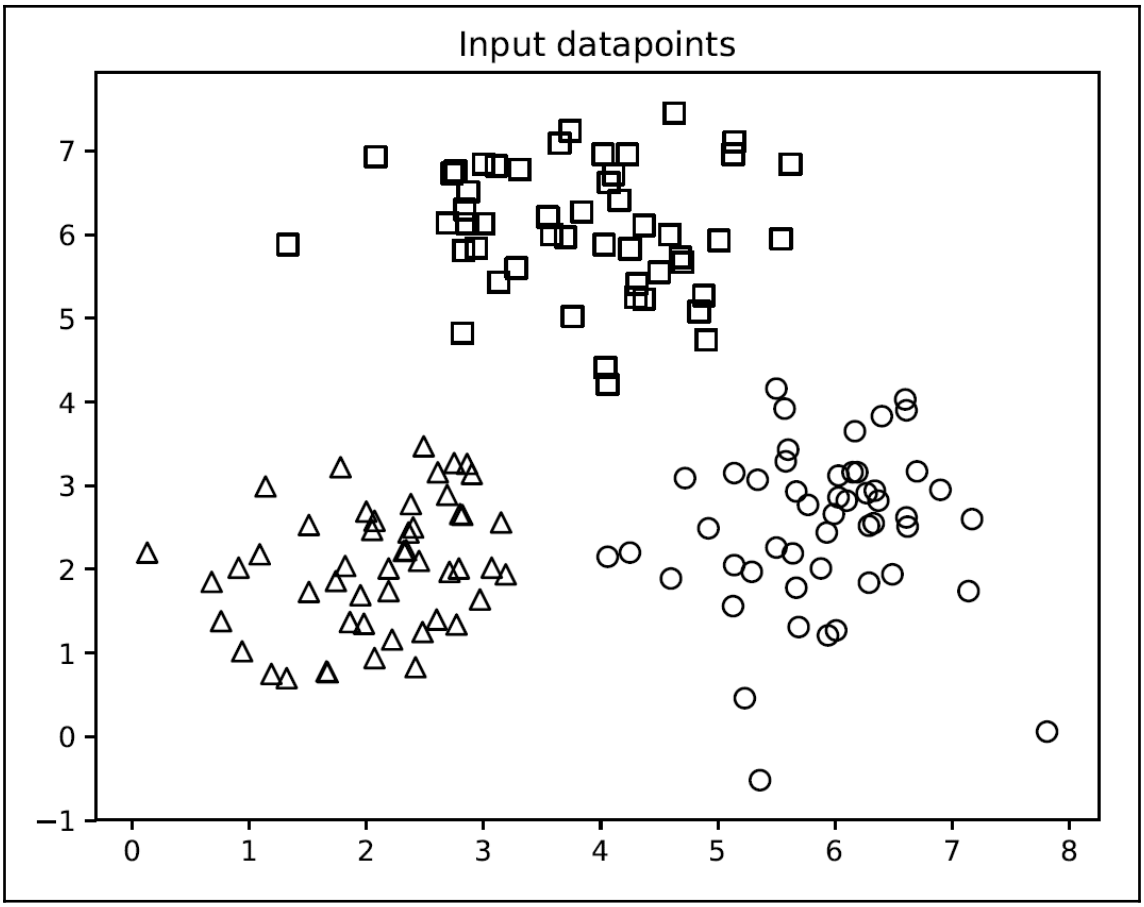

700
600
500
400
300
200
100
0
CRIM
ZN
INDUS
CHAS
NOX
RM
AGE
DIS
RAD
TAX
PTRATIO
B

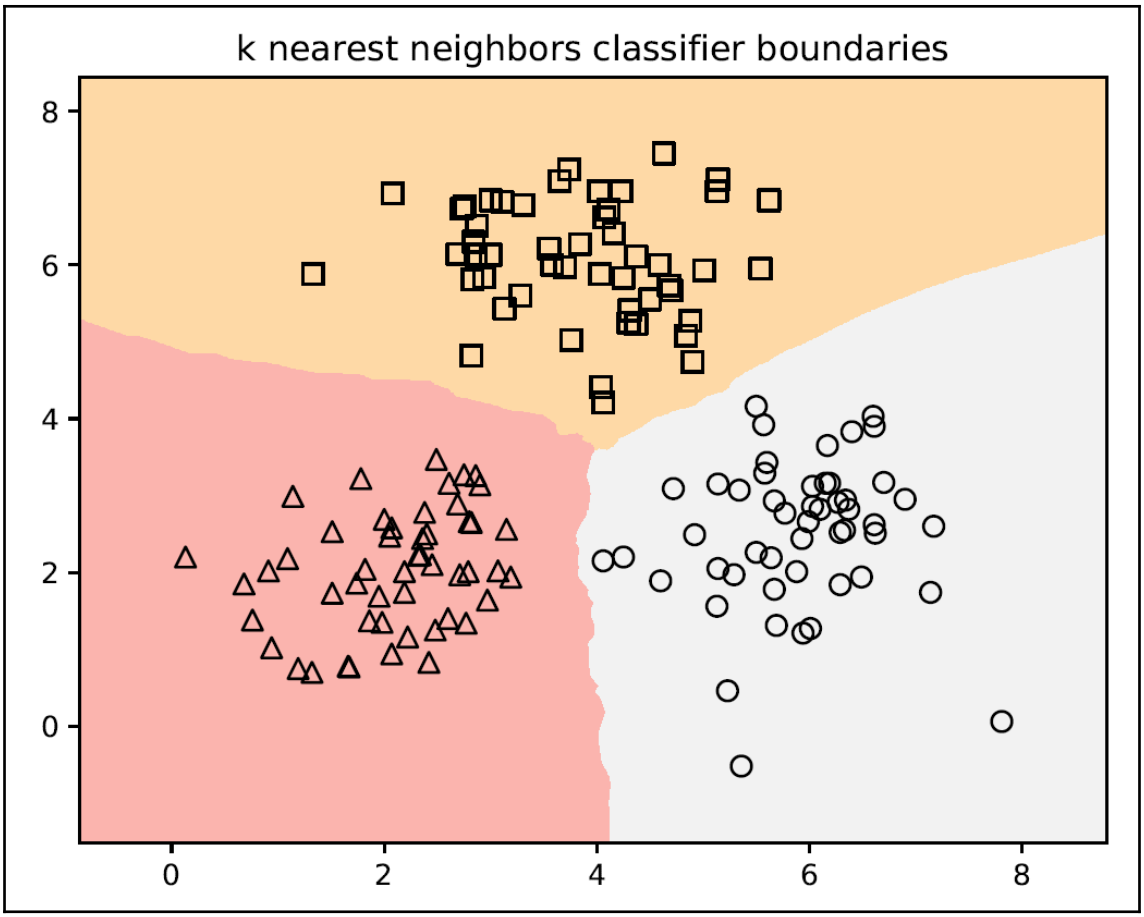

1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
11

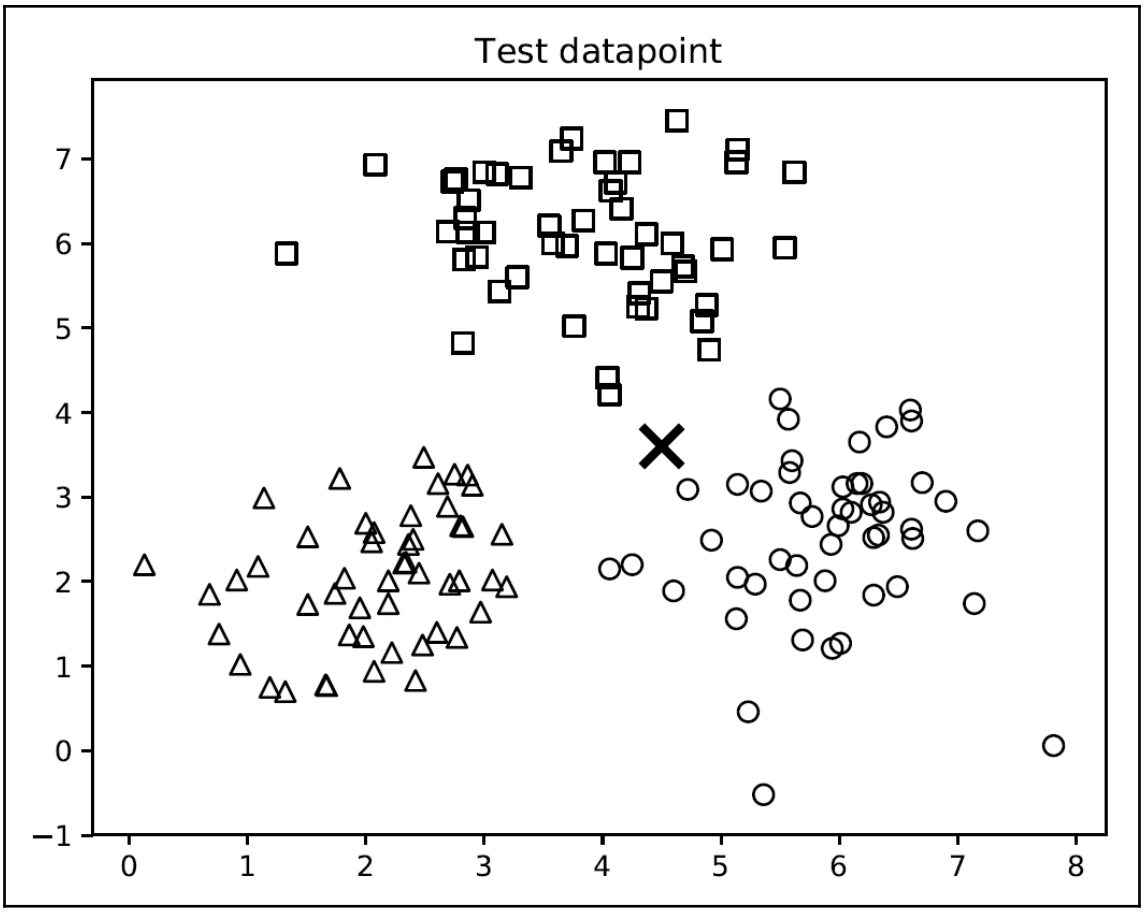
Chapter 6: Building Recommendation Engines

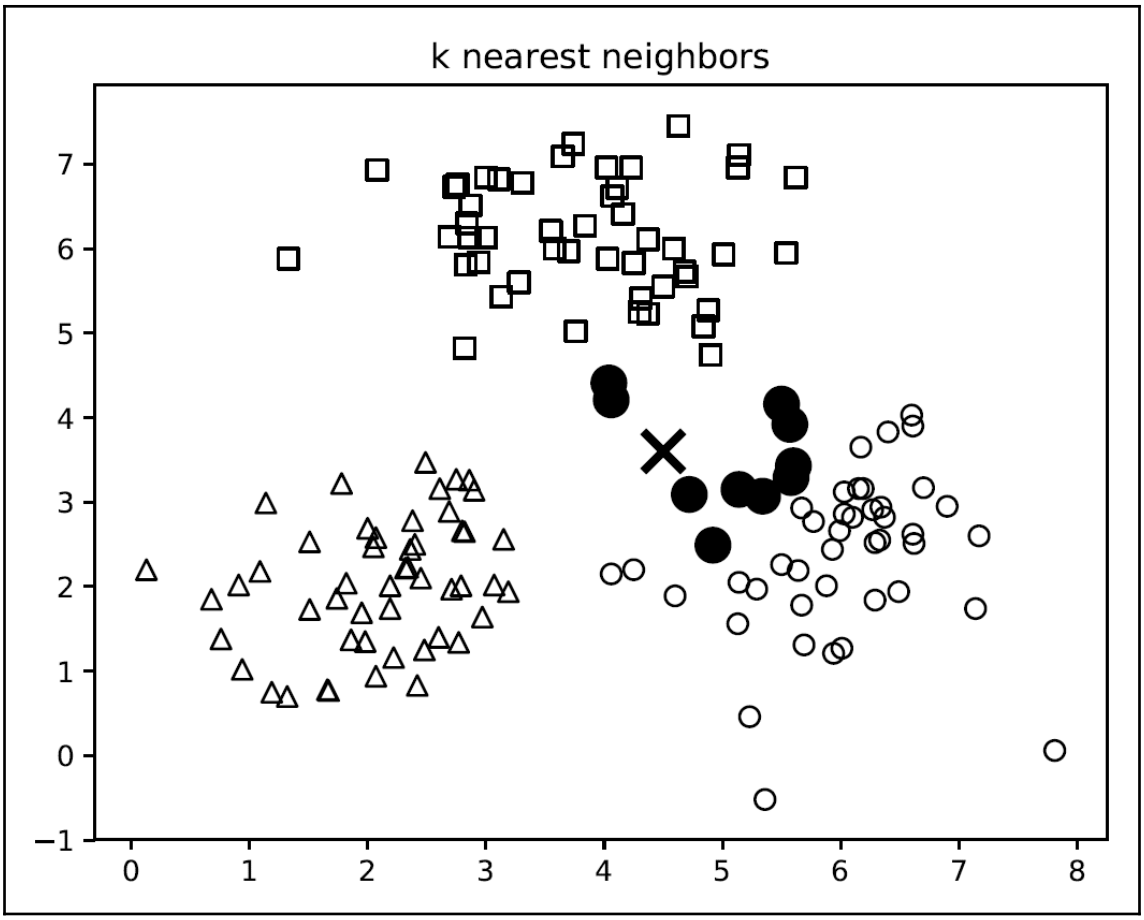


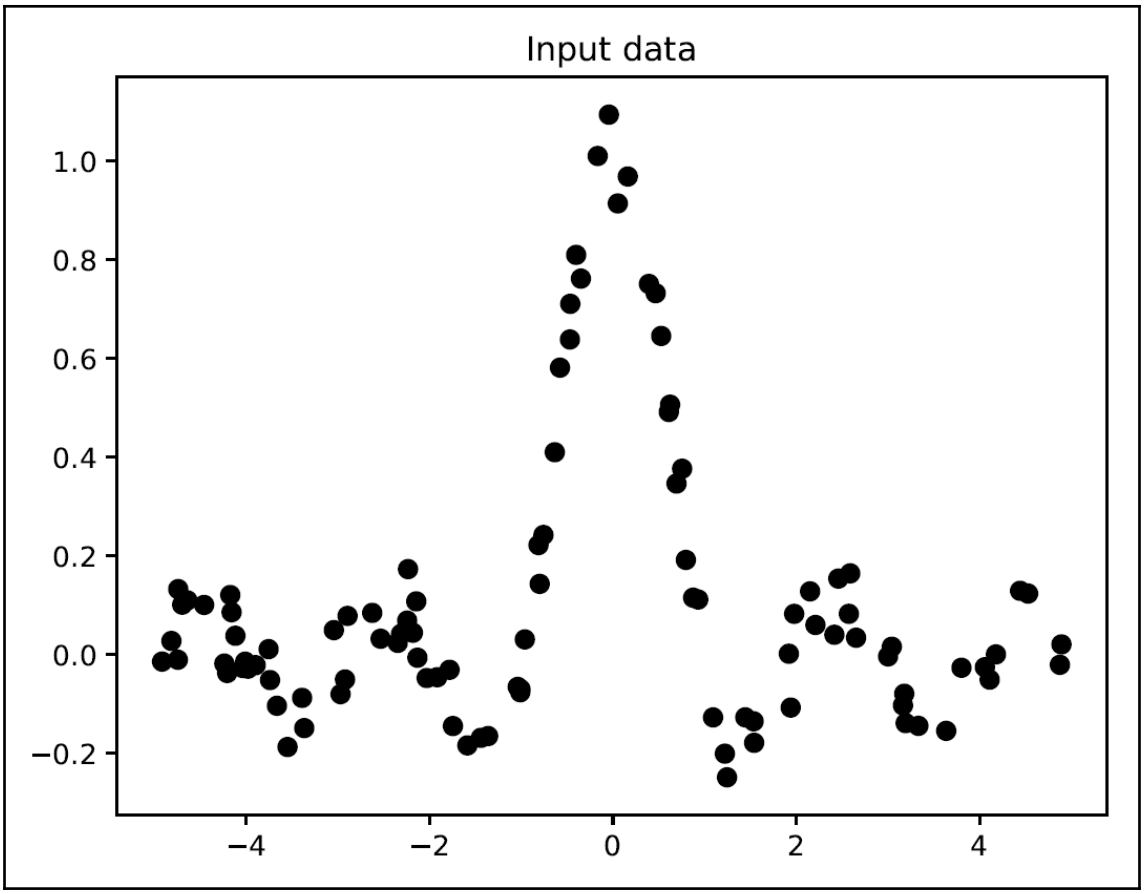

5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1.0
1.5
2.0
2.5
3.0
3.5
4.0

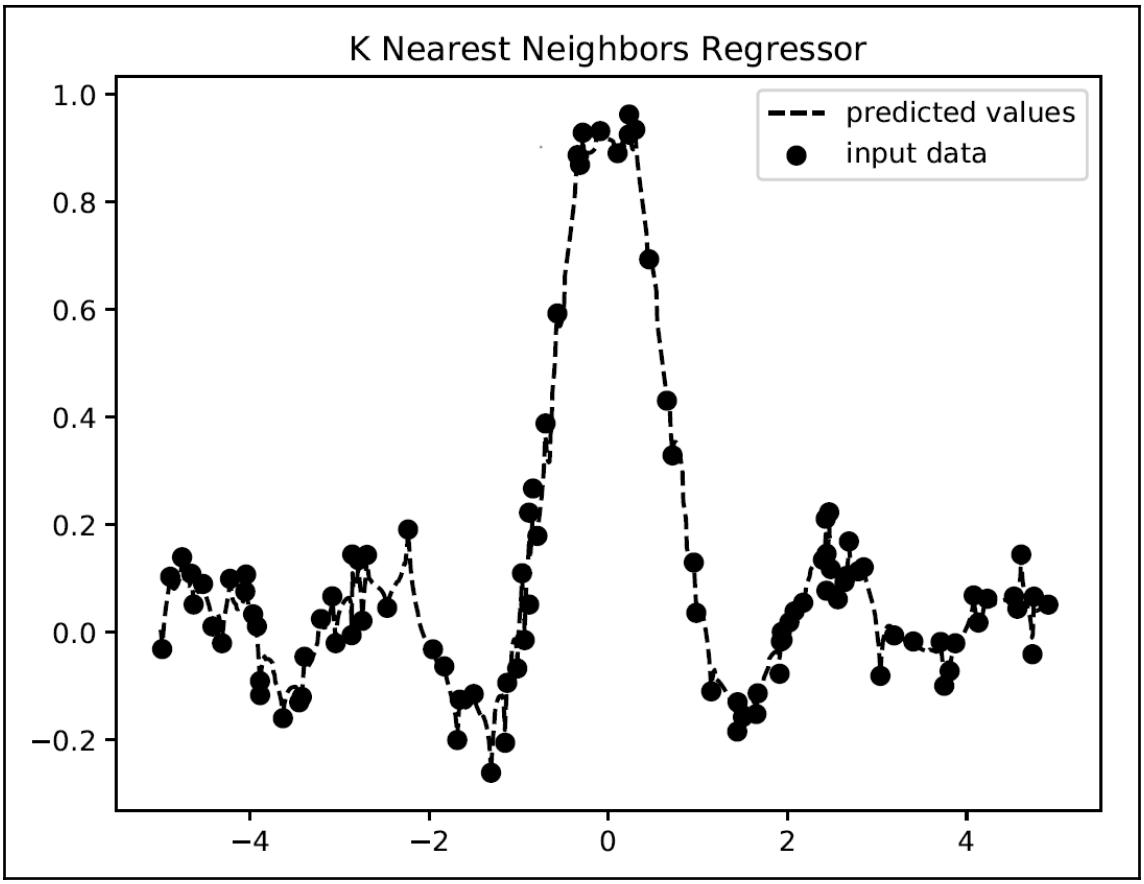

Input datapoints
7
6
5
4
3
2
1
0
−1
0
1
2
3
4
5
6
7
8


k nearest neighbors classifier boundaries
8
6
4
2
0
0
2
4
6
8


Test datapoint
7
6
5
4
3
2
1
0
−1
0
1
2
3
4
5
6
7
8


k nearest neighbors
7
6
5
4
3
2
1
0
−1
0
1
2
3
4
5
6
7
8


Input data
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−4
−2
0
2
4


K Nearest Neighbors Regressor
predicted values
input data
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−4
−2
0
2
4

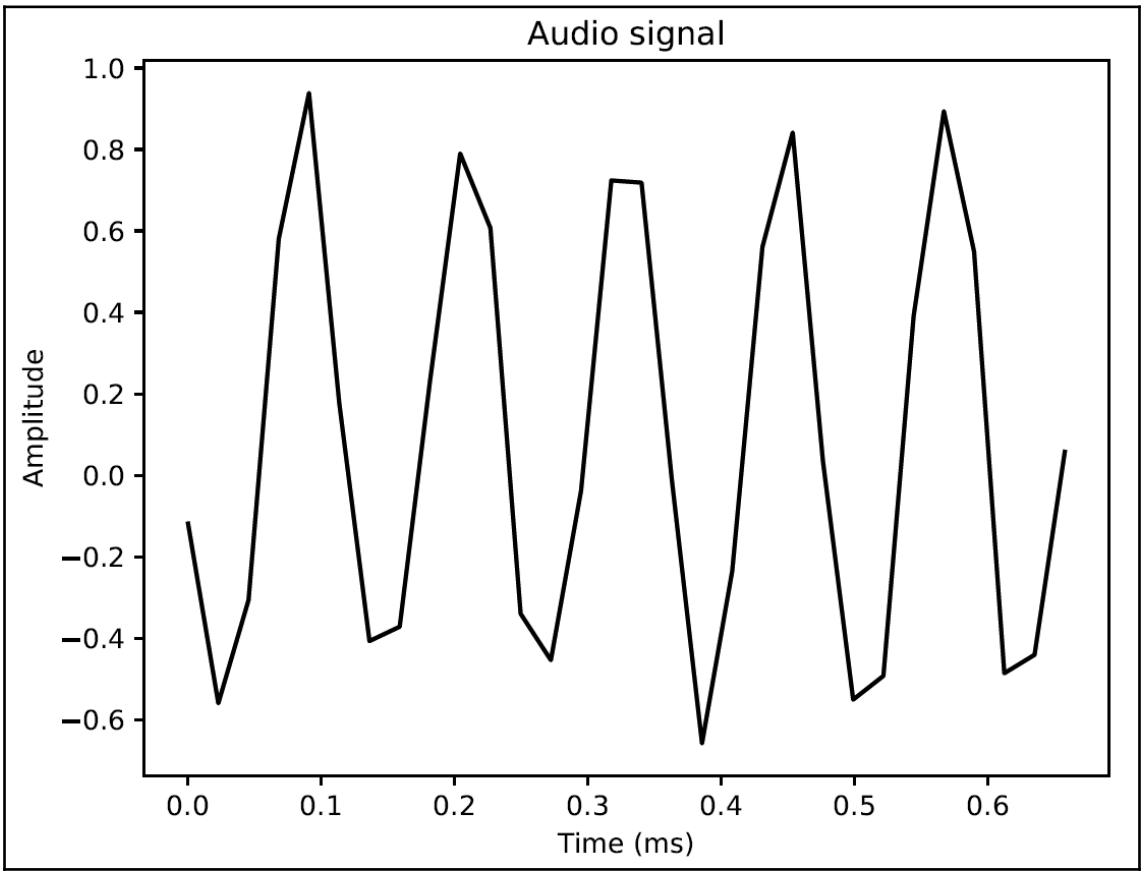
WORD	PORTER	LANCASTER	SNOWBALL
table	tabl	tabl	tabl
probably	probabl	prob	probabl
wolves	wolv	wolv	wolv
playing	play	play	play
is	is	is	is
dog	dog	dog	dog
the	the	the	the
beaches	beach	beach	beach
grounded	ground	ground	ground
dreamt	dreamt	dreamt	dreamt
envision	envis	envid	envis

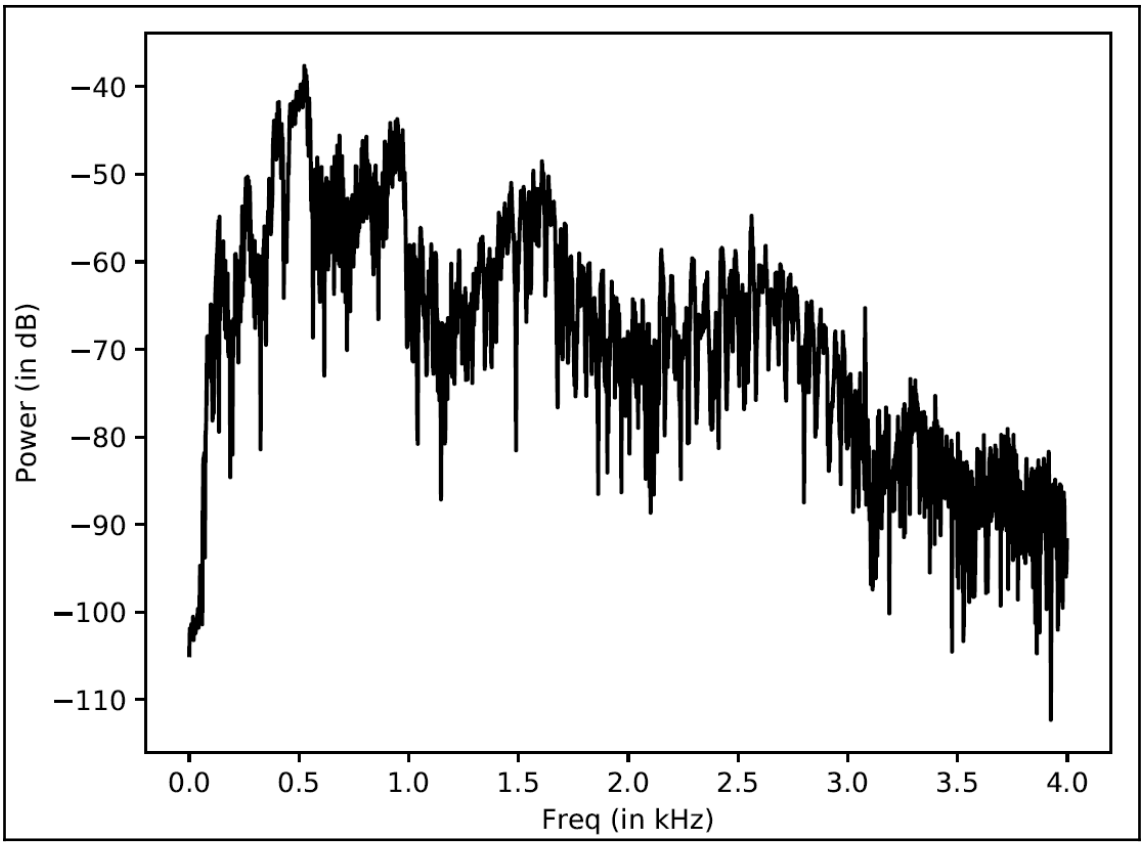
WORD	NOUN LEMMATIZER	VERB LEMMATIZER
table	table	table
probably	probably	probably
wolves	wolf	wolves
playing	playing	play
is	is	be
dog	dog	dog
the	the	the
beaches	beach	beach
grounded	grounded	ground
dreamt	dreamt	dream
envision	envision	envision

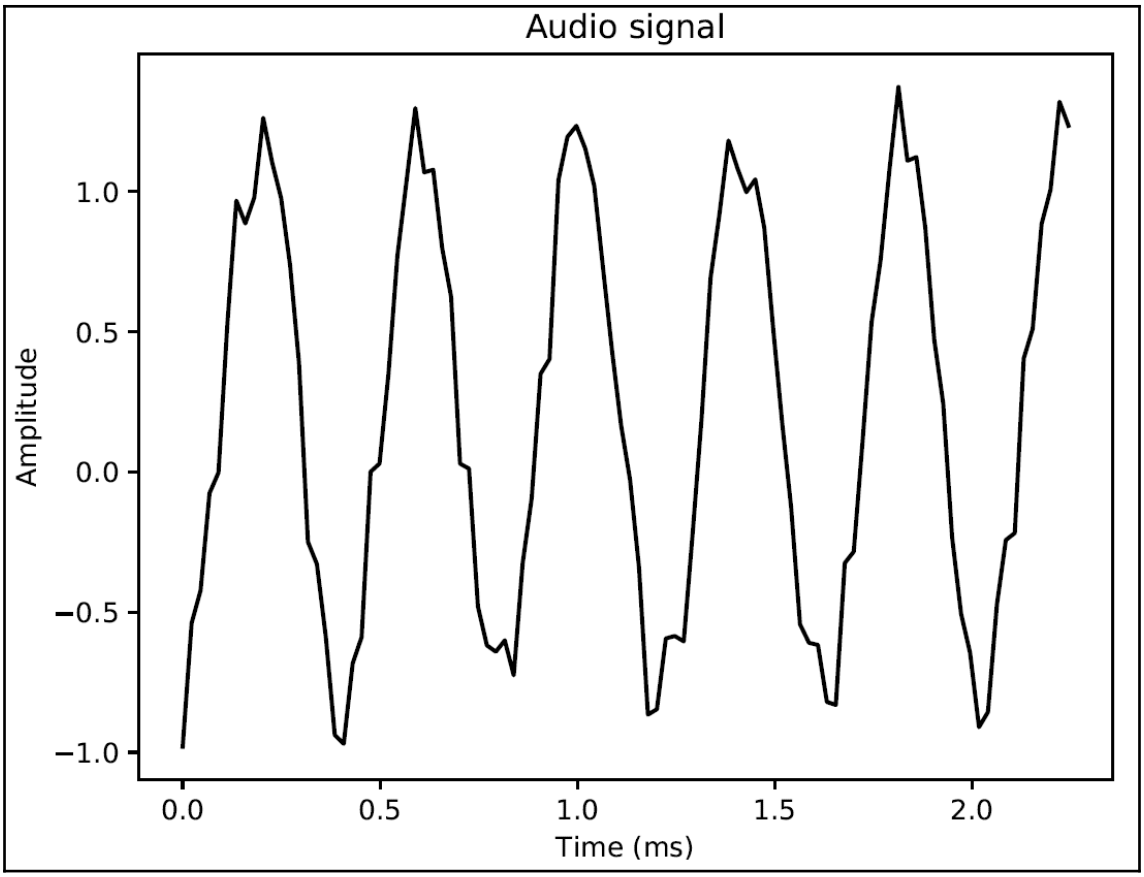
Document term matrix:

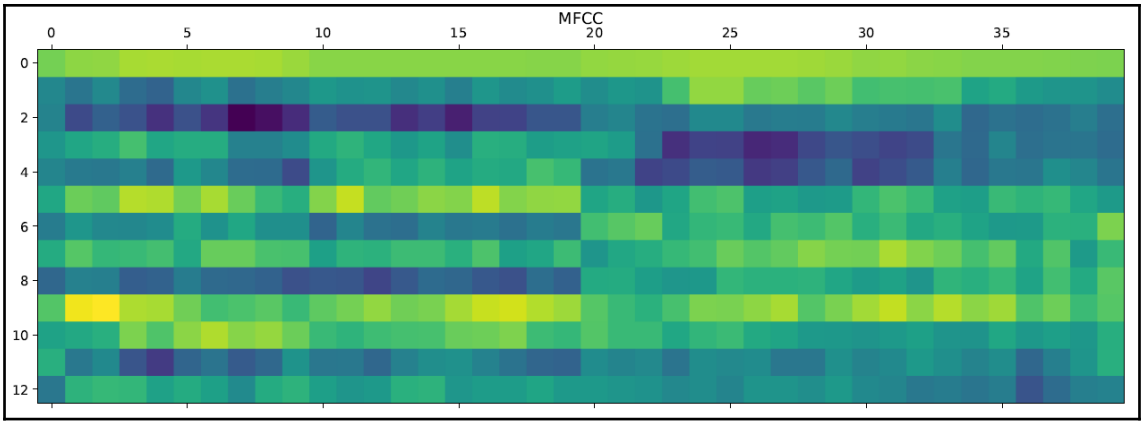
Word	Chunk-0	Chunk-1	Chunk-2	Chunk-3	Chunk-4
about	1	1	1	1	3
after	2	3	2	1	3
against	1	2	2	1	1
aid	1	1	1	3	5
all	2	2	5	2	1
also	3	3	3	4	3
an	5	7	5	7	10
and	34	27	36	36	41
are	5	3	6	3	2
as	13	4	14	18	4
at	5	7	9	3	6
be	20	14	7	10	18
been	7	1	6	15	5
before	2	2	1	1	2
but	3	3	2	9	5
by	8	22	15	14	12
committee	2	10	3	1	7
congress	1	1	3	3	1
did	2	1	1	2	2

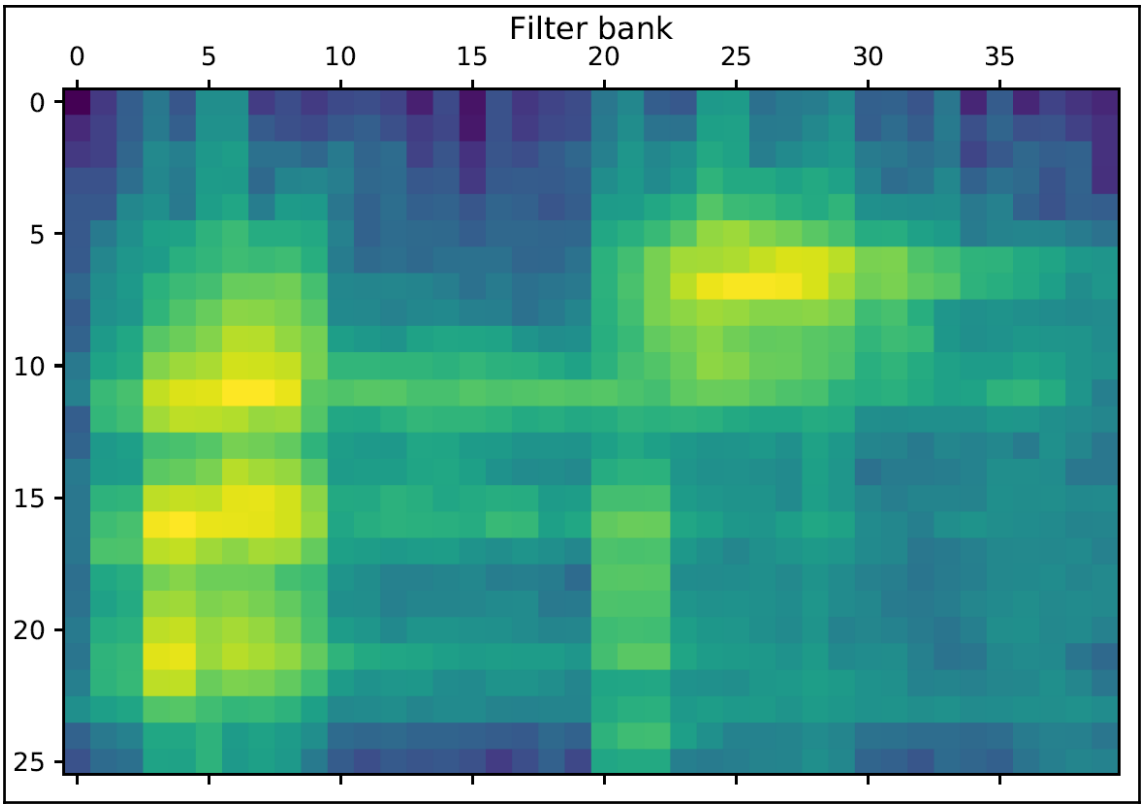
Chapter 8: Speech Recognition



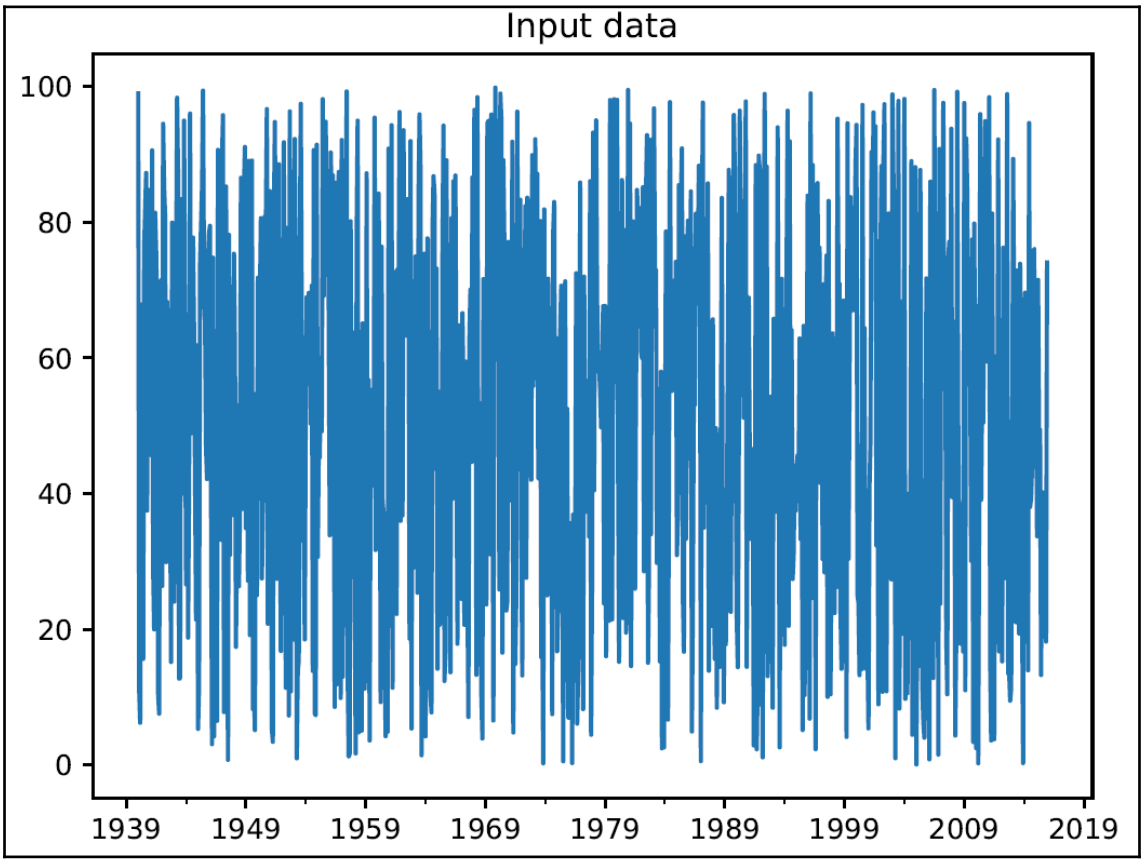

−40
−50
−60
−70
−80
−90
−100
−110
Power (in dB)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Freq (in kHz)

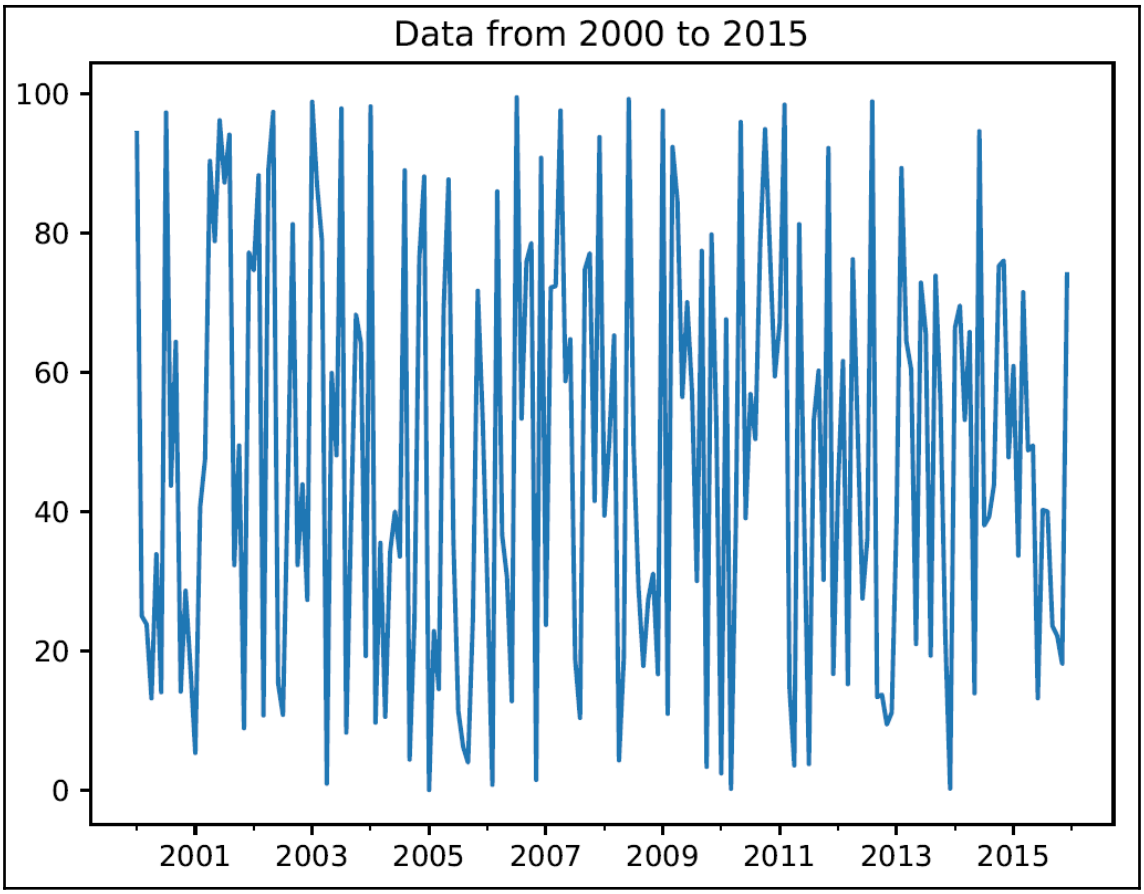

Audio signal
Amplitude
1.0
0.5
0.0
−0.5
−1.0
0.0
0.5
1.0
1.5
2.0
Time (ms)

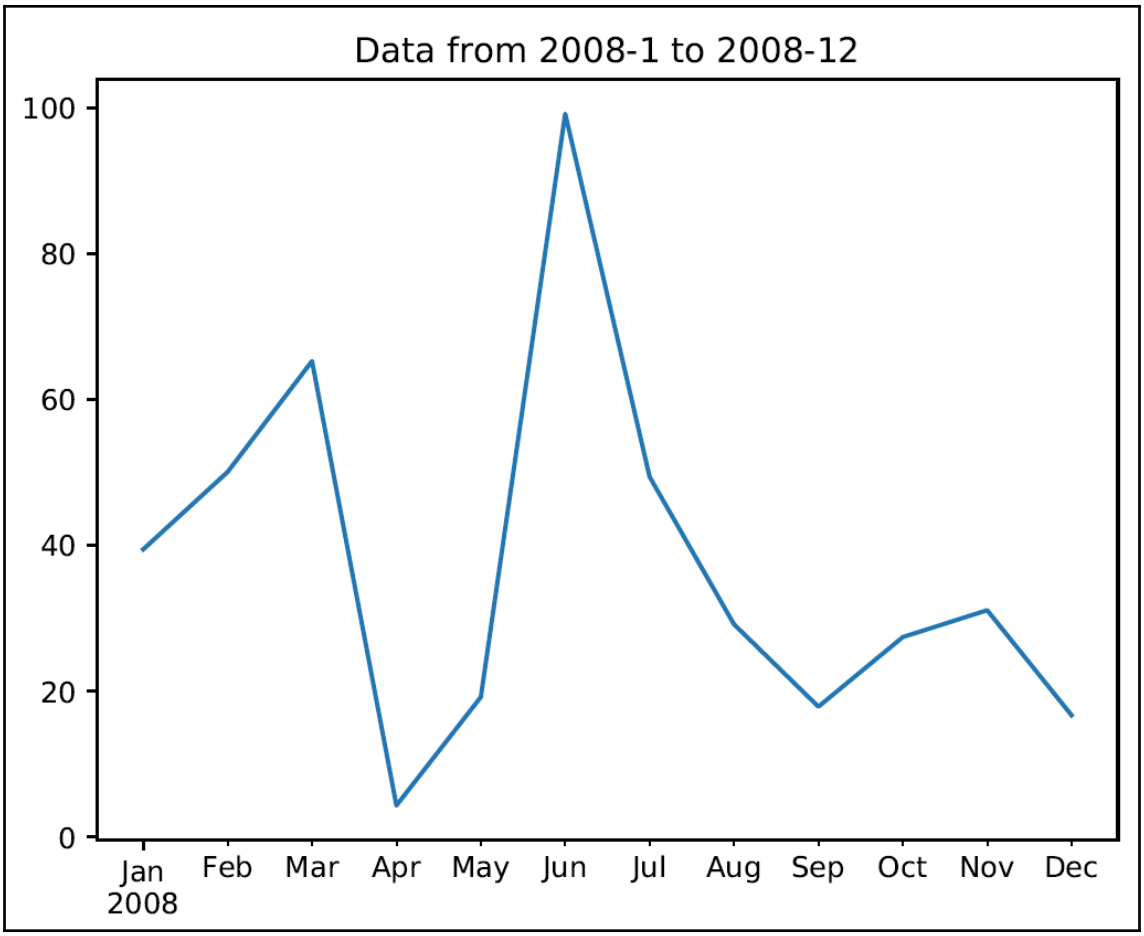

MFCC
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12

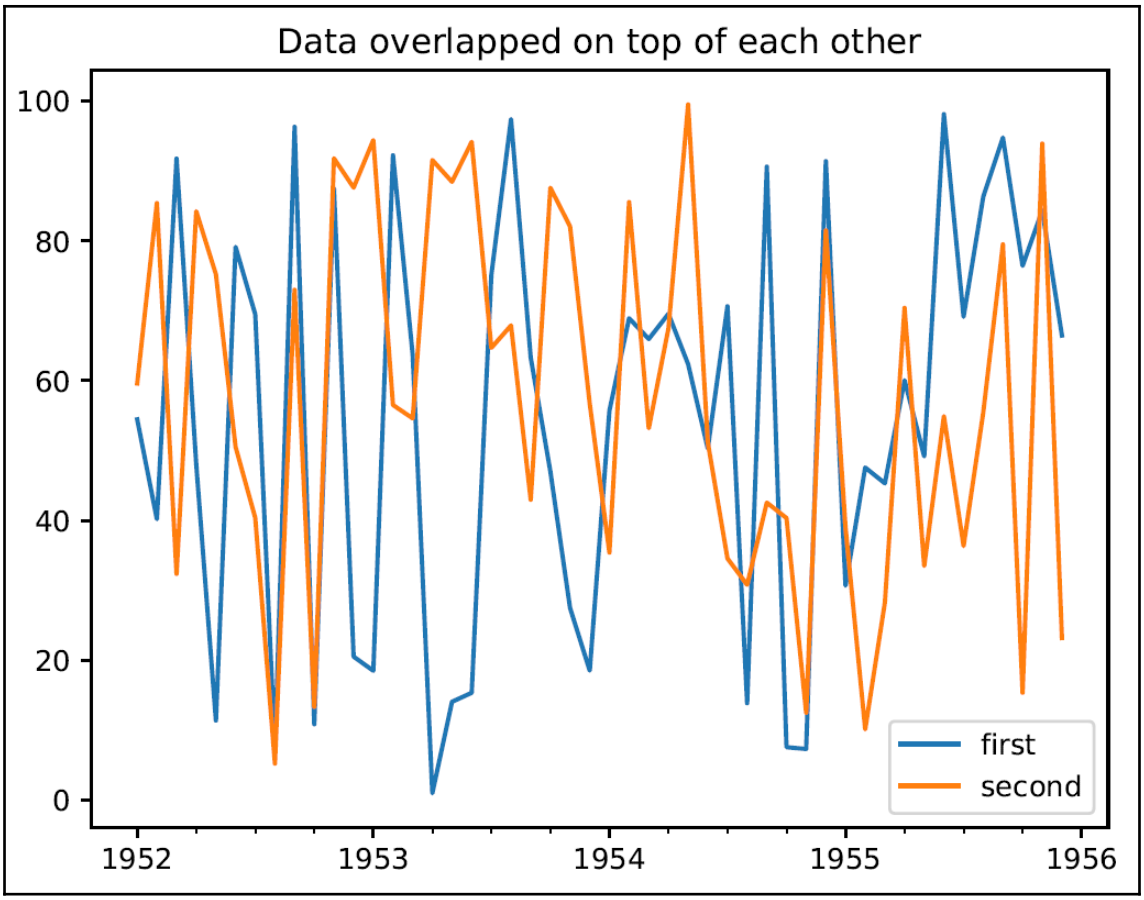

Filter bank
0
5
10
15
20
25
30
35
0
5
10
15
20
25

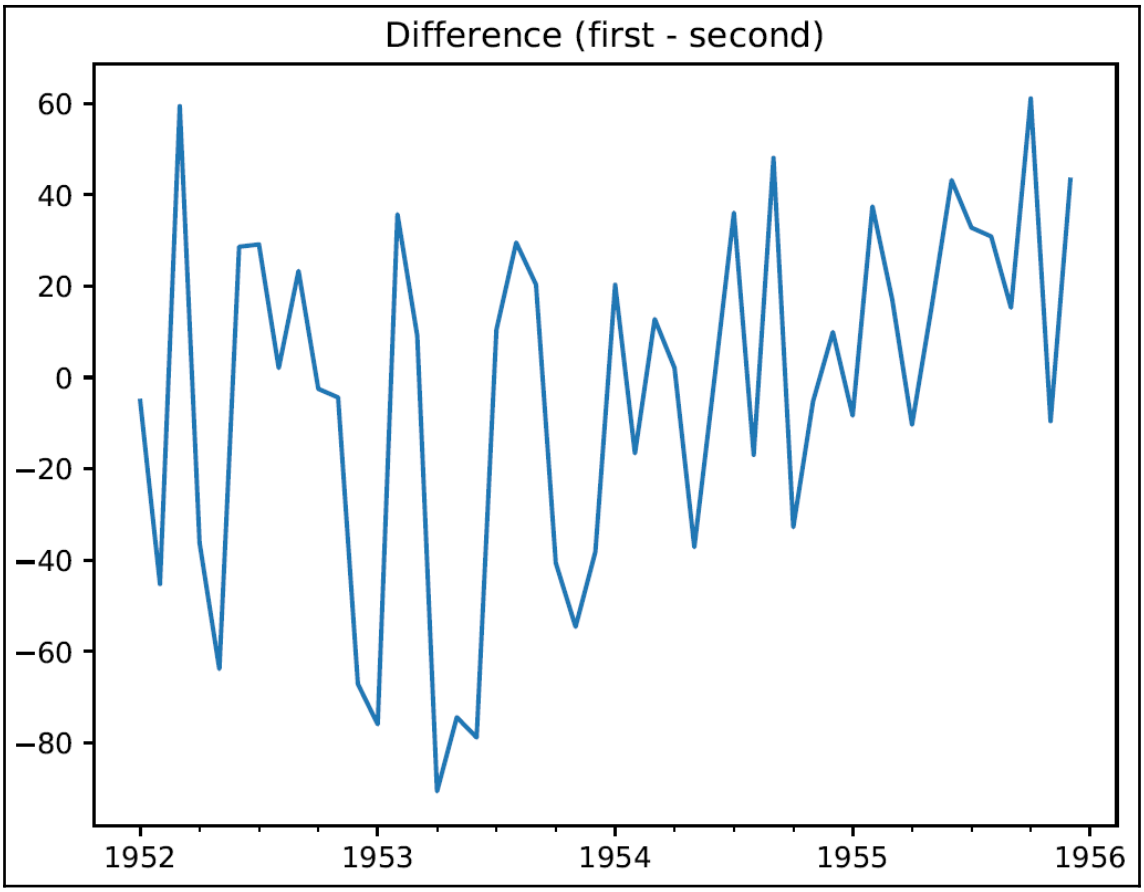
Chapter 9: Dissecting Time Series and Sequential Data

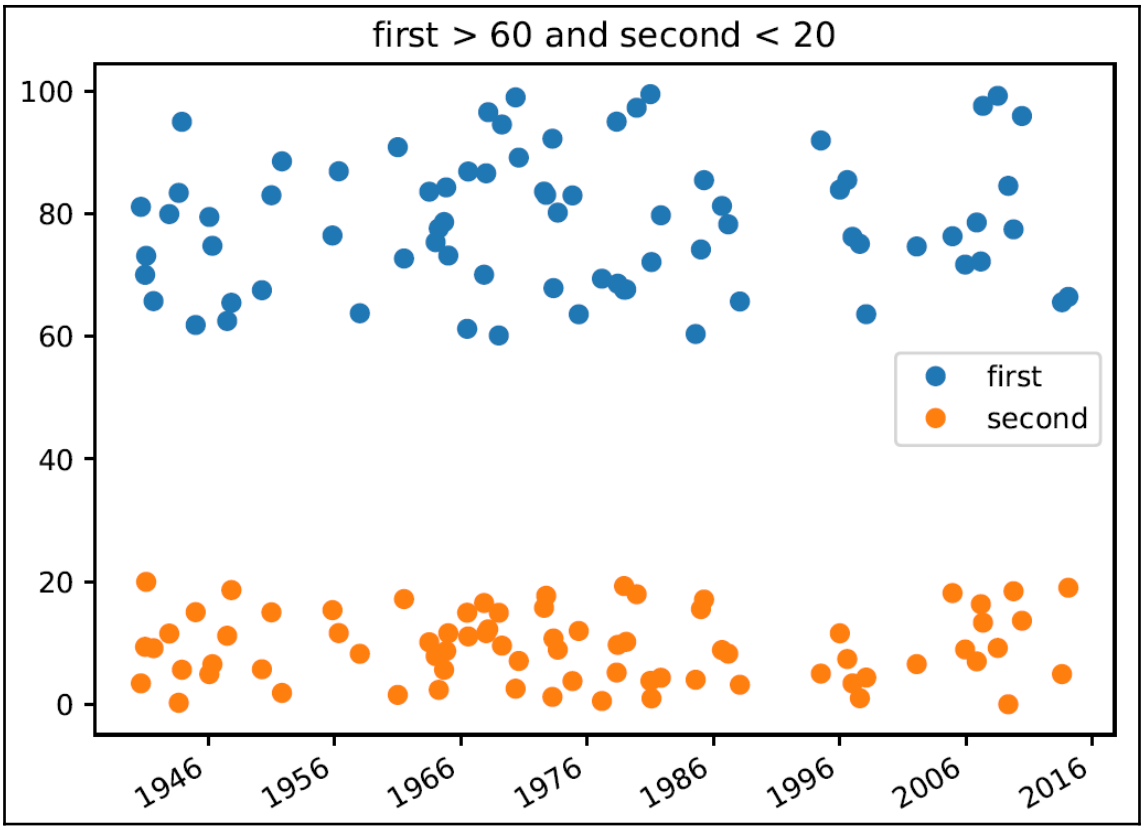


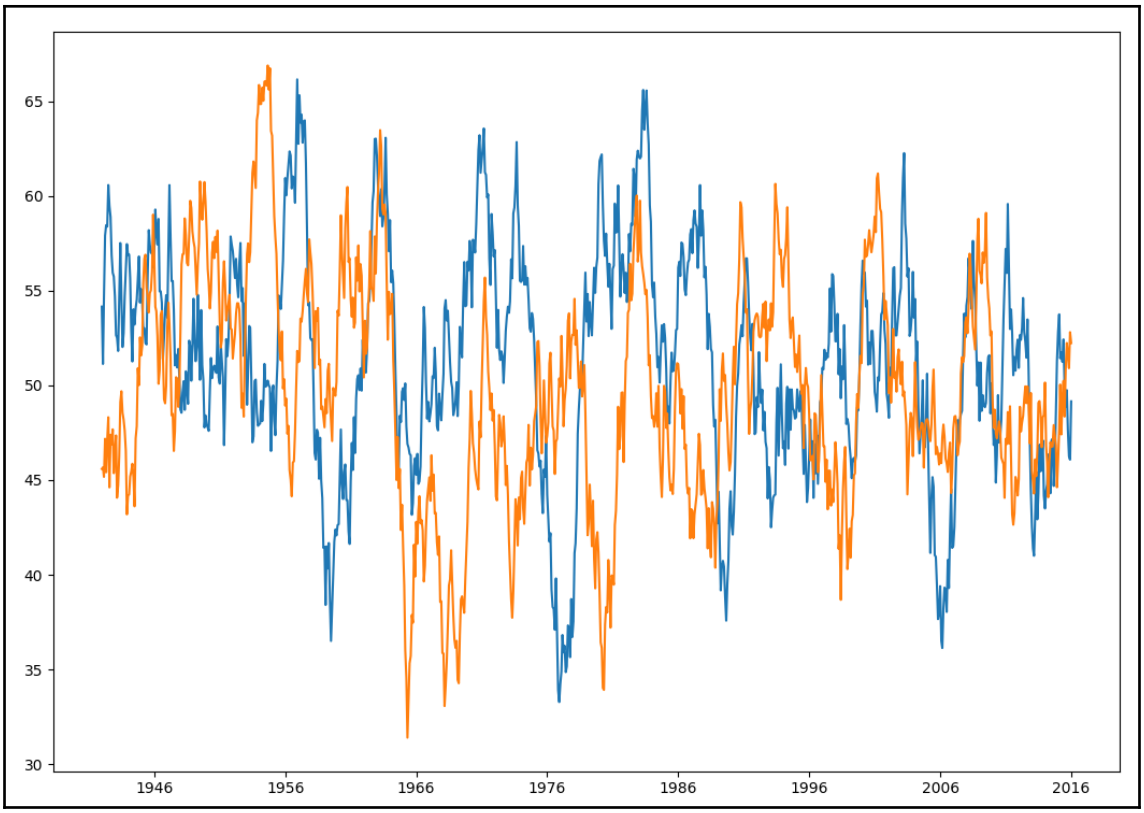

Data from 2000 to 2015
100
80
60
40
20
0
2001
2003
2005
2007
2009
2011
2013
2015

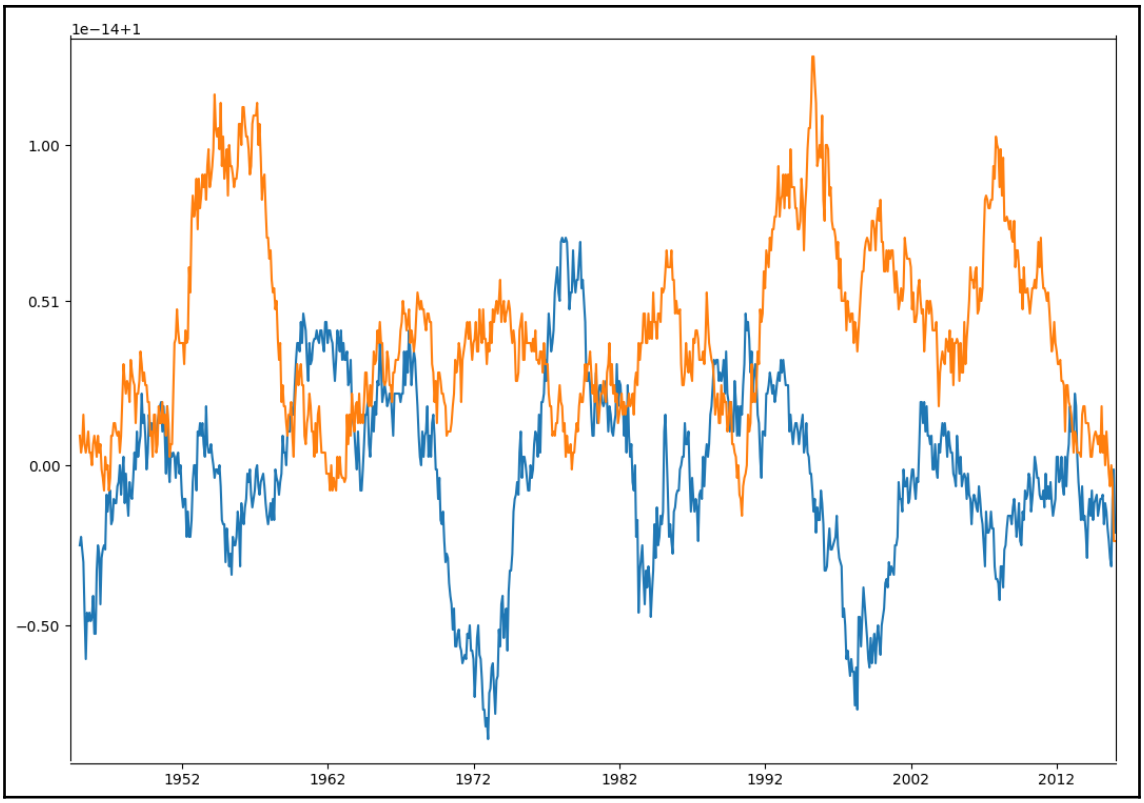

Data from 2008-1 to 2008-12
100
80
60
40
20
0
Jan
2008
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Data overlapped on top of each other
100
80
60
40
20
0
1952
1953
1954
1955
1956
first
second


Difference (first - second)
60
40
20
0
−20
−40
−60
−80
1952
1953
1954
1955
1956

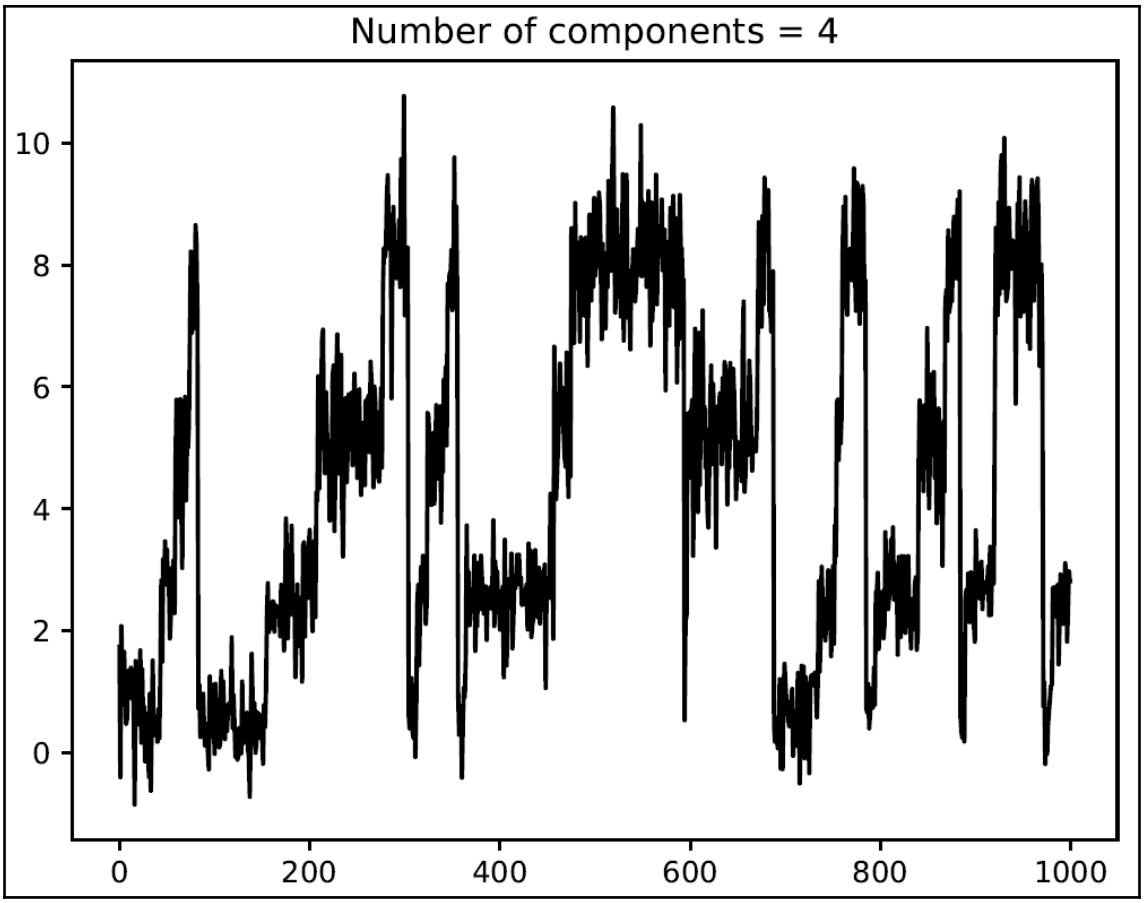

first > 60 and second < 20
100
80
60
40
20
0
1946
1956
1966
1976
1986
1996
2006
2016
first
second

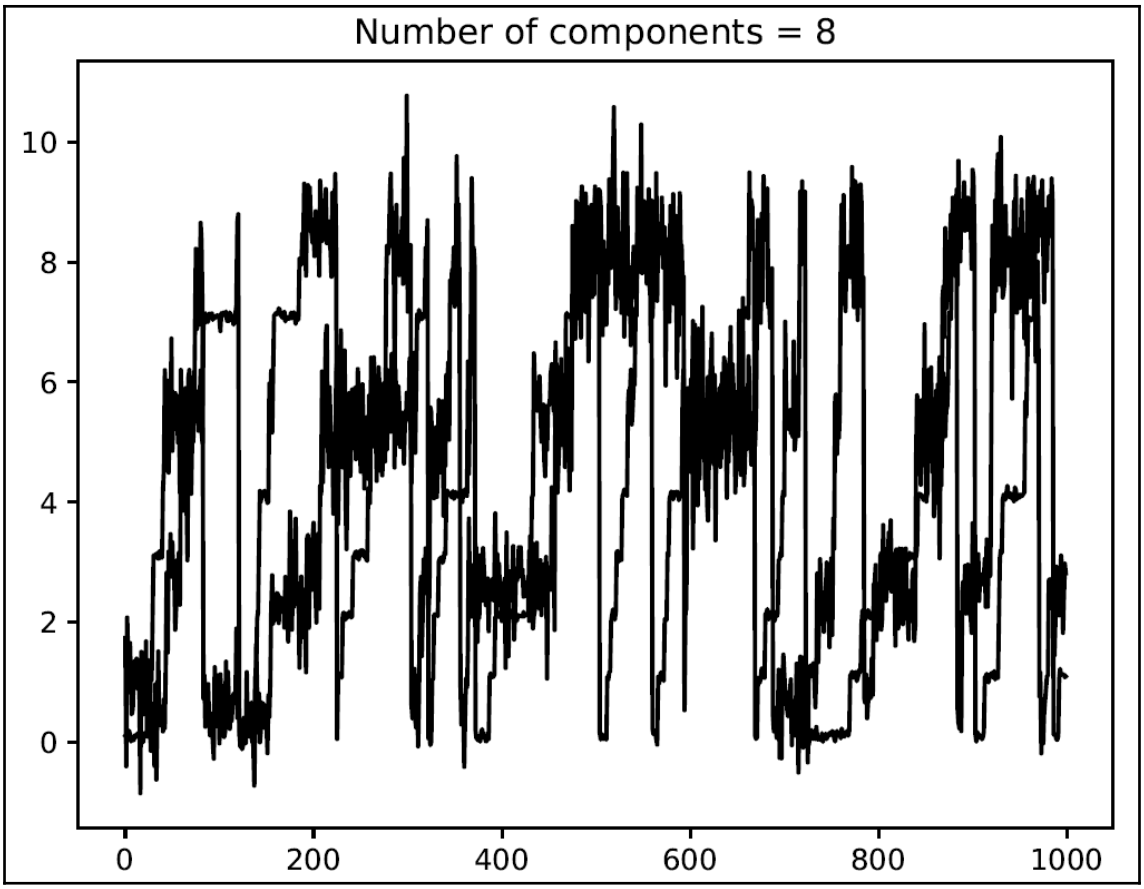

65
60
55
50
45
40
35
30
1946
1956
1966
1976
1986
1996
2006
2016

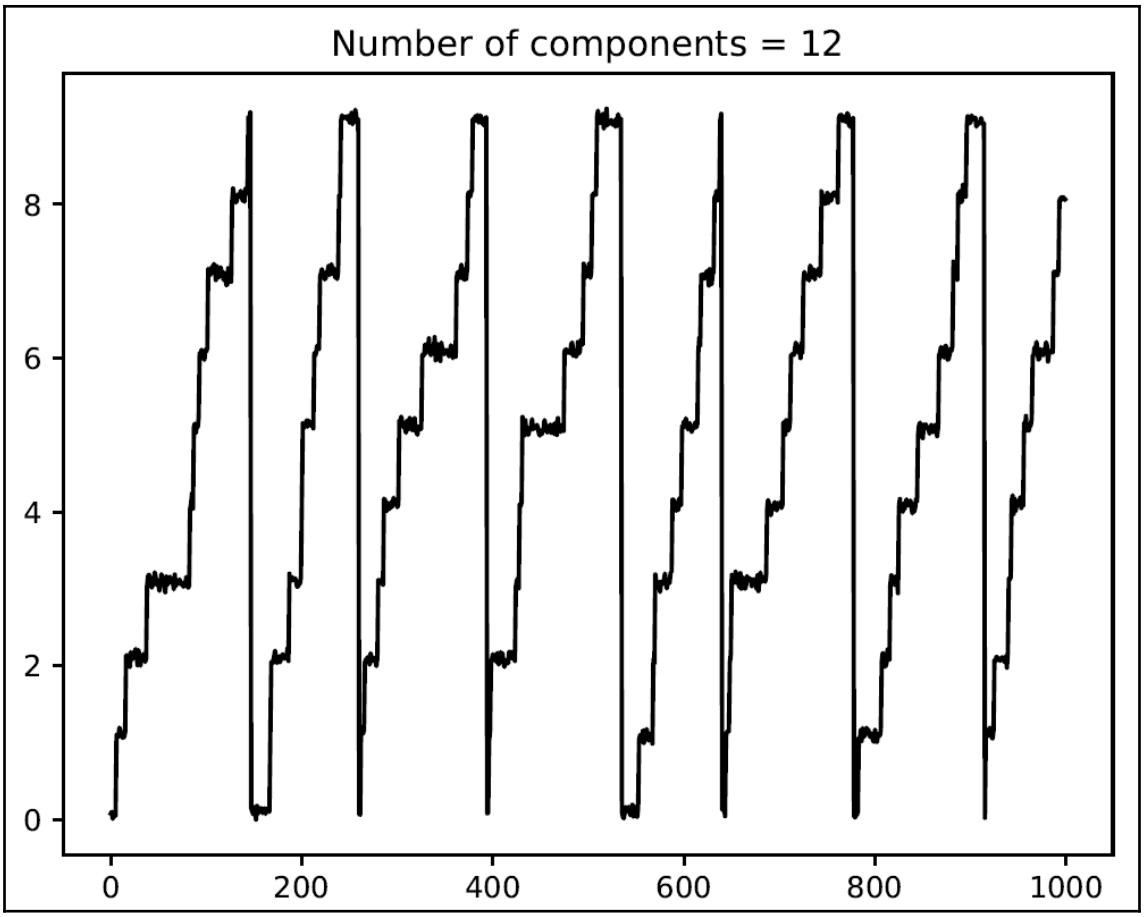

1e−14+1
1.00
0.51
0.00
−0.50
1952
1962
1972
1982
1992
2002
2012

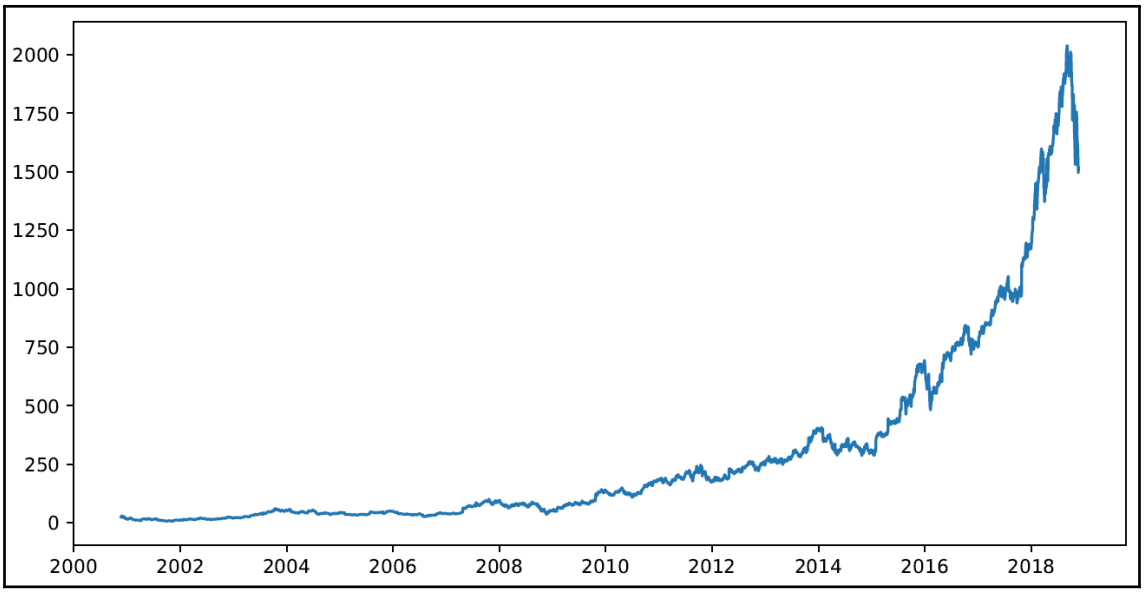
```
Maximum:
first     99.82
second    99.97
dtype: float64

Minimum:
first     0.07
second    0.00
dtype: float64

Mean:
first     51.264529
second    49.695417
dtype: float64
```

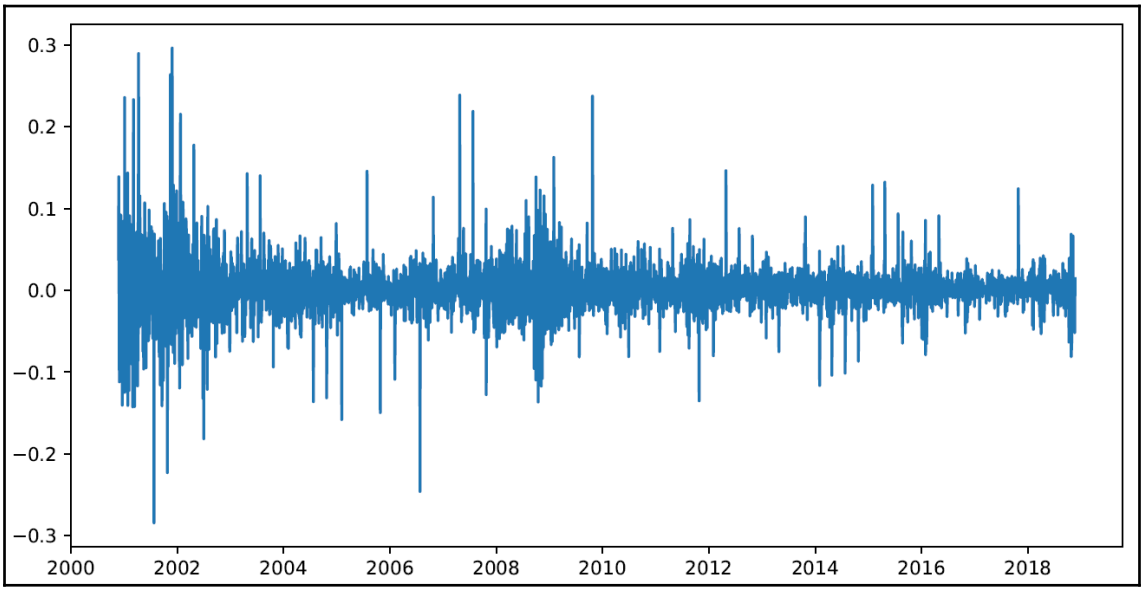
```
Mean row-wise:
1940-01-31    81.885
1940-02-29    41.135
1940-03-31    10.305
1940-04-30    83.545
1940-05-31    18.395
1940-06-30    16.695
1940-07-31    86.875
1940-08-31    42.255
1940-09-30    55.880
1940-10-31    34.720
Freq: M, dtype: float64

Correlation coefficients:
             first     second
first     1.000000   0.077607
second    0.077607   1.000000
```


Number of components = 4
10
8
6
4
2
0
0
200
400
600
800
1000

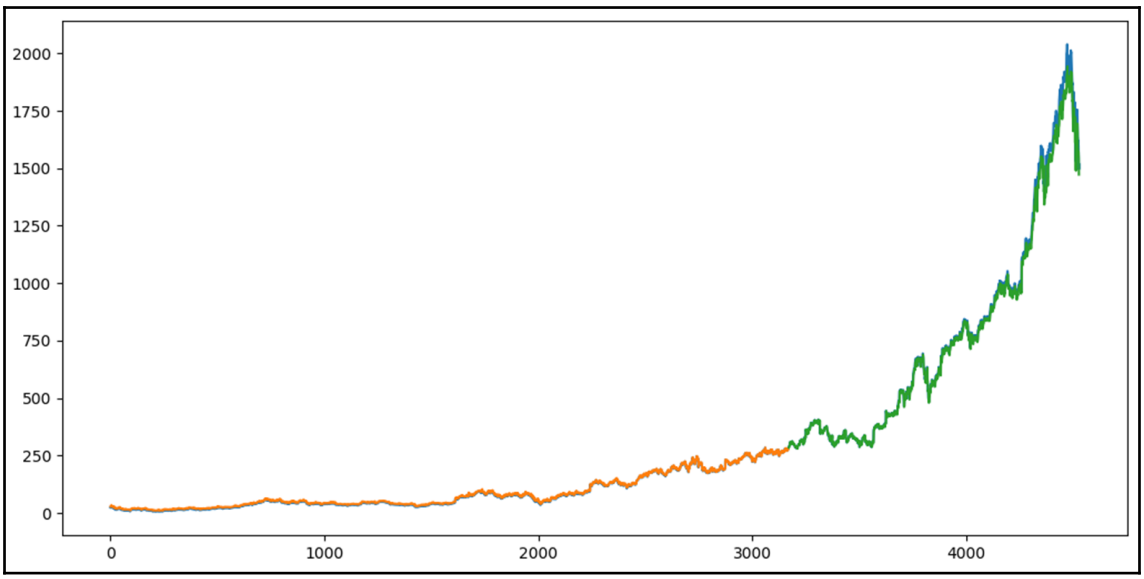

Number of components = 8
10
8
6
4
2
0
0
200
400
600
800
1000


Number of components = 12
0
2
4
6
8
0
200
400
600
800
1000

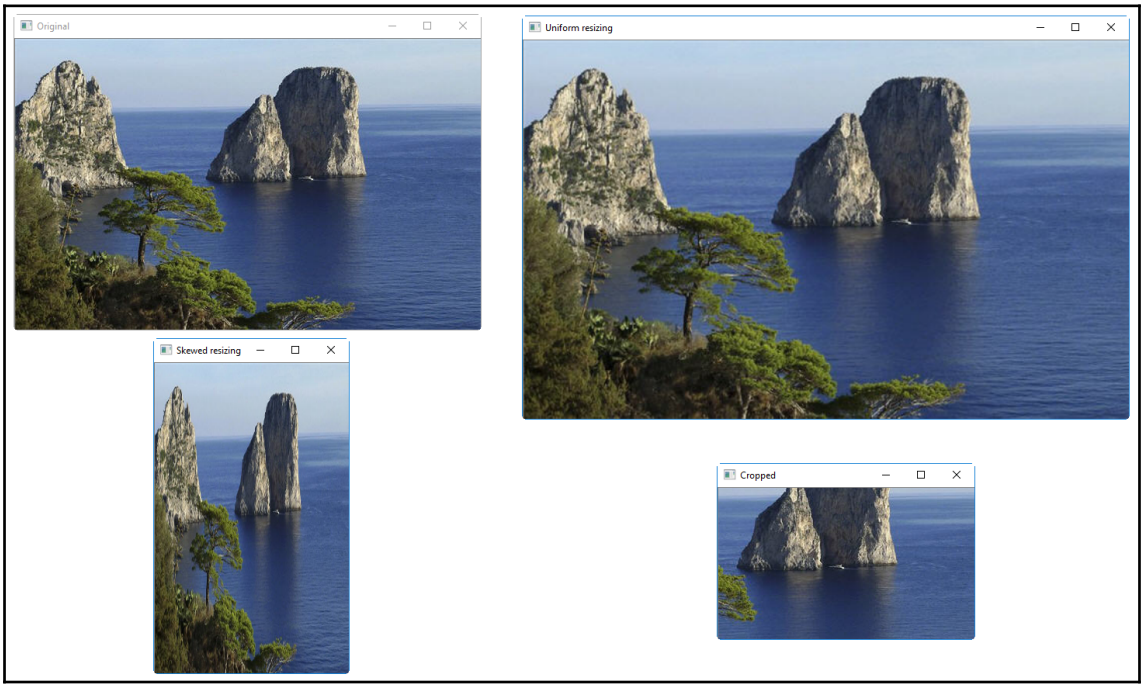

2000
1750
1500
1250
1000
750
500
250
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

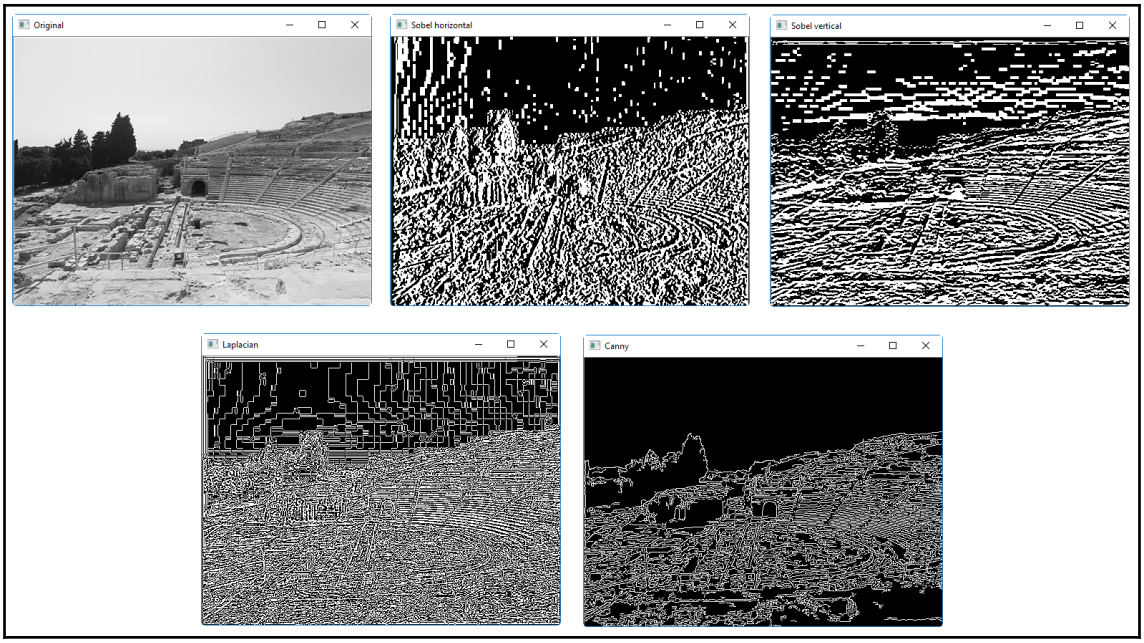

0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018

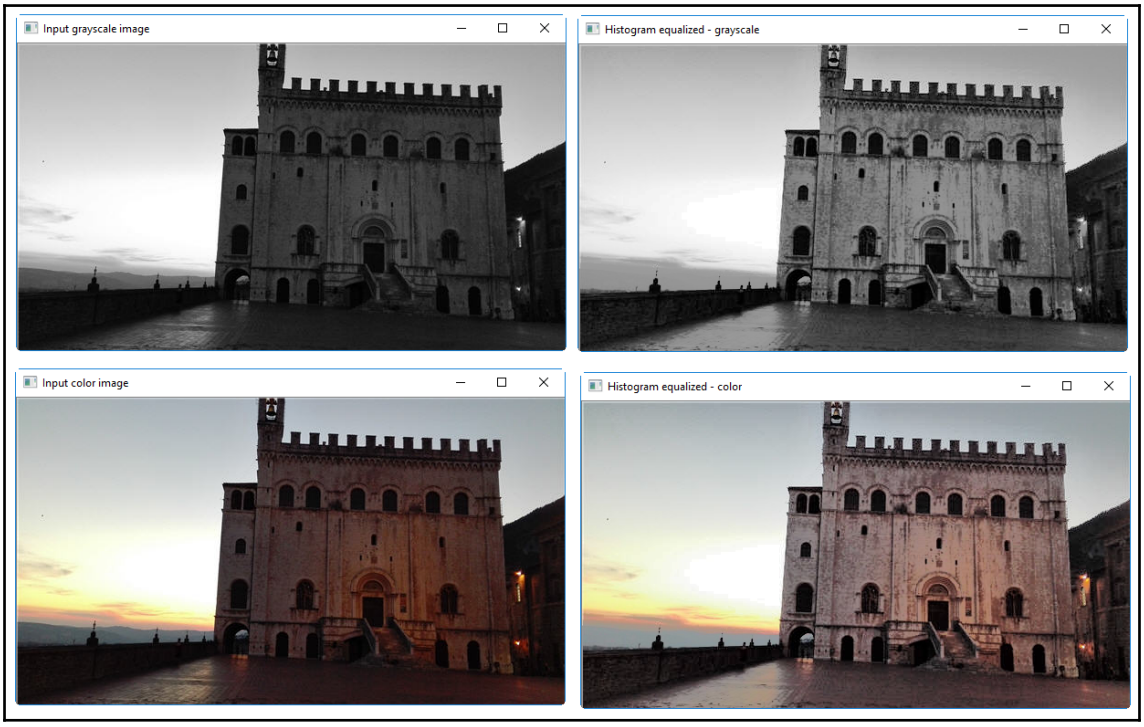
```
Layer (type)                 Output Shape              Param #
=================================================================
lstm_4 (LSTM)                (None, 256)               264192
_________________________________________________________________
dense_4 (Dense)              (None, 1)                 257
=================================================================
Total params: 264,449
Trainable params: 264,449
Non-trainable params: 0
_________________________________________________________________
```

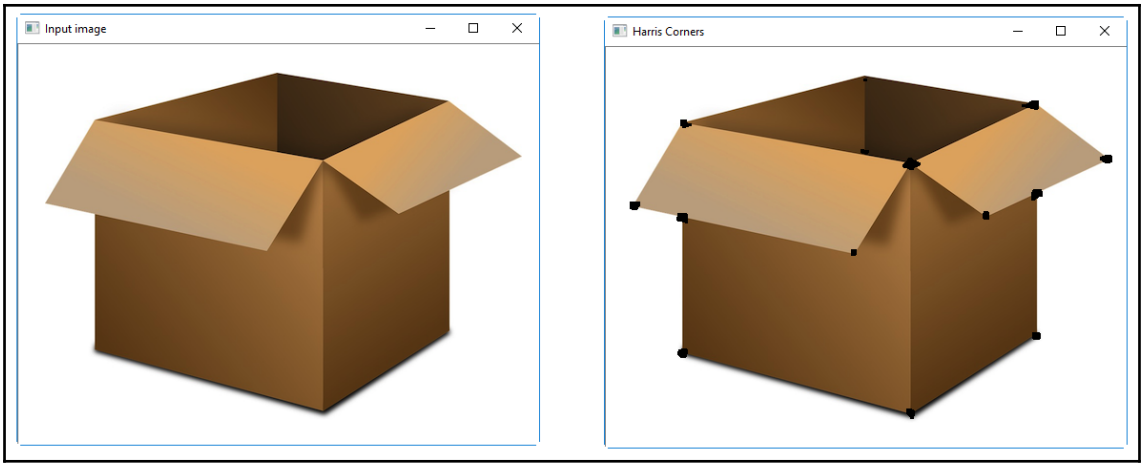


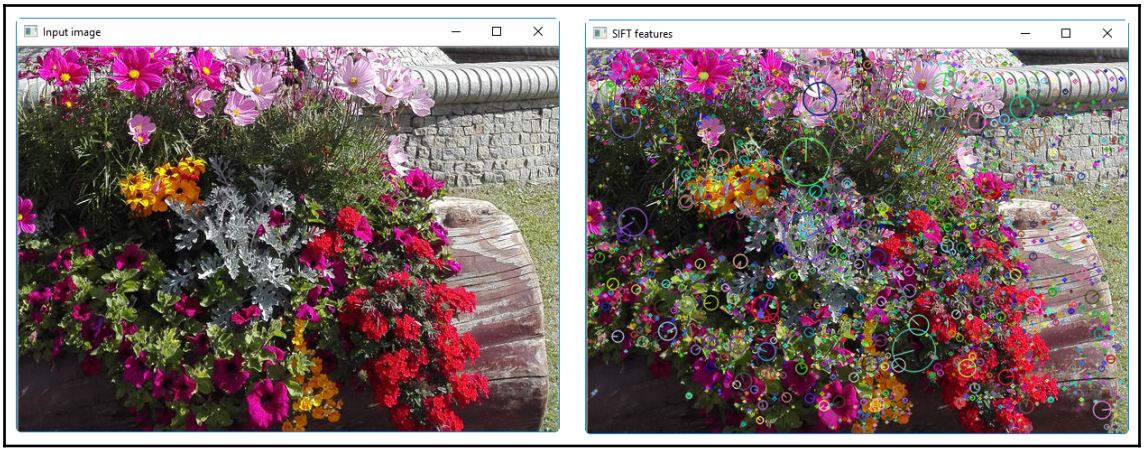
Chapter 10: Analyzing Image Content

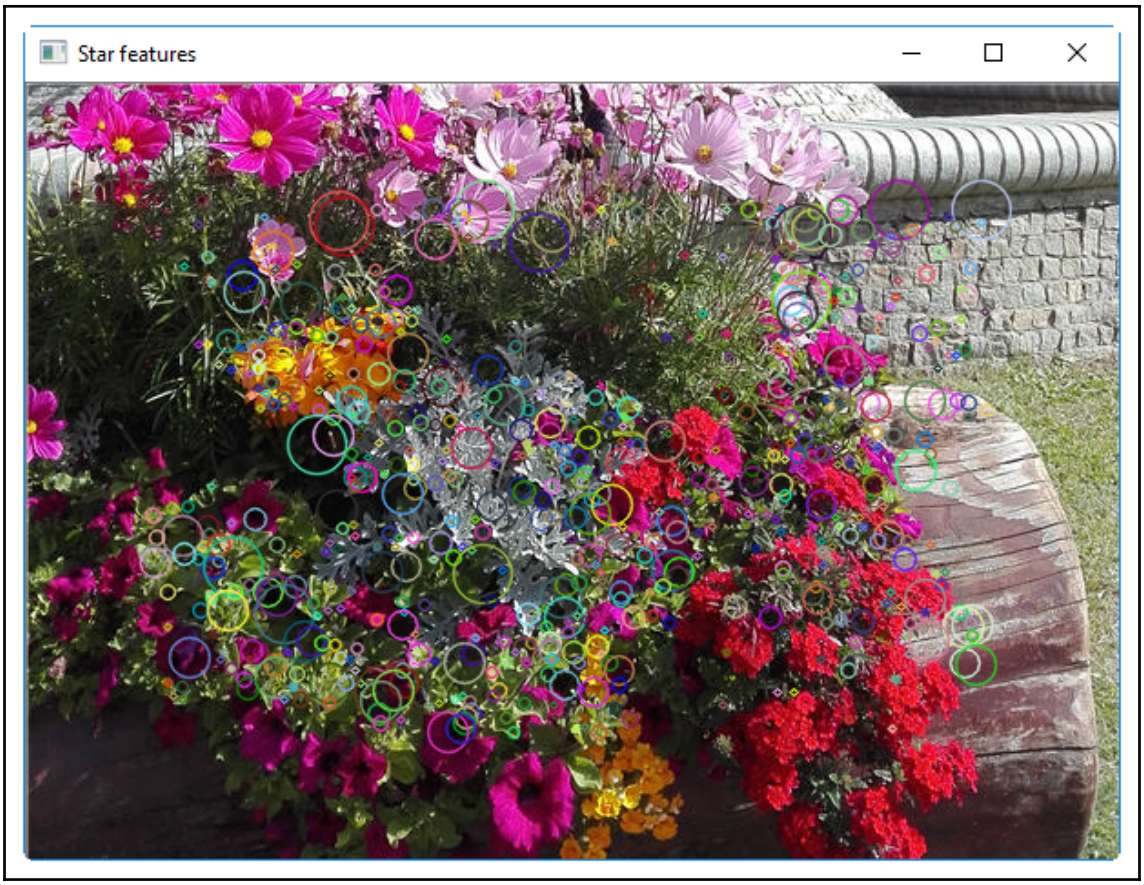



Original
Sobel horizontal
Sobel vertical
Laplacian
Canny

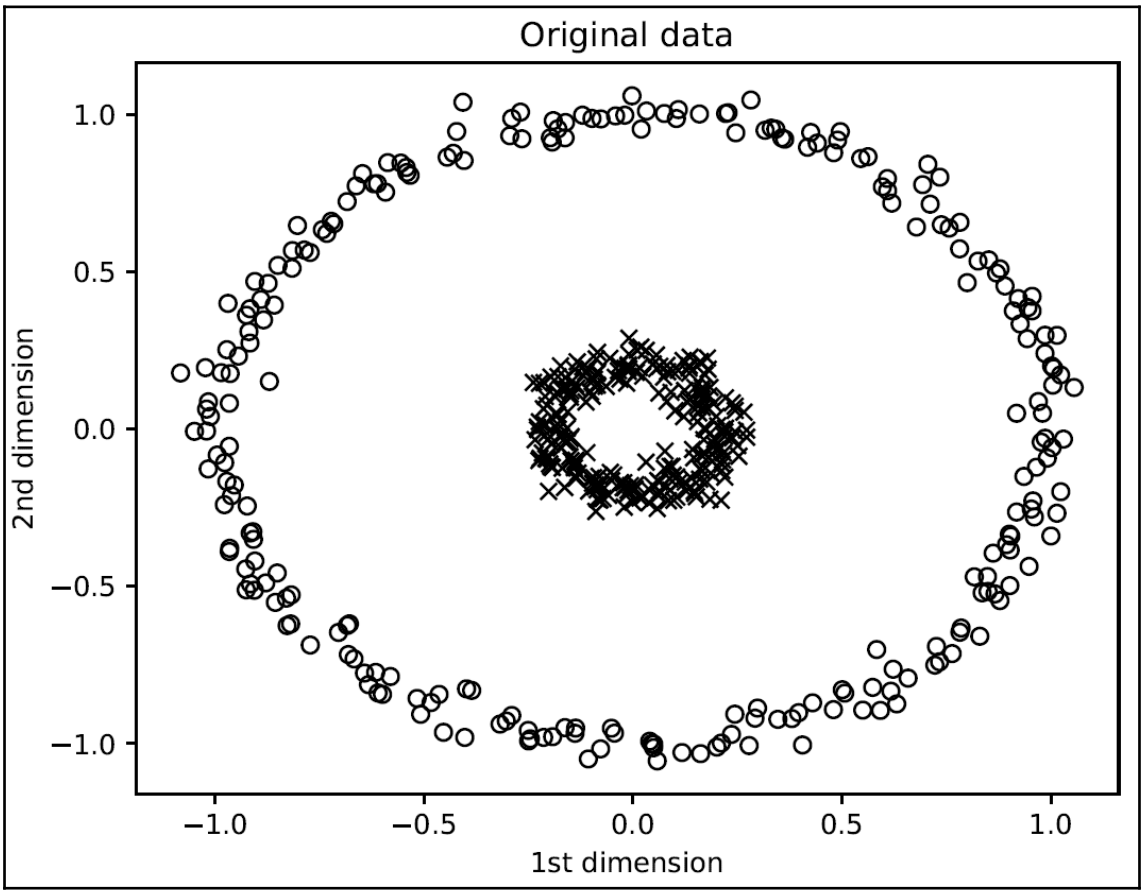

Input grayscale image
Histogram equalized - grayscale
Input color image
Histogram equalized - color

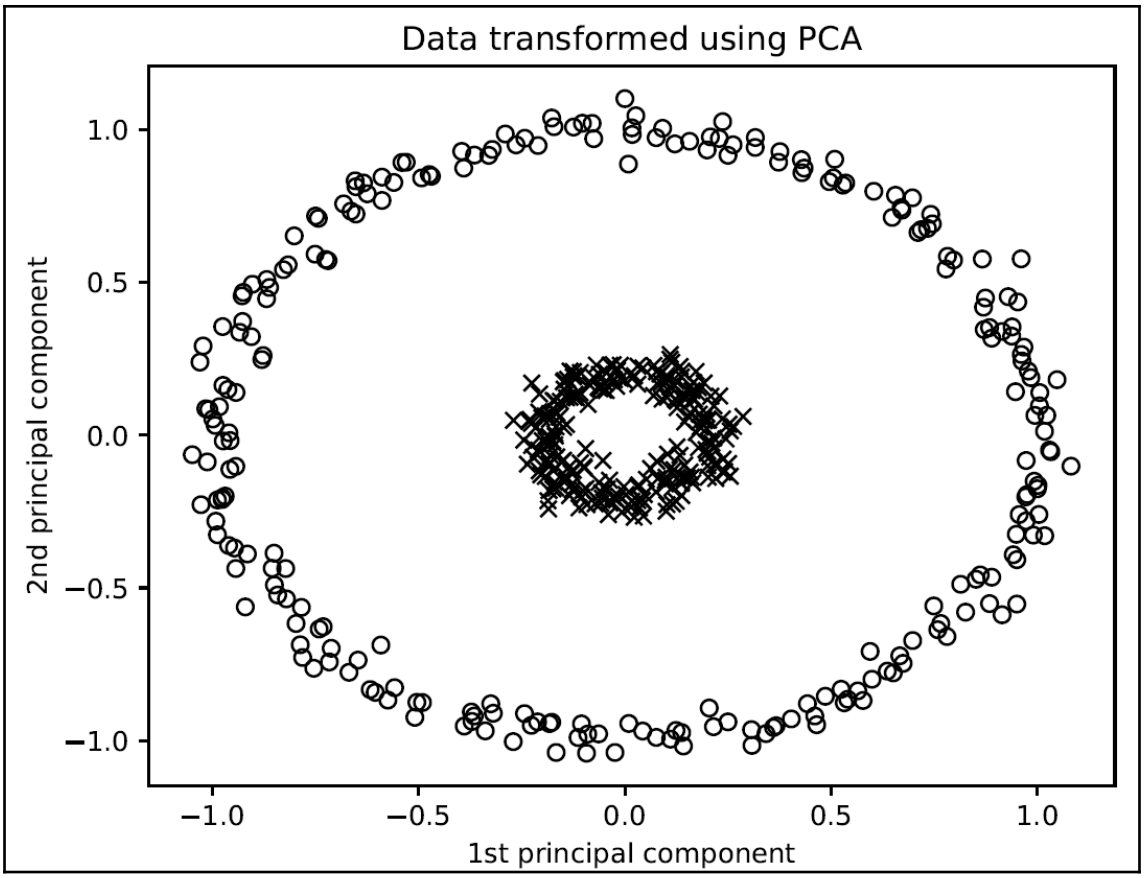

Input image
Harris Corners

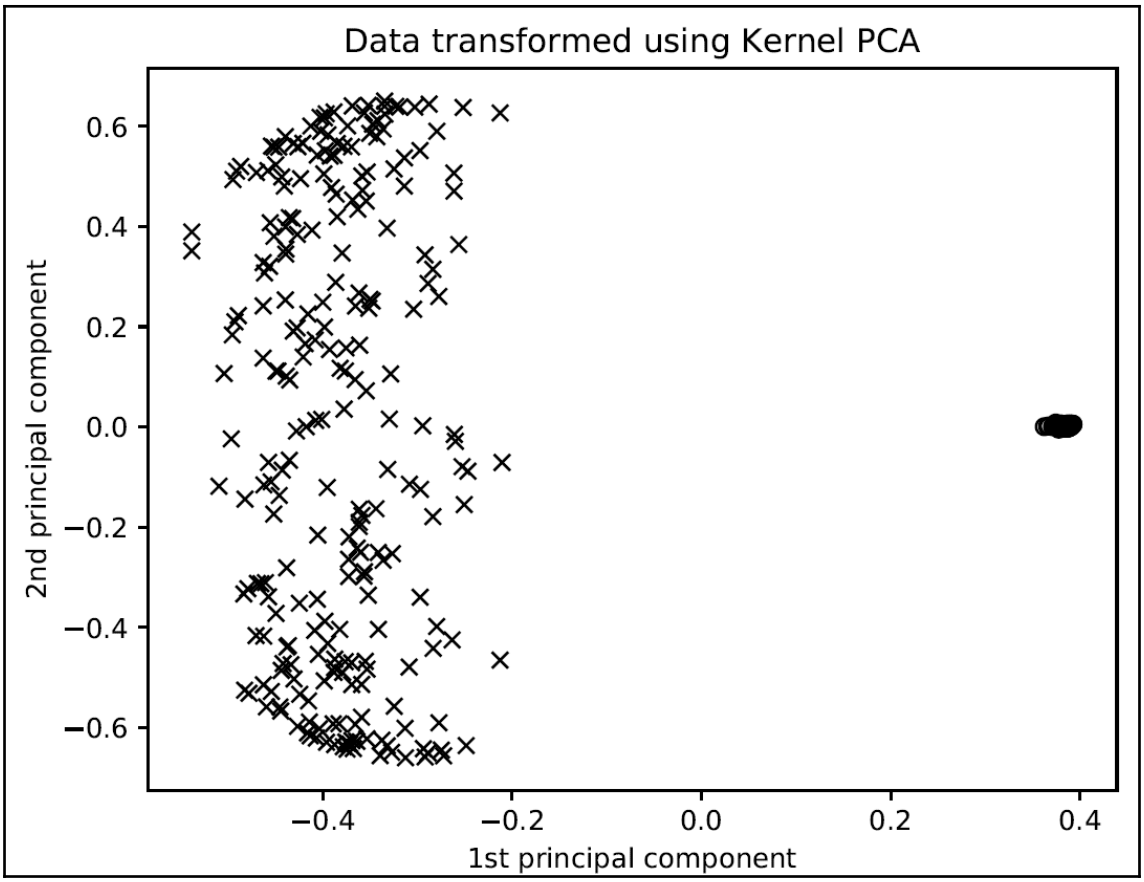

Input image
SIFT features

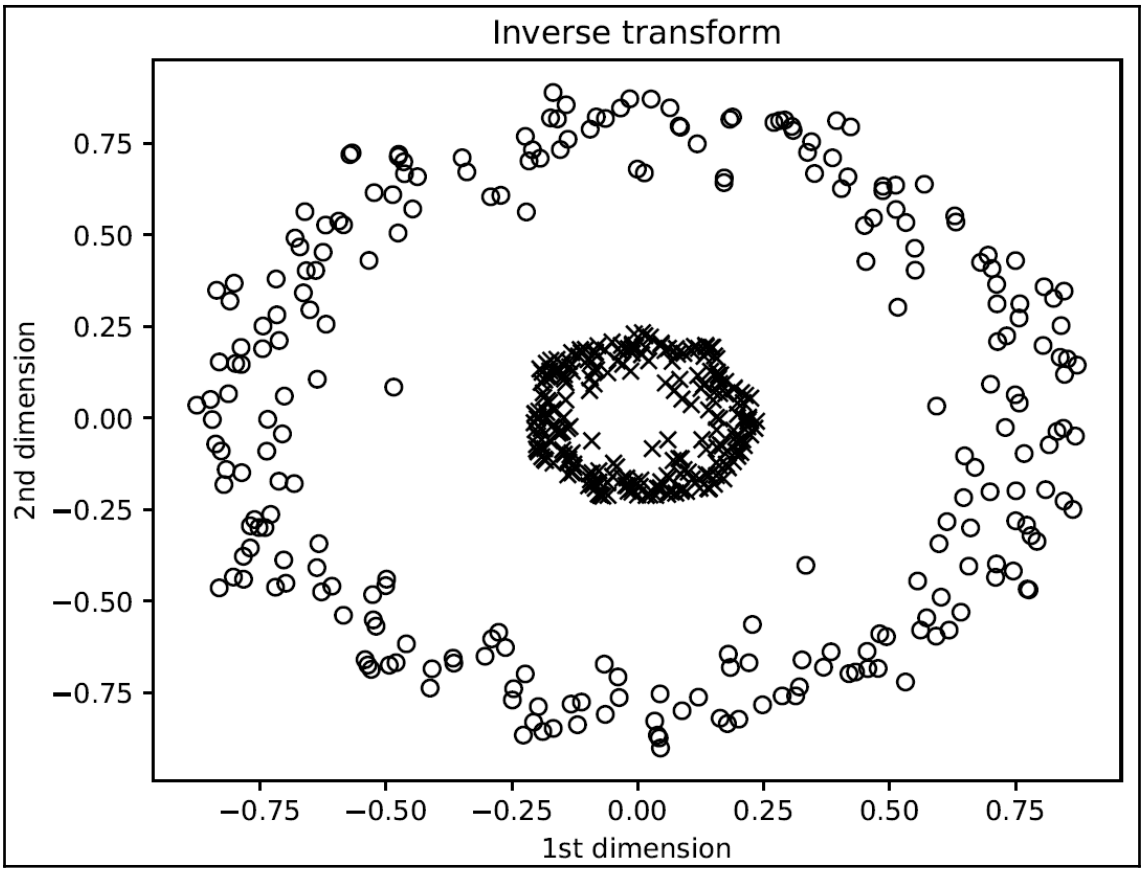

Star features

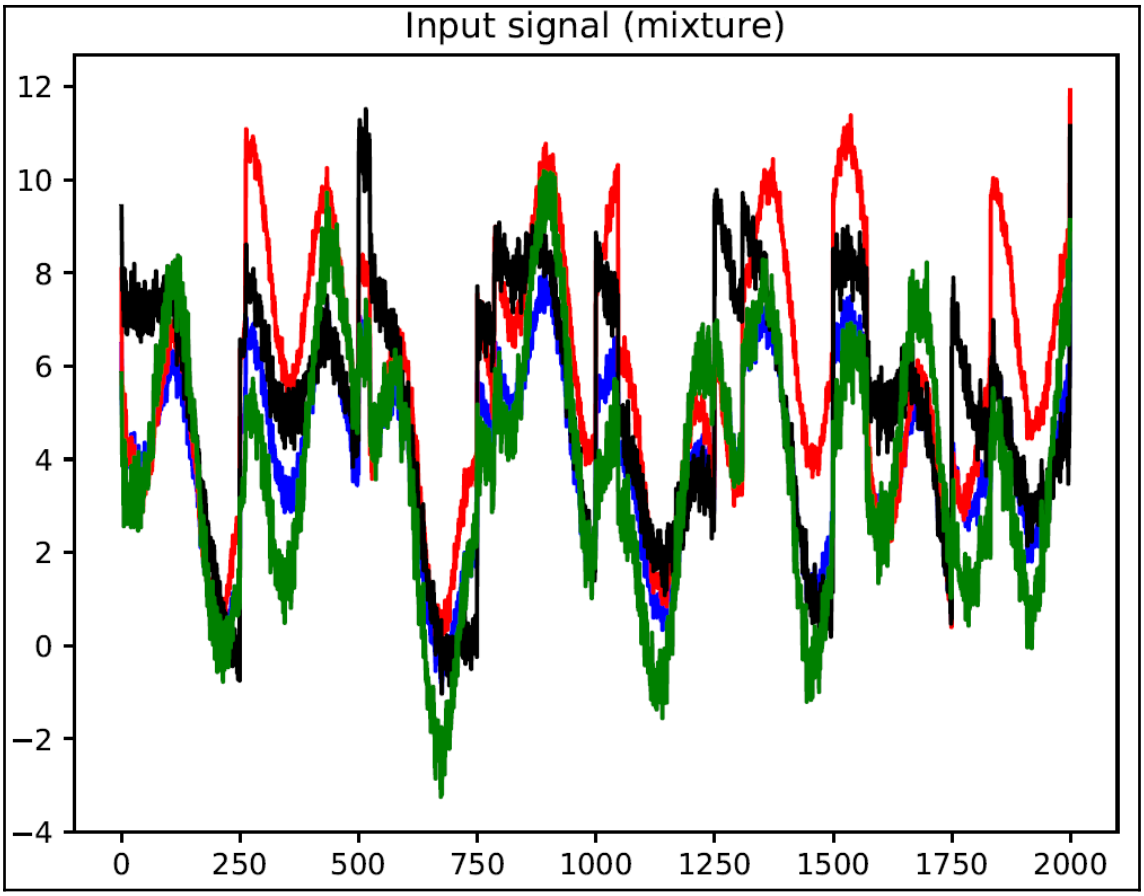
Chapter 11: Biometric Face Recognition

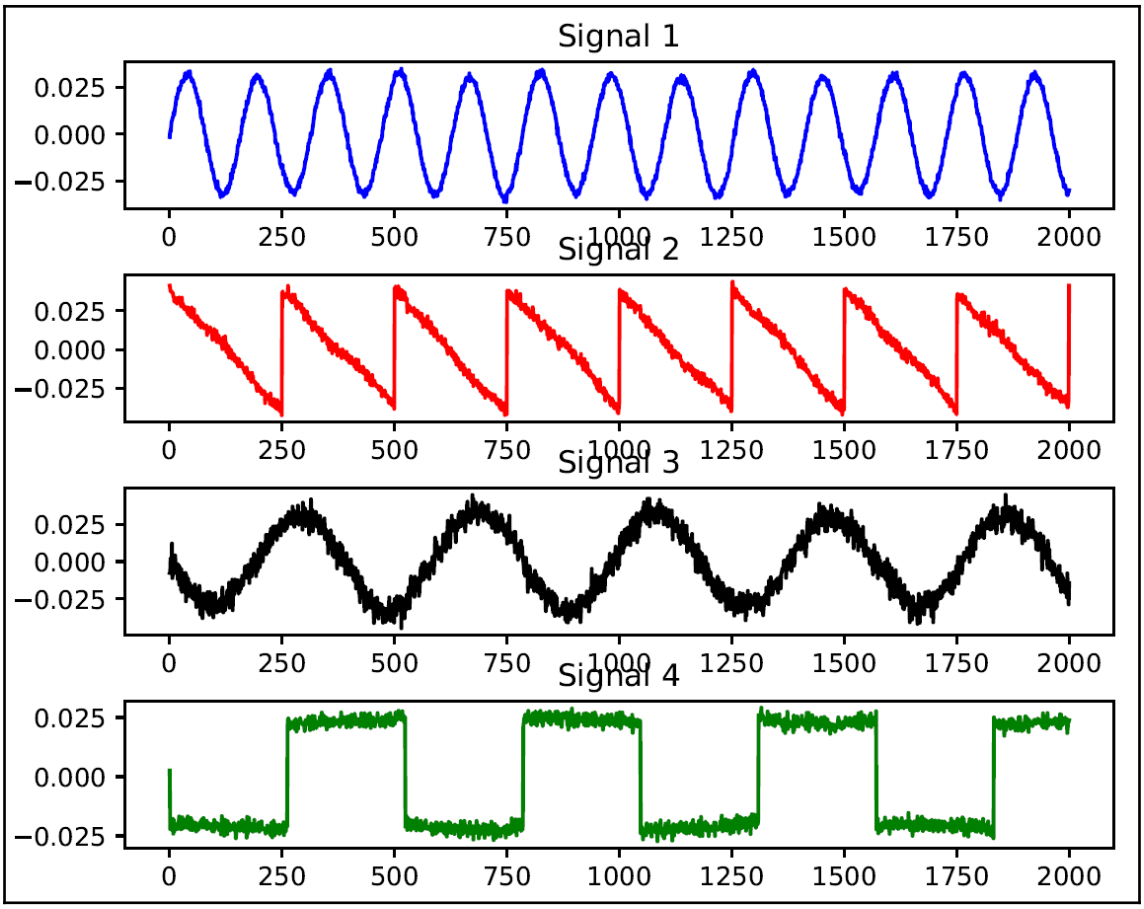


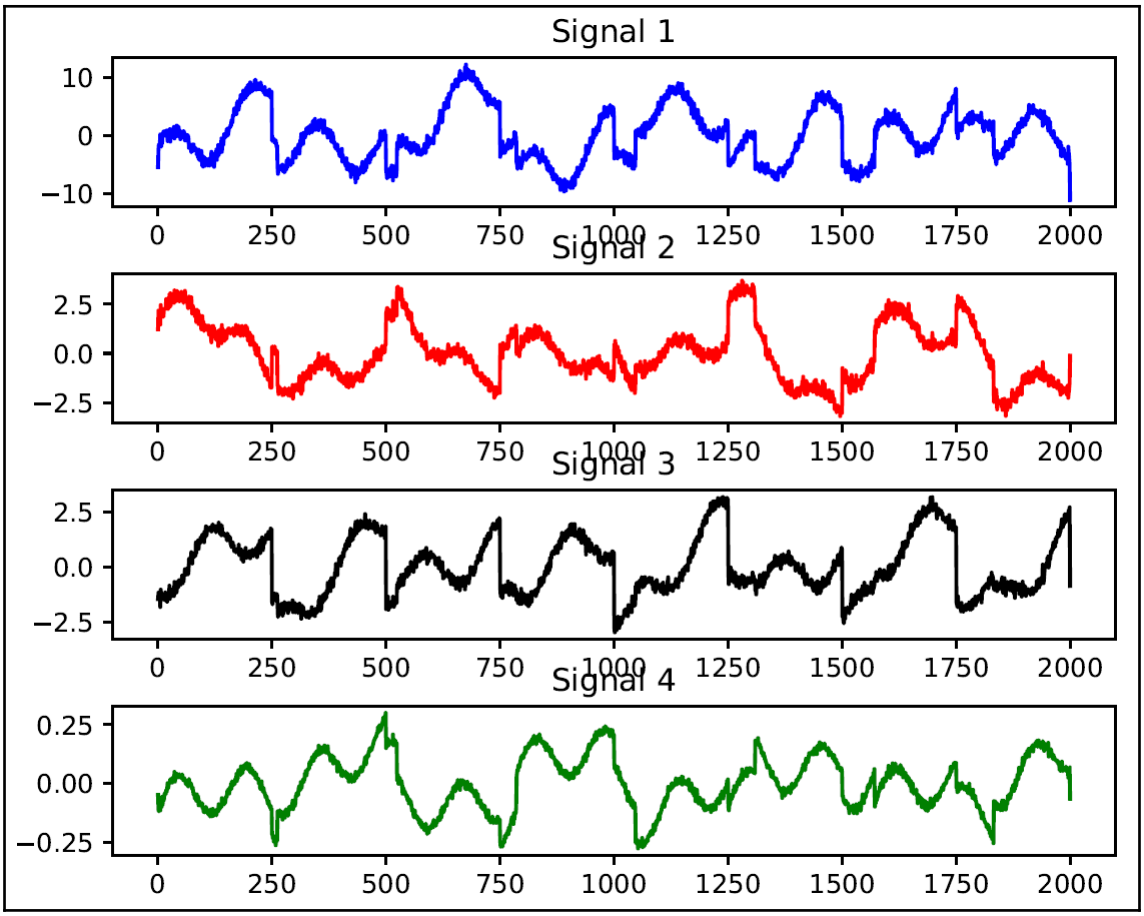

Data transformed using PCA
2nd principal component
1st principal component
1.0
0.5
0.0
−0.5
−1.0
−1.0
−0.5
0.0
0.5
1.0

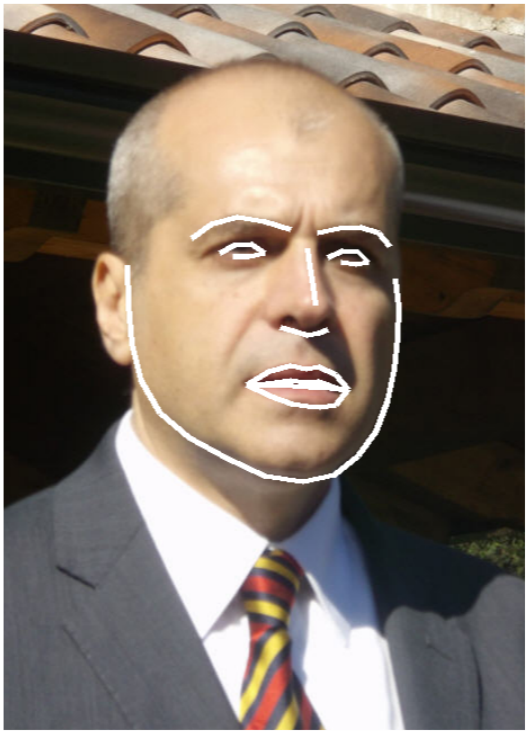

Data transformed using Kernel PCA
2nd principal component
1st principal component
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.4
−0.2
0.0
0.2
0.4


Inverse transform
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
2nd dimension
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1st dimension


Input signal (mixture)
12
10
8
6
4
2
0
−2
−4
0
250
500
750
1000
1250
1500
1750
2000

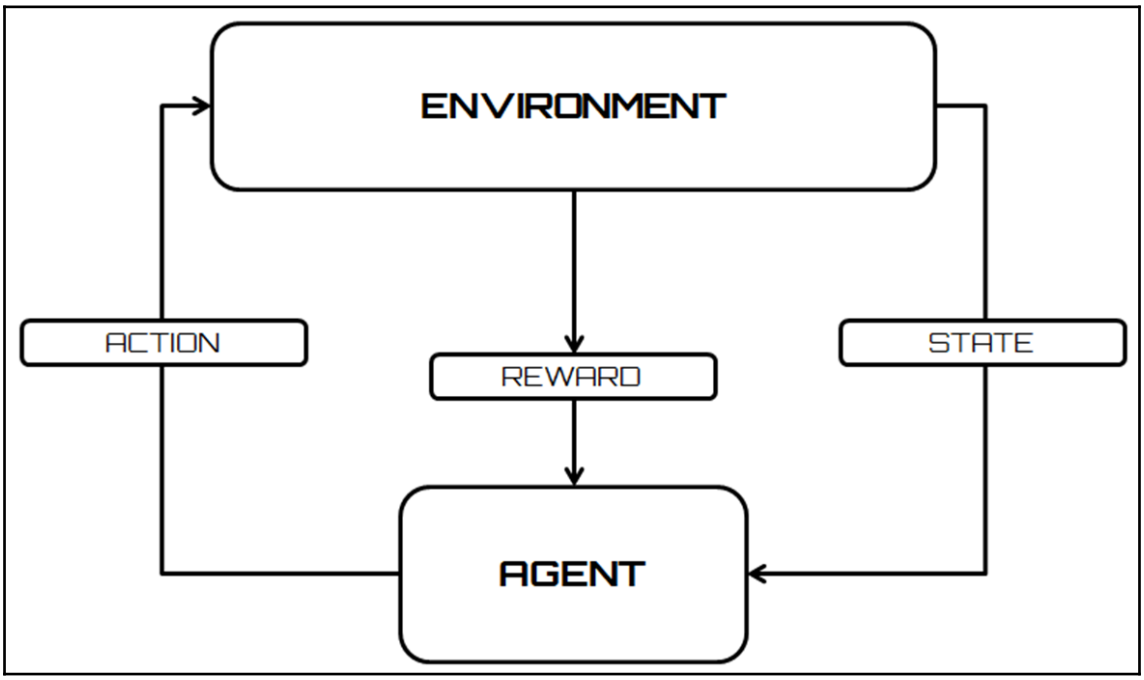

Signal 1
0.025
0.000
−0.025
0
250
500
750
1000
1250
1500
1750
2000
Signal 2
0.025
0.000
−0.025
0
250
500
750
1000
1250
1500
1750
2000
Signal 3
0.025
0.000
−0.025
0
250
500
750
1000
1250
1500
1750
2000
Signal 4
0.025
0.000
−0.025
0
250
500
750
1000
1250
1500
1750
2000

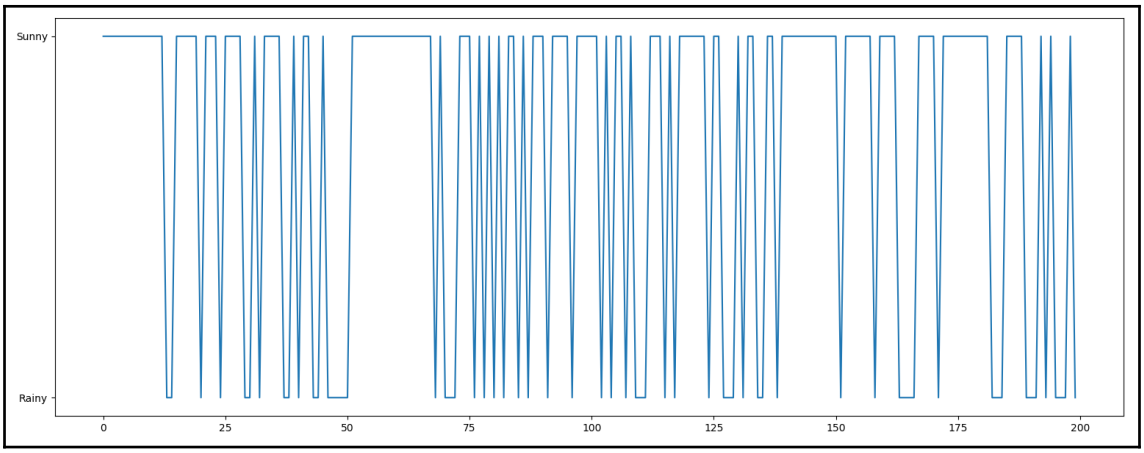

Signal 1
10
0
−10
0
250
500
750
1000
1250
1500
1750
2000
Signal 2
2.5
0.0
−2.5
0
250
500
750
1000
1250
1500
1750
2000
Signal 3
2.5
0.0
−2.5
0
250
500
750
1000
1250
1500
1750
2000
Signal 4
0.25
0.00
−0.25
0
250
500
750
1000
1250
1500
1750
2000

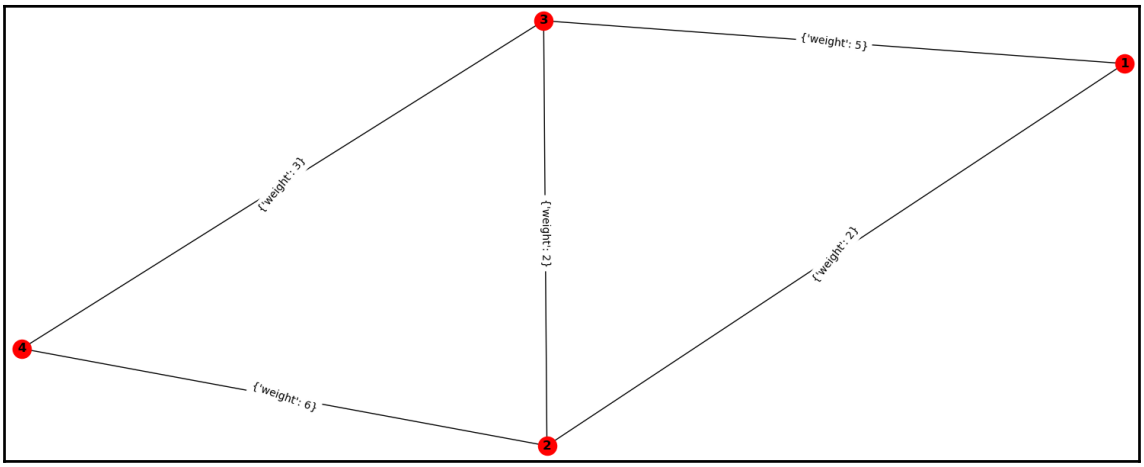


```
chin points: [(112, 236), (113, 271), (116, 305), (124, 338), (141, 367),
       (167, 389), (200, 407), (234, 423), (268, 428), (296, 422), (317, 405),
       (333, 383), (343, 356), (349, 328), (352, 300), (353, 273), (350, 248)]

left_eyebrow points: [(169, 212), (187, 199), (210, 193), (234, 197), (257, 204)]

right_eyebrow points: [(281, 207), (300, 203), (319, 202), (335, 207), (345, 219)]

nose_bridge points: [(272, 221), (274, 237), (277, 254), (279, 271)]

nose_tip points: [(248, 291), (259, 294), (272, 298), (282, 296), (290, 293)]

left_eye points: [(194, 225), (207, 218), (222, 217), (234, 225), (220, 228), (206, 228)]

right_eye points: [(290, 229), (303, 223), (317, 224), (326, 233), (315, 235), (302, 233)]

top_lip points: [(218, 342), (238, 330), (257, 325), (271, 328), (282, 326), (297, 333),
       (308, 346), (301, 346), (281, 339), (270, 340), (257, 338), (228, 342)]

bottom_lip points: [(308, 346), (297, 360), (283, 362), (272, 361), (258, 359), (239, 352),
       (218, 342), (228, 342), (259, 343), (273, 344), (283, 344), (301, 346)]
```

Chapter 12: Reinforcement Learning Techniques

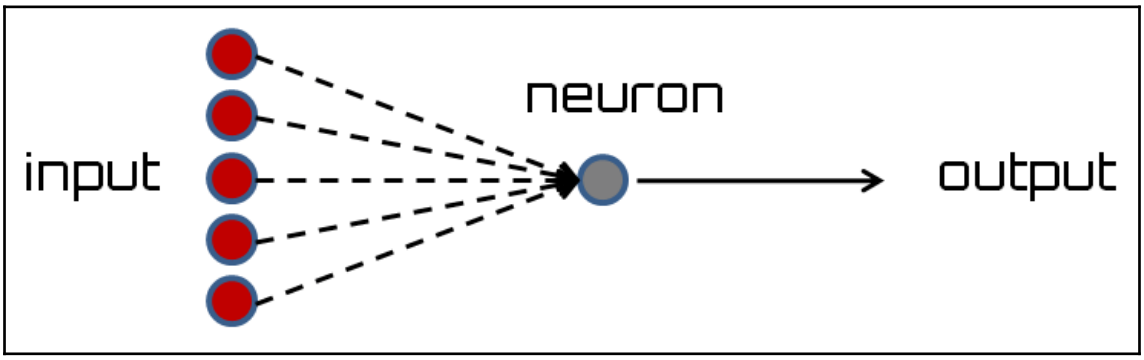


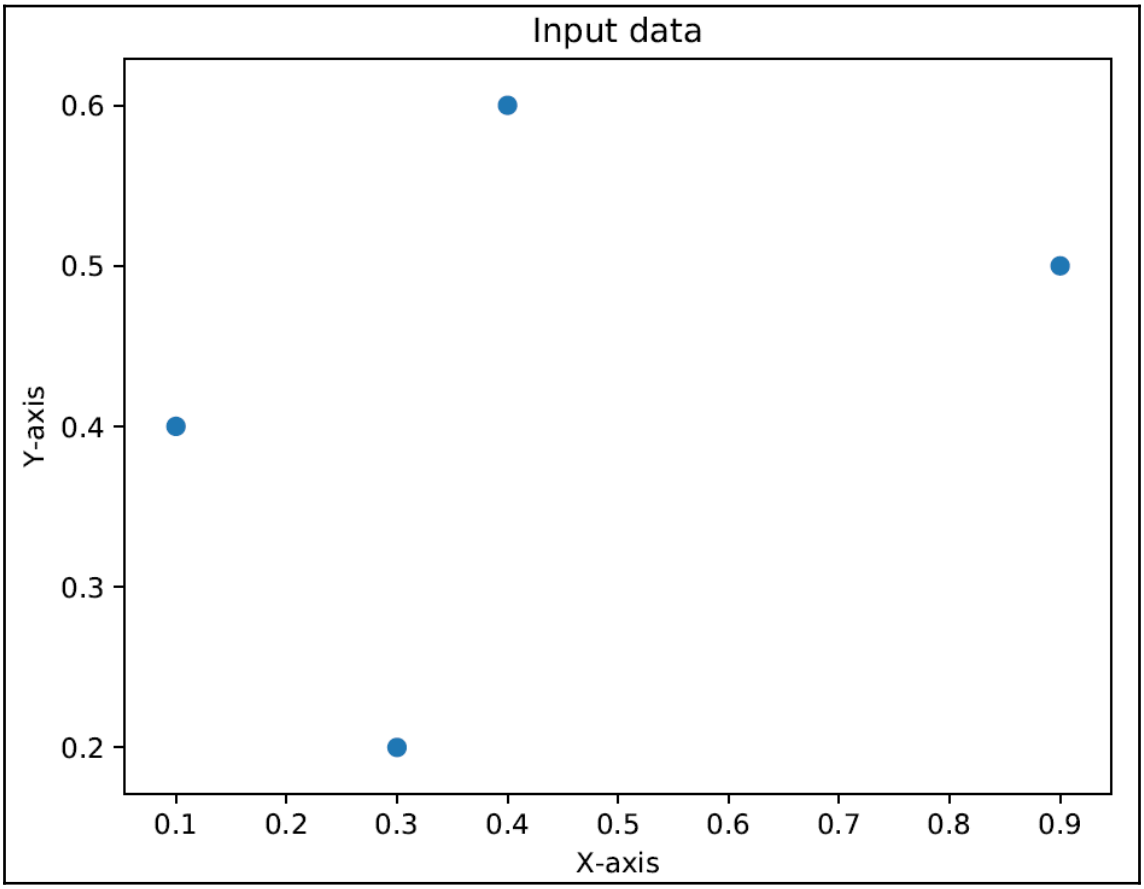


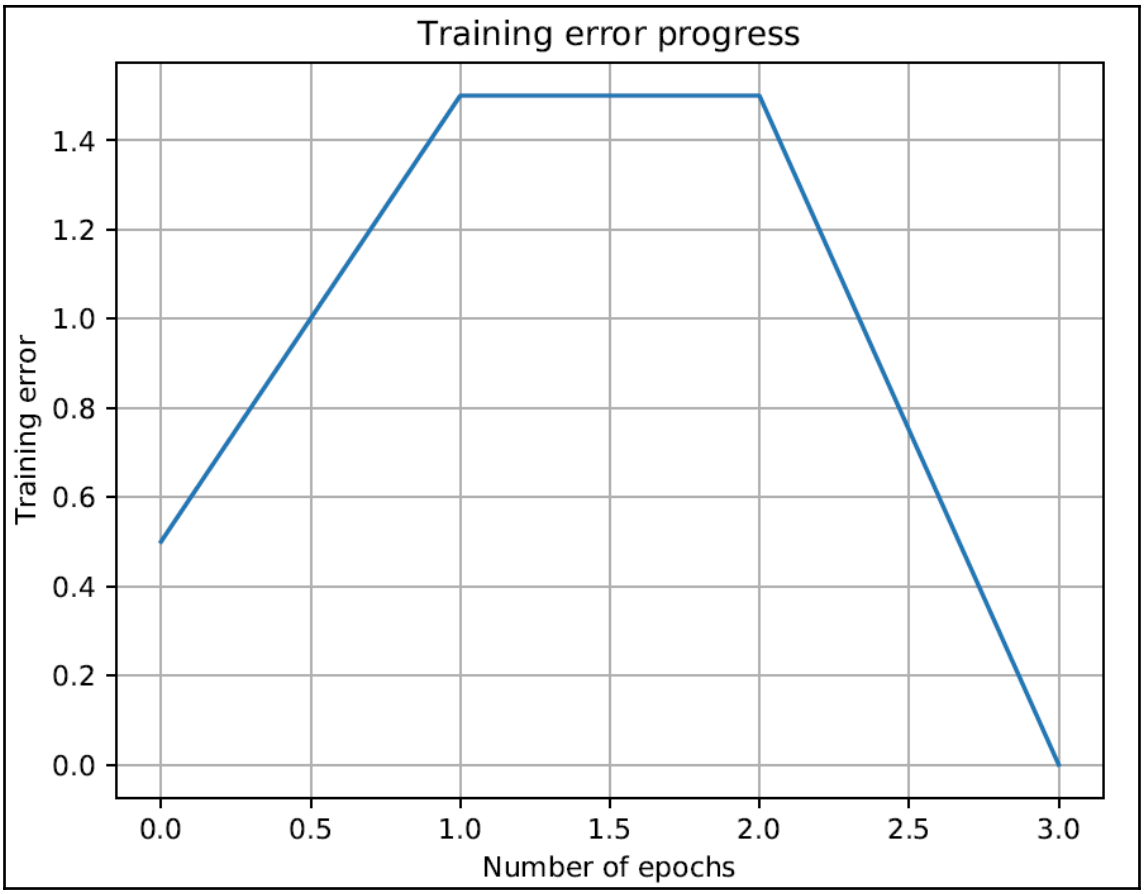


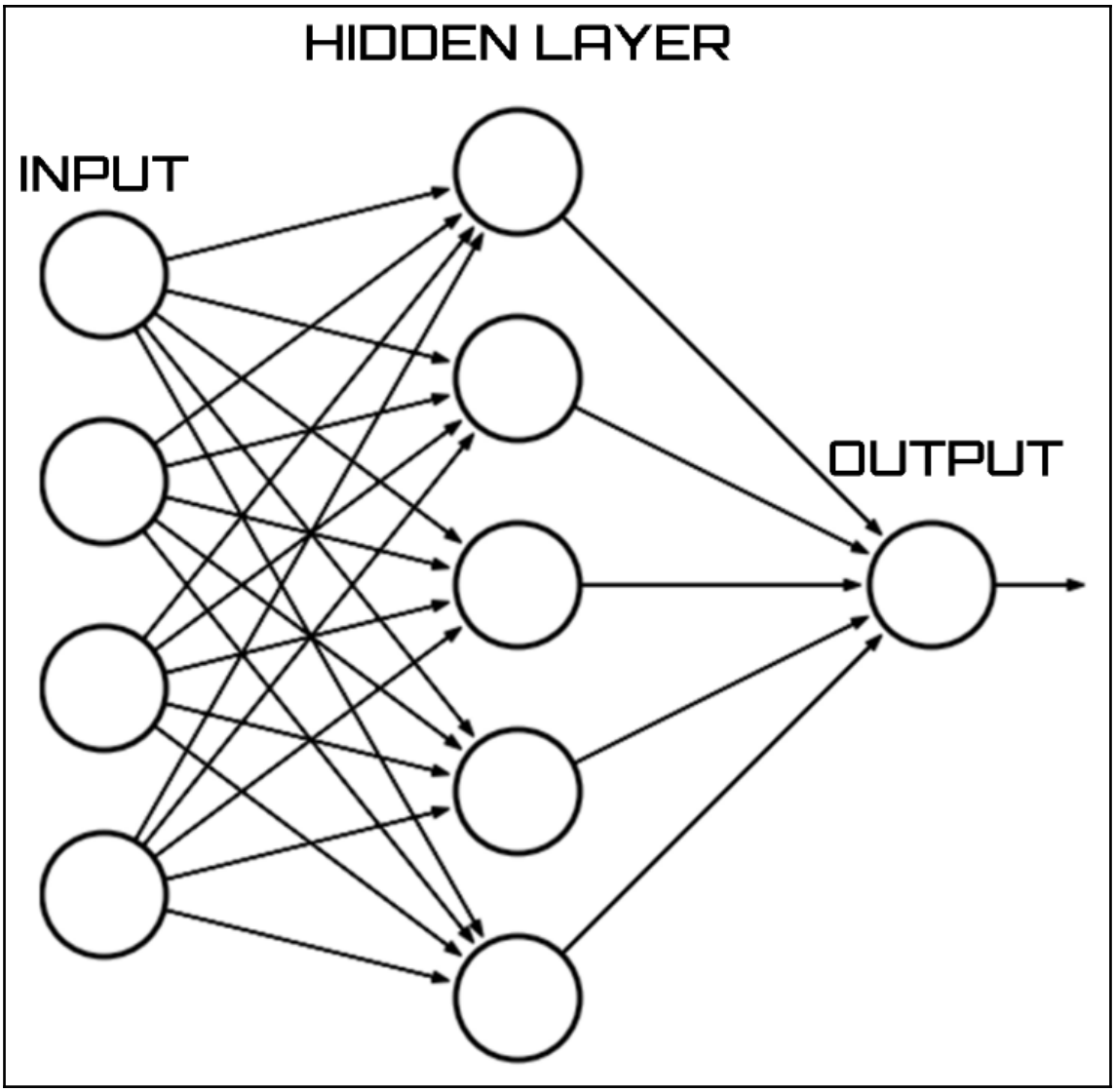

```
Score: 0.441
Final Q-Table Values
[[8.09790682e-02 9.69476193e-03 4.11286493e-03 3.72643060e-03]
 [1.28341407e-03 6.03882961e-04 8.06474557e-04 2.68672382e-01]
 [1.91967449e-03 1.92834234e-03 1.35171928e-03 1.44758358e-01]
 [7.17684420e-04 3.66341807e-07 1.37698057e-04 8.63455110e-02]
 [8.34610385e-02 4.22336752e-06 3.86592526e-05 1.25979894e-03]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]
 [2.97743191e-04 1.84465934e-05 1.15548361e-01 7.03460389e-06]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]
 [3.05085281e-05 8.22833888e-04 1.18894379e-03 9.85186767e-02]
 [5.88378899e-04 3.46691598e-01 3.80809242e-04 2.51803451e-04]
 [5.10025290e-01 1.83055349e-03 9.49003480e-04 2.15726641e-05]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]
 [0.00000000e+00 1.13547942e-03 7.02402188e-01 2.29674937e-04]
 [0.00000000e+00 0.00000000e+00 9.45161063e-01 0.00000000e+00]
 [0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]]
```

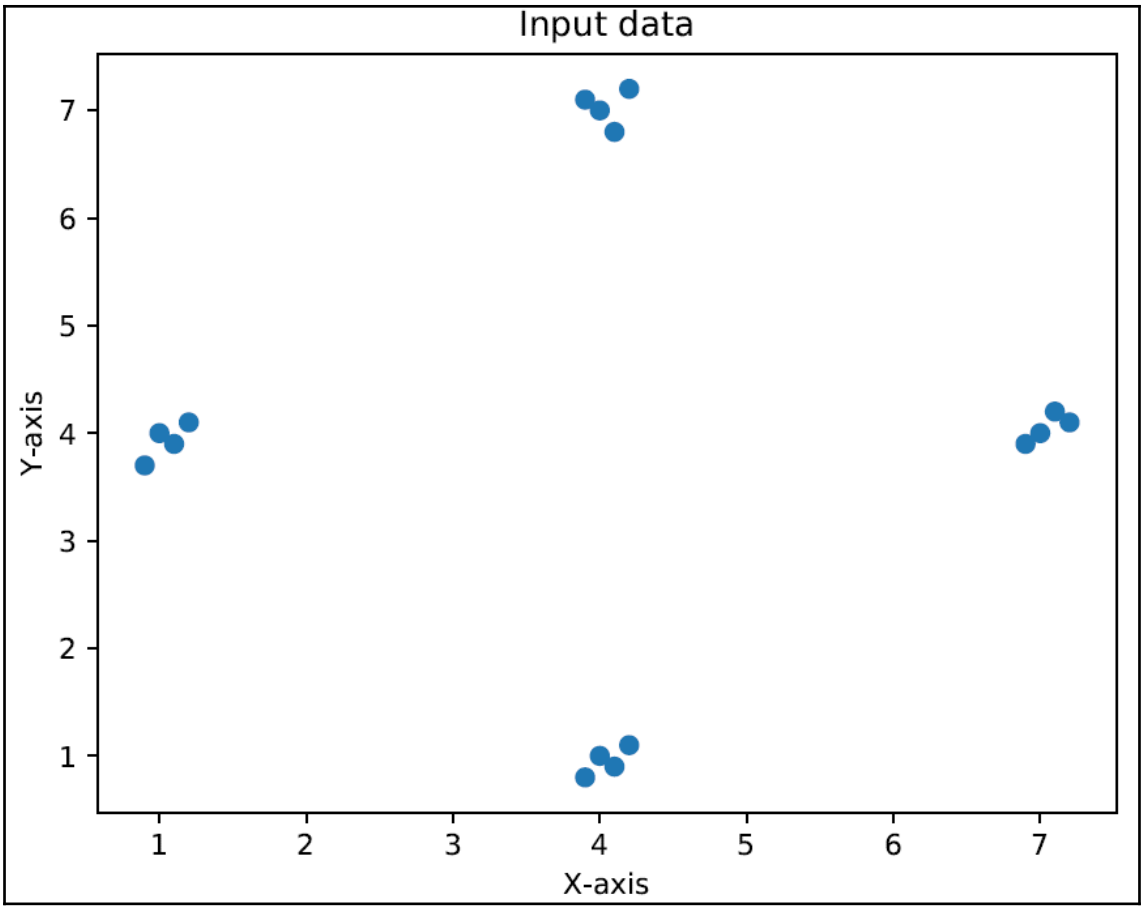
Chapter 13: Deep Neural Networks



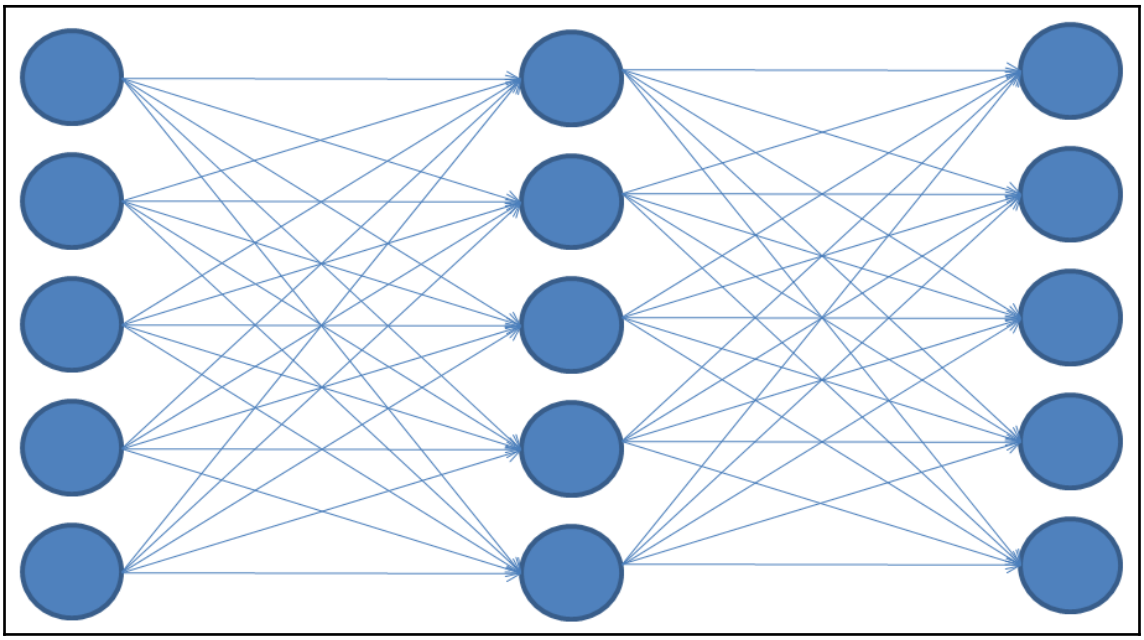


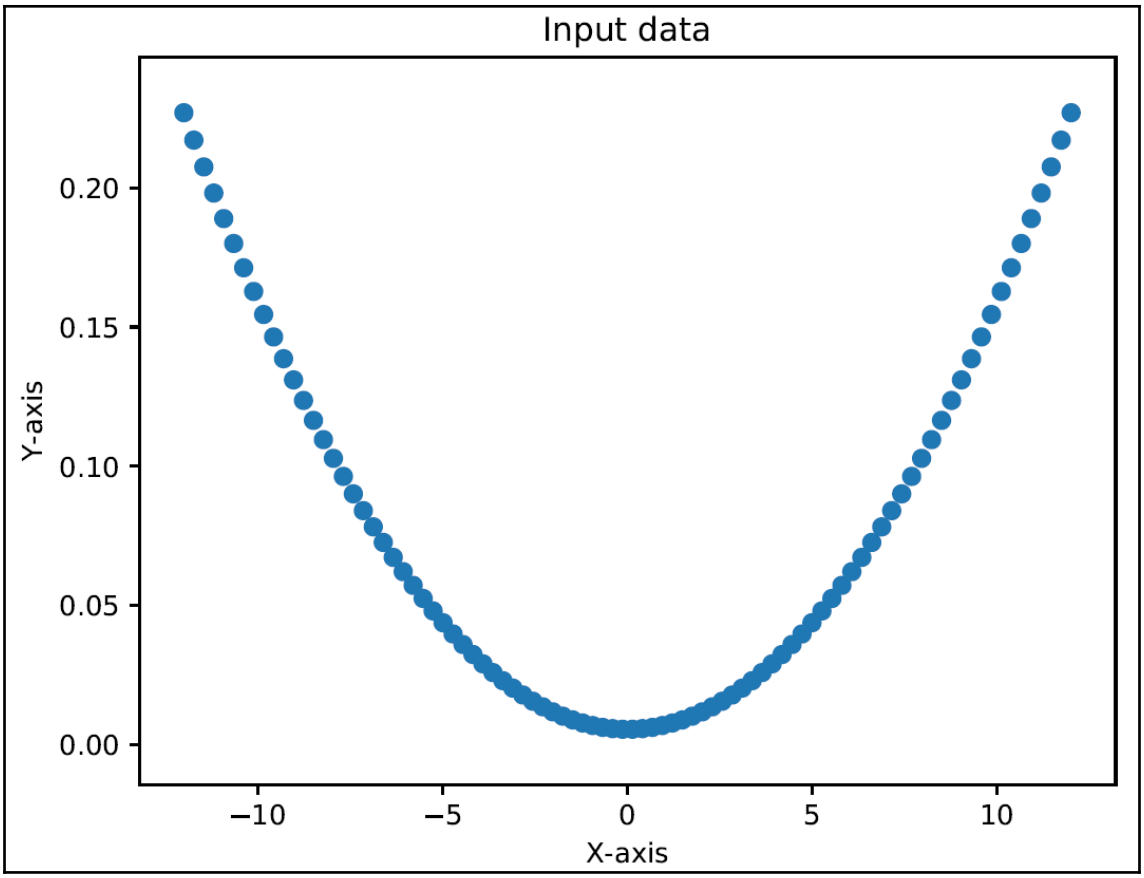

Training error progress
Training error
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Number of epochs

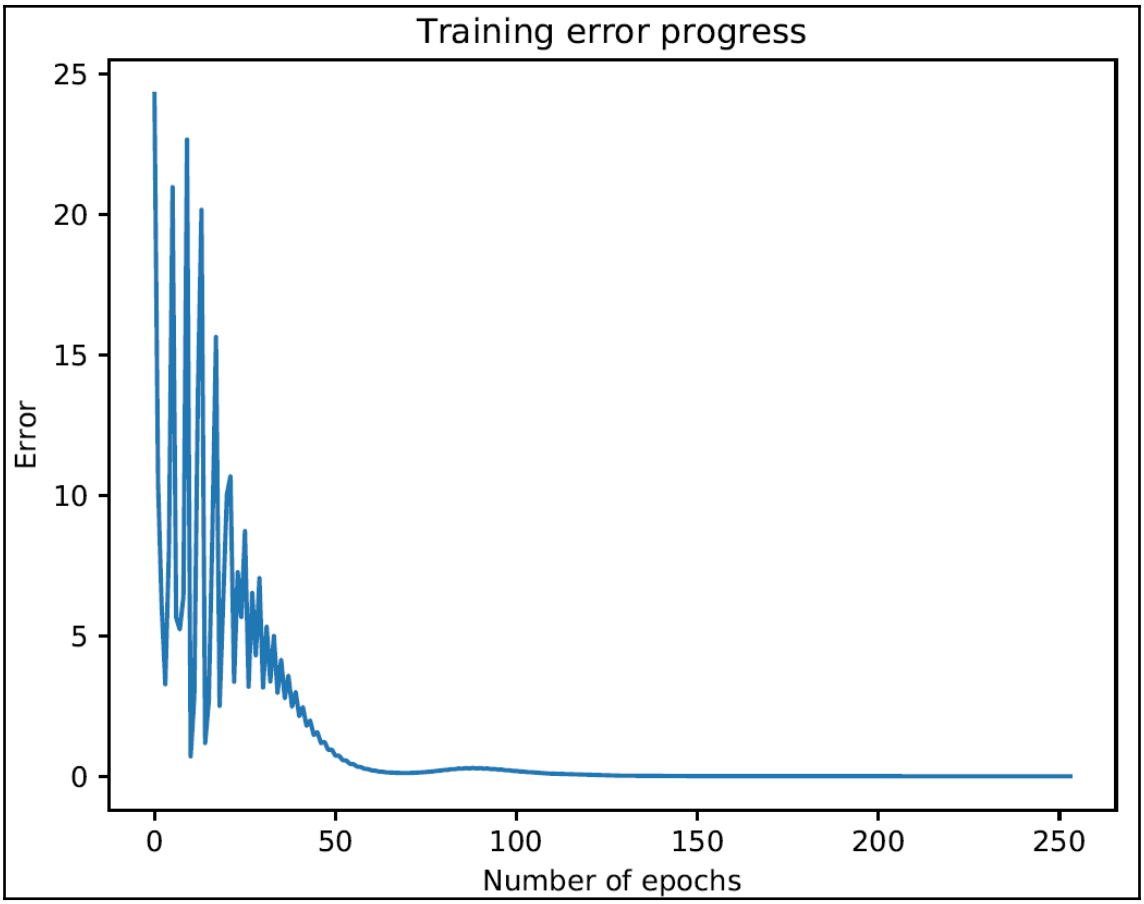

HIDDEN LAYER
INPUT
OUTPUT

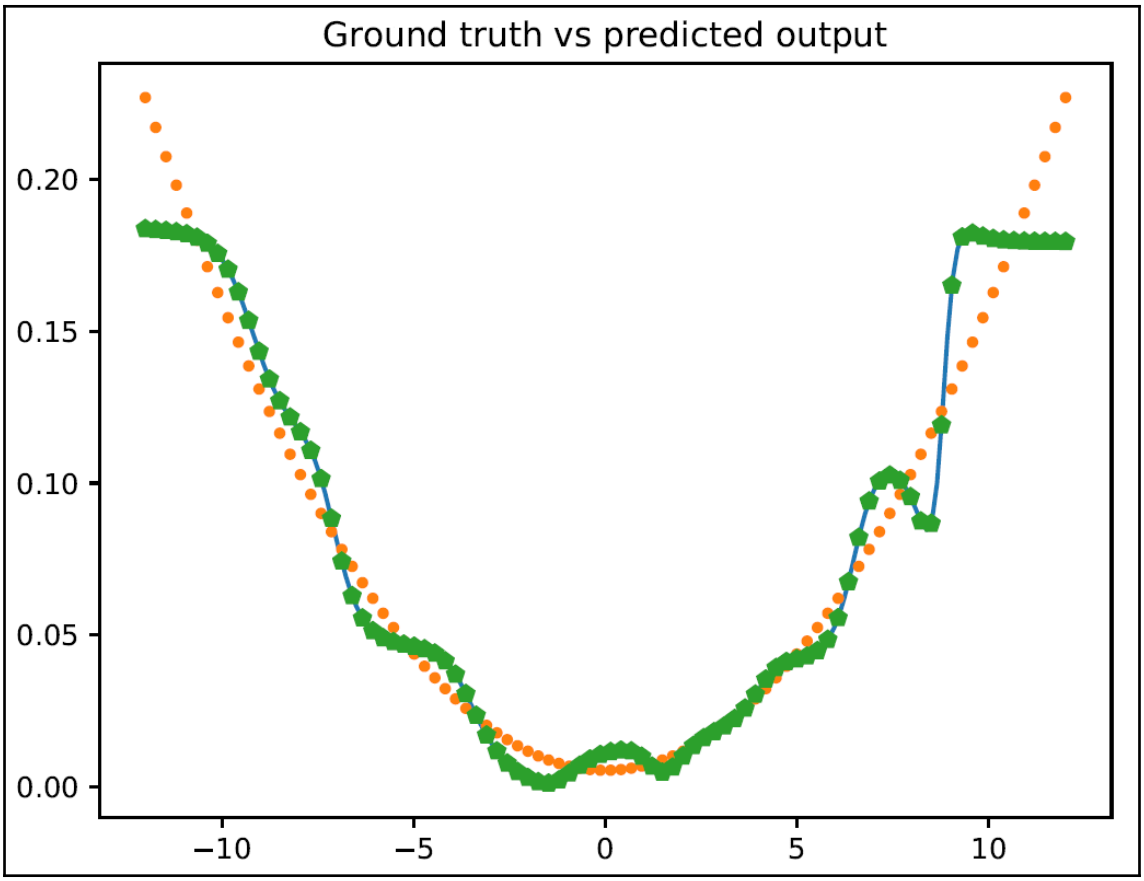

Input data
Y-axis
X-axis
1
2
3
4
5
6
7

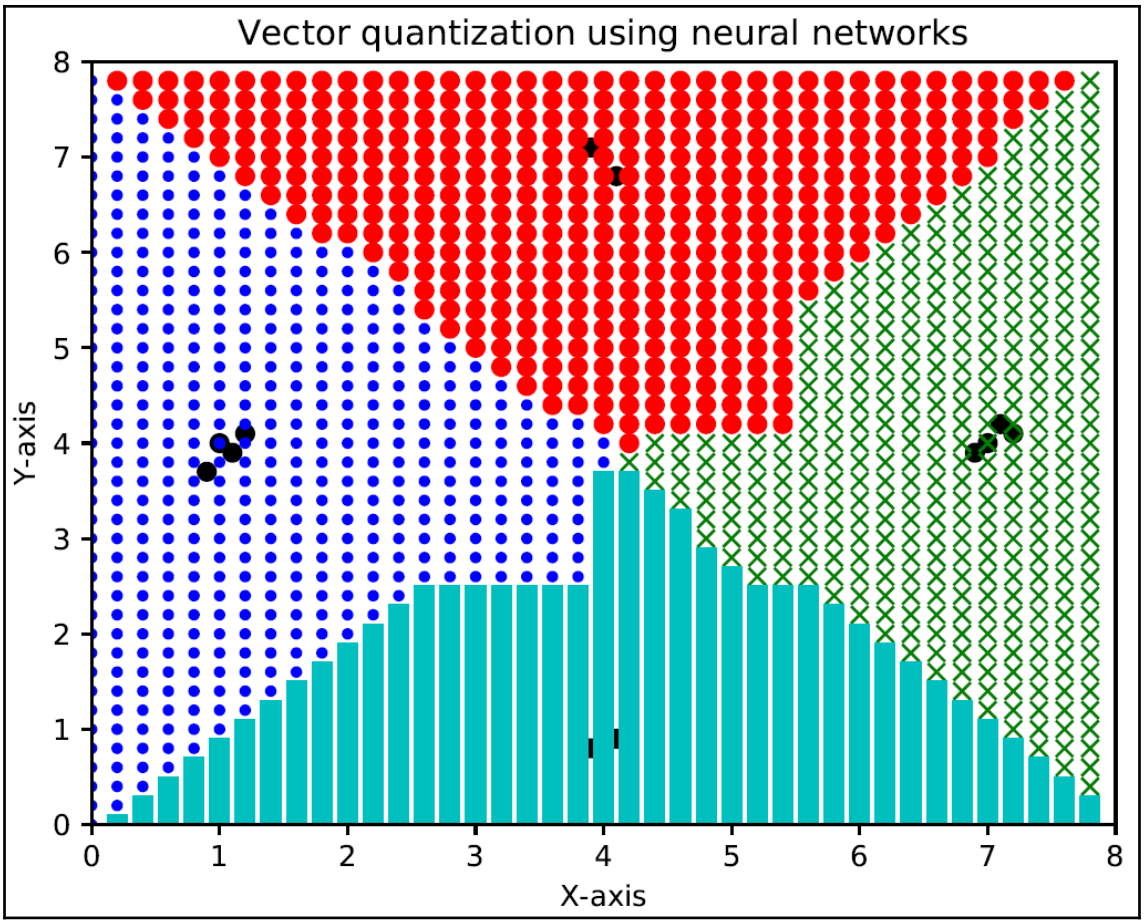
Training error progress
Training error
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
0
10
20
30
40
50
Number of epochs

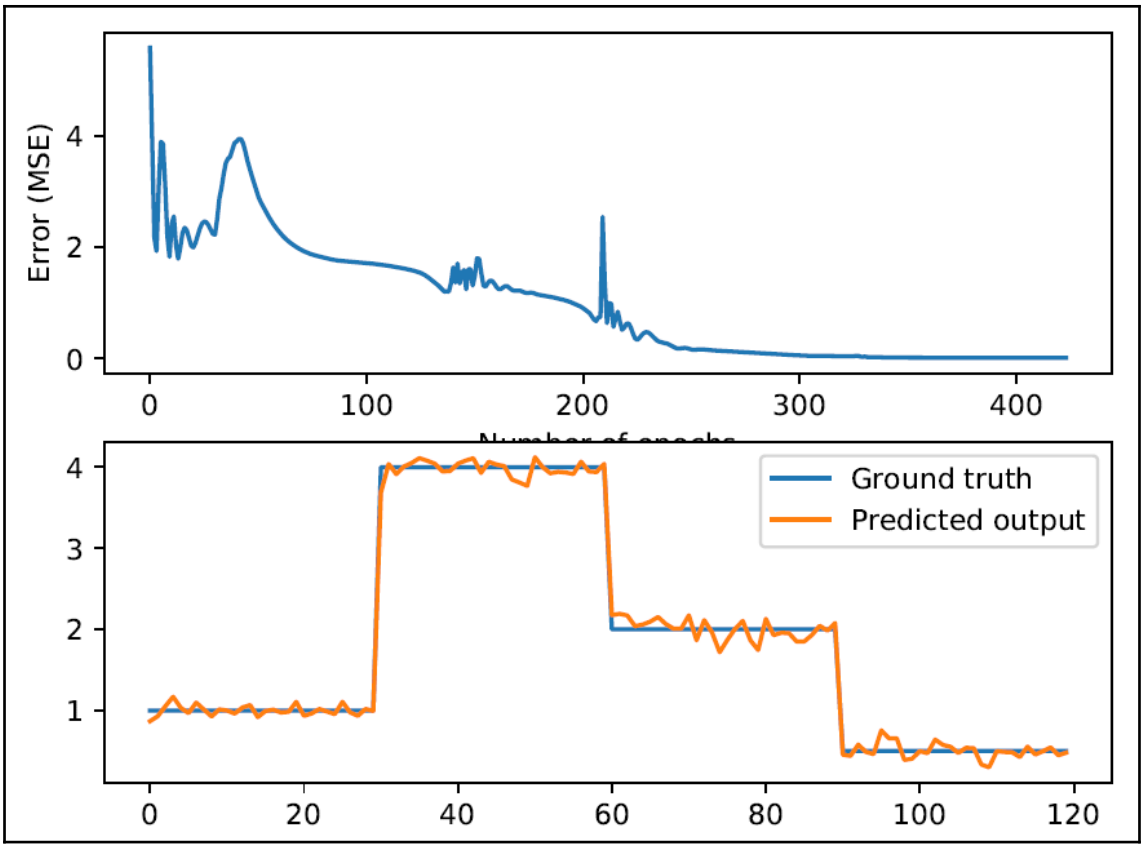


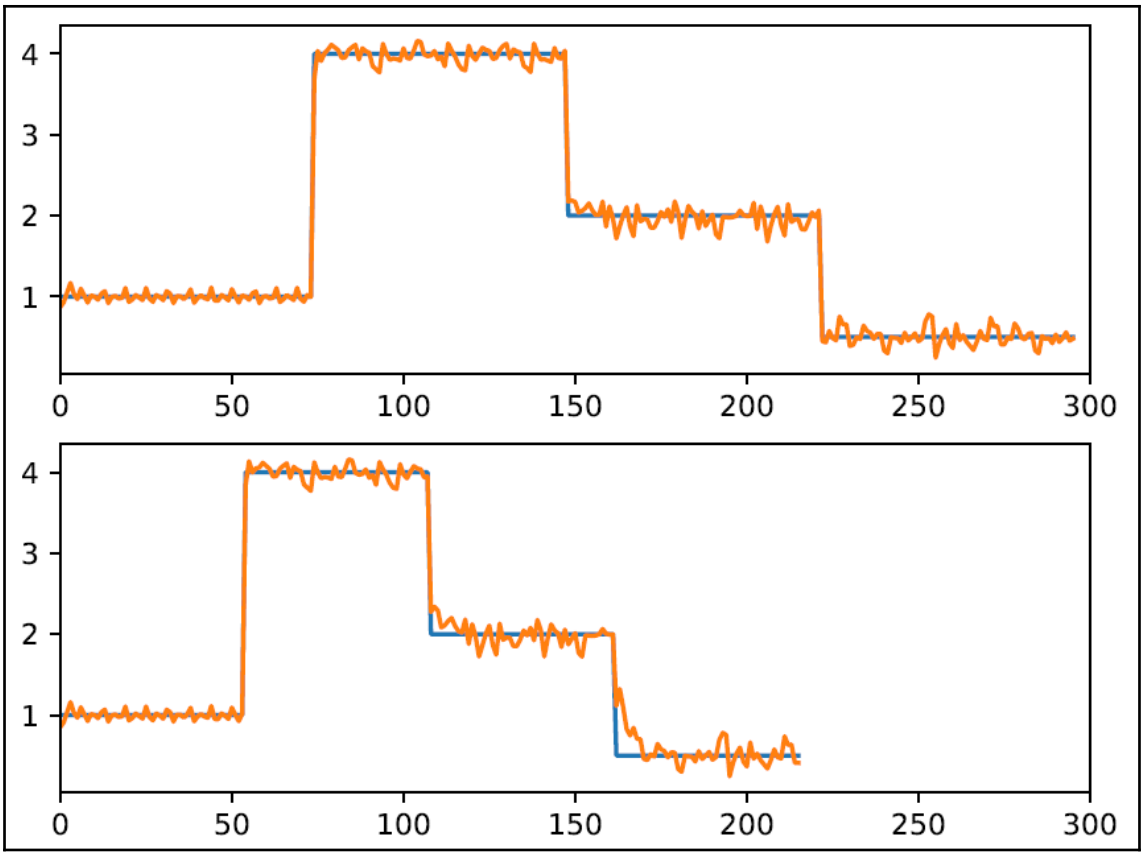

Input data
0.20
0.15
0.10
0.05
0.00
Y-axis
−10
−5
0
5
10
X-axis


Training error progress
Error
Number of epochs
25
20
15
10
5
0
0
50
100
150
200
250


Ground truth vs predicted output
0.20
0.15
0.10
0.05
0.00
−10
−5
0
5
10


Vector quantization using neural networks
Y-axis
X-axis
0
1
2
3
4
5
6
7
8


Error (MSE)
0
2
4
0
100
200
300
400
Ground truth
Predicted output
1
2
3
4
0
20
40
60
80
100
120

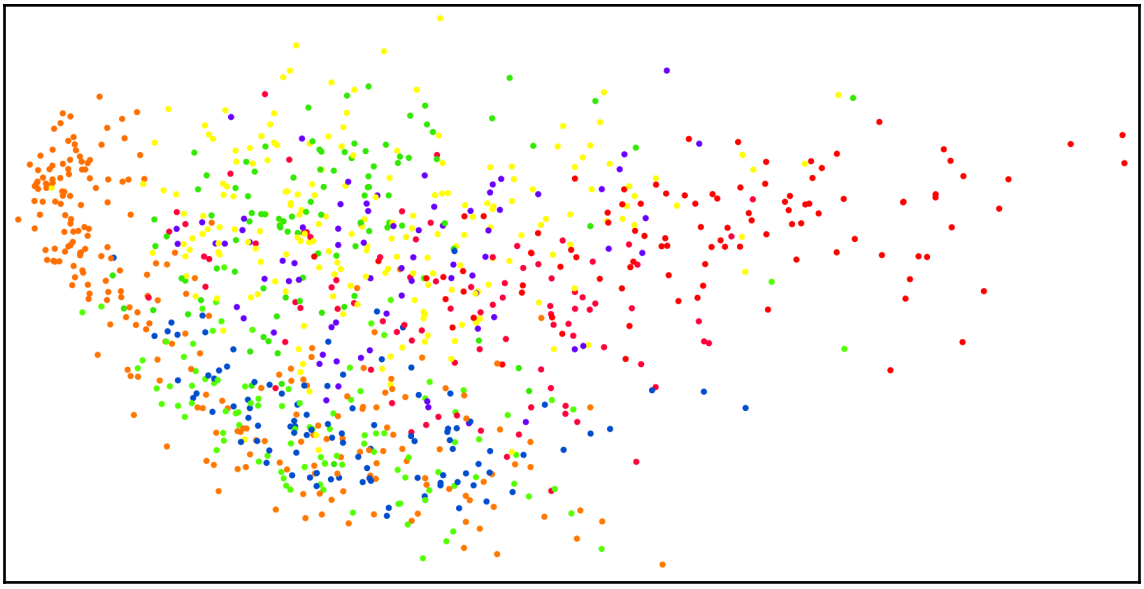

4
3
2
1
0
50
100
150
200
250
300
4
3
2
1
0
50
100
150
200
250
300

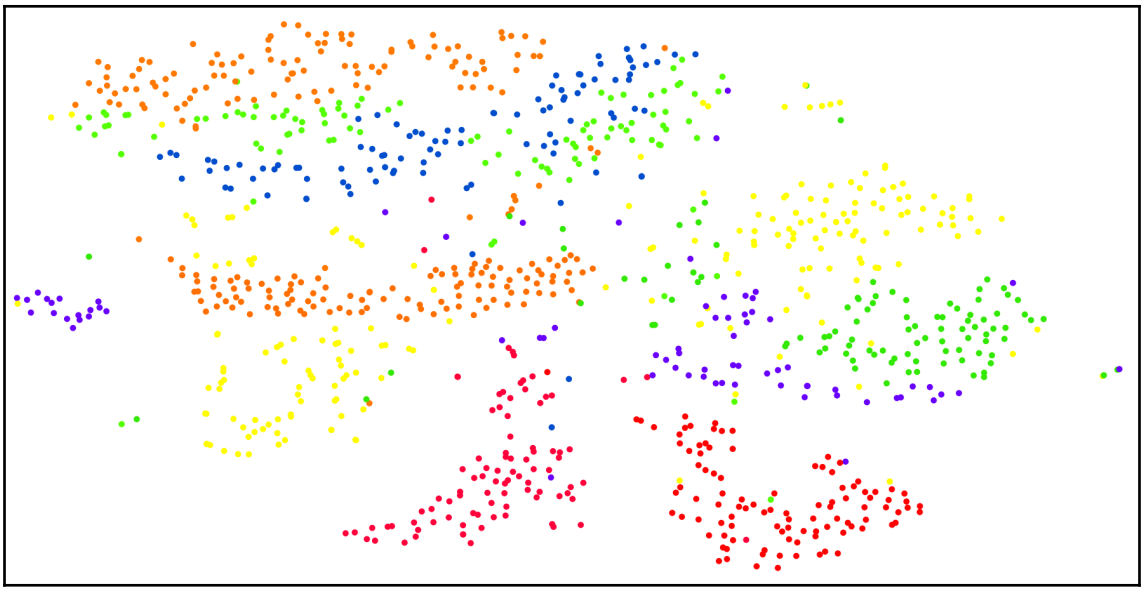
Chapter 14: Unsupervised Representation Learning

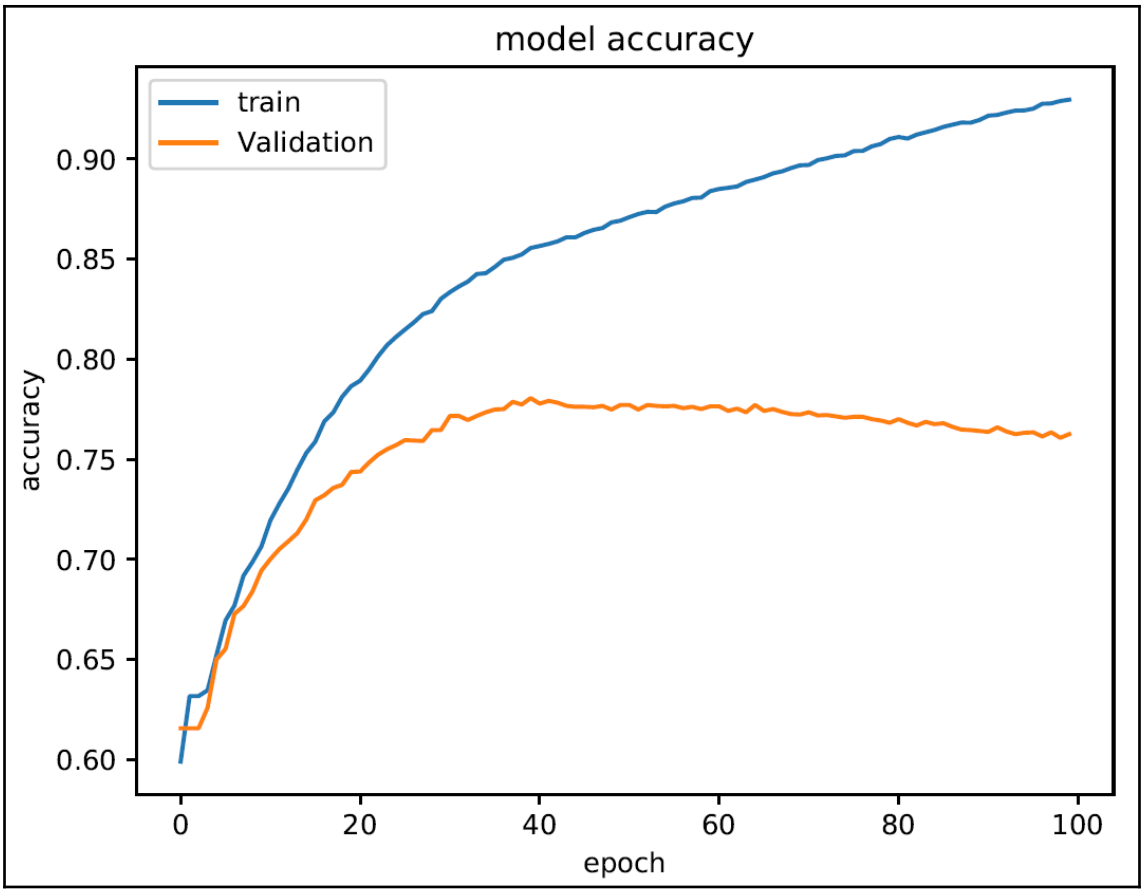
```
Layer (type)                 Output Shape              Param #
=================================================================
input_11 (InputLayer)        (None, 29)                0
_________________________________________________________________
dense_27 (Dense)             (None, 16)                480
_________________________________________________________________
dense_28 (Dense)             (None, 29)                493
=================================================================
Total params: 973
Trainable params: 973
Non-trainable params: 0
```

	Error	TrueClass
count	85443.000000	85443.000000
mean	0.626414	0.001580
std	3.109587	0.039718
min	0.021684	0.000000
25%	0.182318	0.000000
50%	0.307632	0.000000
75%	0.513372	0.000000
max	250.801476	1.000000

```
[ 2.9973486e-03 -2.1124829e-03  3.7657898e-03 -1.9050670e-03
 -5.5578595e-04  4.4527398e-03  3.5046584e-03 -1.1438223e-03
  6.0215552e-04 -4.7409125e-03  6.5806962e-04 -3.1985594e-03
  4.9693016e-03 -4.6585896e-03  3.9025352e-03  1.8993361e-03
 -3.1448407e-03 -3.9996076e-03 -8.3503849e-04  3.0914405e-03
  1.9336957e-03 -3.3351057e-03 -2.9735183e-03  2.7546713e-03
 -3.3761256e-03 -9.1228267e-04  3.2378505e-03  1.5043288e-03
  2.4148268e-03  2.5566125e-03  4.3902192e-03  2.9606789e-03
  3.2952502e-03  5.1441148e-04  4.9631284e-03  9.9989376e-04
  7.8822329e-04 -1.9999940e-03 -3.2441963e-03  3.4300482e-03
 -3.6022202e-03  1.4991680e-05 -2.6601211e-03  6.7162287e-04
 -3.7157589e-03  8.3351281e-04  4.1153287e-03  1.7590256e-03
  2.8772959e-03 -4.8740720e-03  4.2099557e-03 -3.3802991e-03
  6.6956610e-04 -6.9876245e-05  2.5645932e-03 -1.9160225e-03
  3.7302410e-03  4.5263176e-03  3.9929748e-03  2.4912667e-03
  1.7155730e-03  2.6570156e-03  4.7879852e-03 -2.6194321e-03
 -2.6944634e-03 -6.9214404e-04 -1.3537740e-03 -1.8741252e-04
  2.7855171e-03 -4.8087412e-03  4.6137013e-03  4.8322077e-03
 -4.5008543e-03  2.3164917e-03 -1.3799219e-03  3.4371777e-03
 -2.3554889e-03 -3.6085211e-03 -1.2845232e-03  3.0950166e-03
 -8.2744996e-04  1.9454588e-03 -3.5008623e-03  1.1105792e-03
  2.0449003e-03  1.3874291e-03 -2.0715776e-03  3.7589835e-03
  2.3339926e-03 -2.6291853e-03  7.2893663e-04 -3.3051639e-03
 -3.7970208e-04 -3.9213565e-03 -2.4992733e-03 -6.0153619e-04
  4.3616220e-03  4.7860332e-03 -2.0897989e-03 -5.8777170e-04]
```







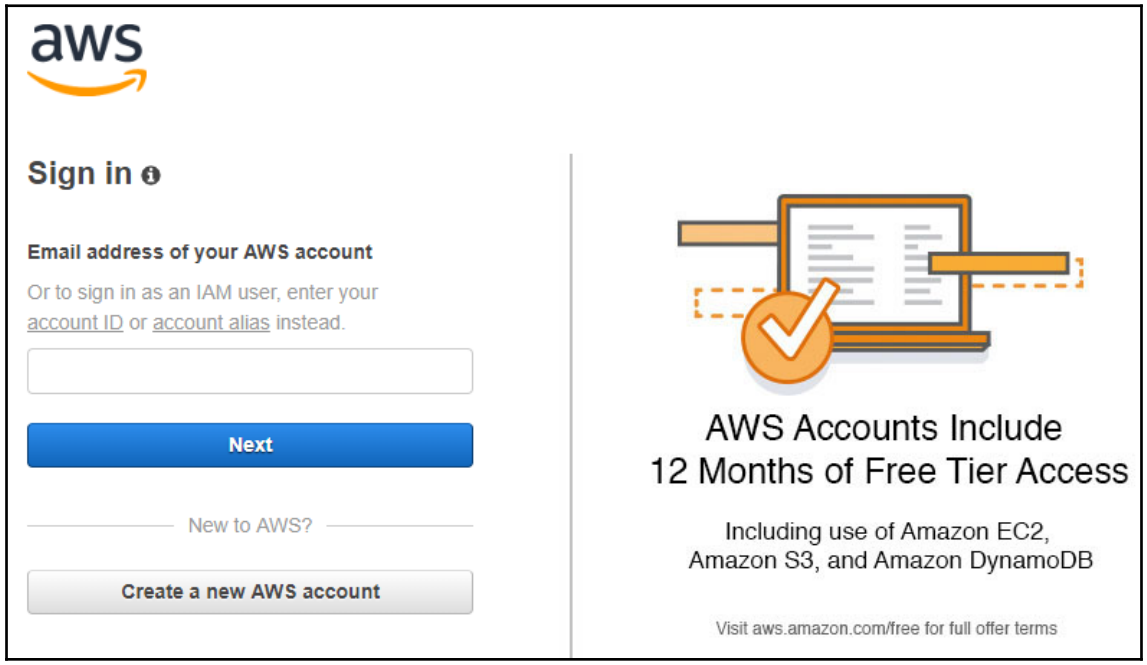

```
[[0.00446534 0.56017529 0.00444546 0.00448087 0.42643304]
 [0.00473608 0.23609134 0.00480174 0.11751968 0.63685116]
 [0.00465339 0.00467568 0.0046488  0.40054602 0.5854761 ]
 [0.0036422  0.00367292 0.00365825 0.00368085 0.98534578]
 [0.00391229 0.45669382 0.00393234 0.53151557 0.00394598]
 [0.49615403 0.49076604 0.00435414 0.00435434 0.00437146]
 [0.00371638 0.0824078  0.00375522 0.90637378 0.00374683]
 [0.00359108 0.41826357 0.00361352 0.00361033 0.57092149]
 [0.00475393 0.00476904 0.00473842 0.25953364 0.72620497]
 [0.00345123 0.98611337 0.0034578  0.00349065 0.00348694]]
```

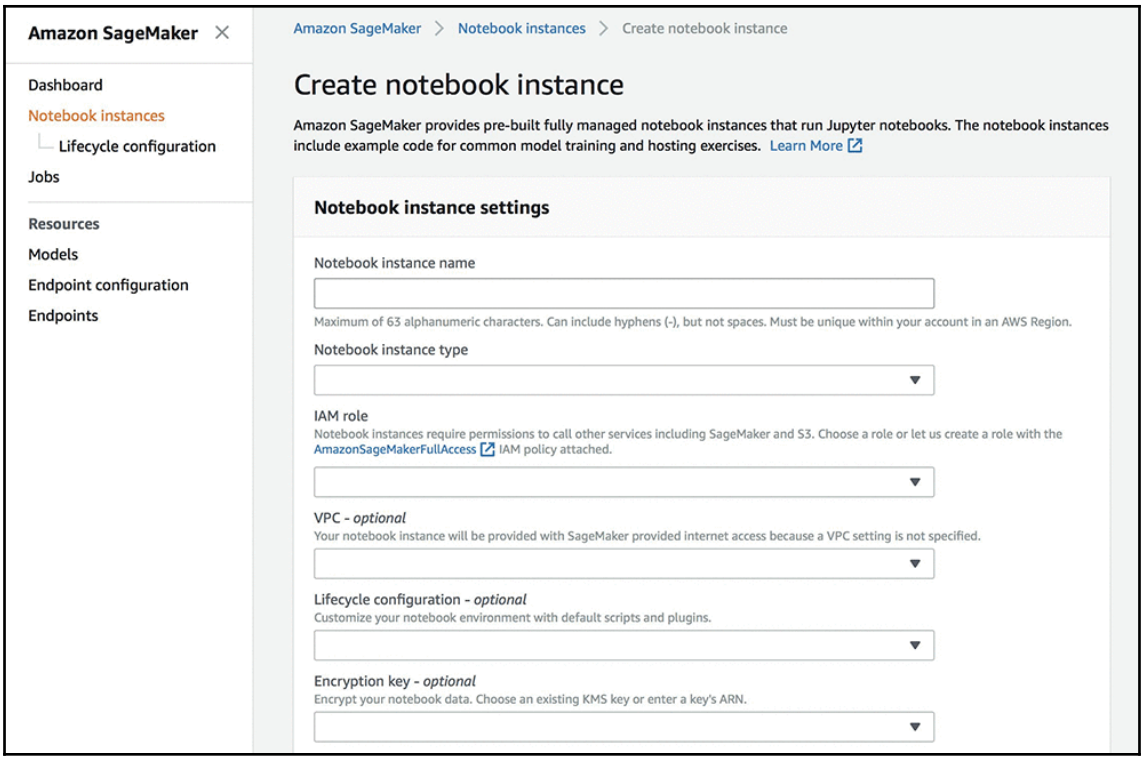
```
Topic 0: ax max b8f pl g9v 1d9 a86 34u 145 3t 0t 2tm wm 1t giz bhj 7ey sl bxn gk
Topic 1: key encryption chip keys des clipper security bit algorithm public law
         use used ripem number data escrow product enforcement cipher
Topic 2: people don just think god like does know say believe time good make way
         did said really right ve things
Topic 3: price 00 car sale new 50 excellent edu 20 condition shipping offer best
         asking old tape interested hard used send
Topic 4: cancer medical air hiv health research aids gun 800 care number center
         10 volume patients insurance page dr disease april
Topic 5: file use like edu program output windows thanks know available mail ftp
         does files need info don email help good
Topic 6: 55 10 18 11 17 40 14 12 24 15 16 period 34 pp 25 13 19 28 widget 20
Topic 7: new space people information university like time 1993 years available
         service know work public use center internet program technology nasa
Topic 8: drive card master slave mode video drives screen problem pin use driver
         16 bus jumper using disk apple scsi memory
Topic 9: game play team year games got season dod power bike second good like
         just right win great hit puck flyers
```

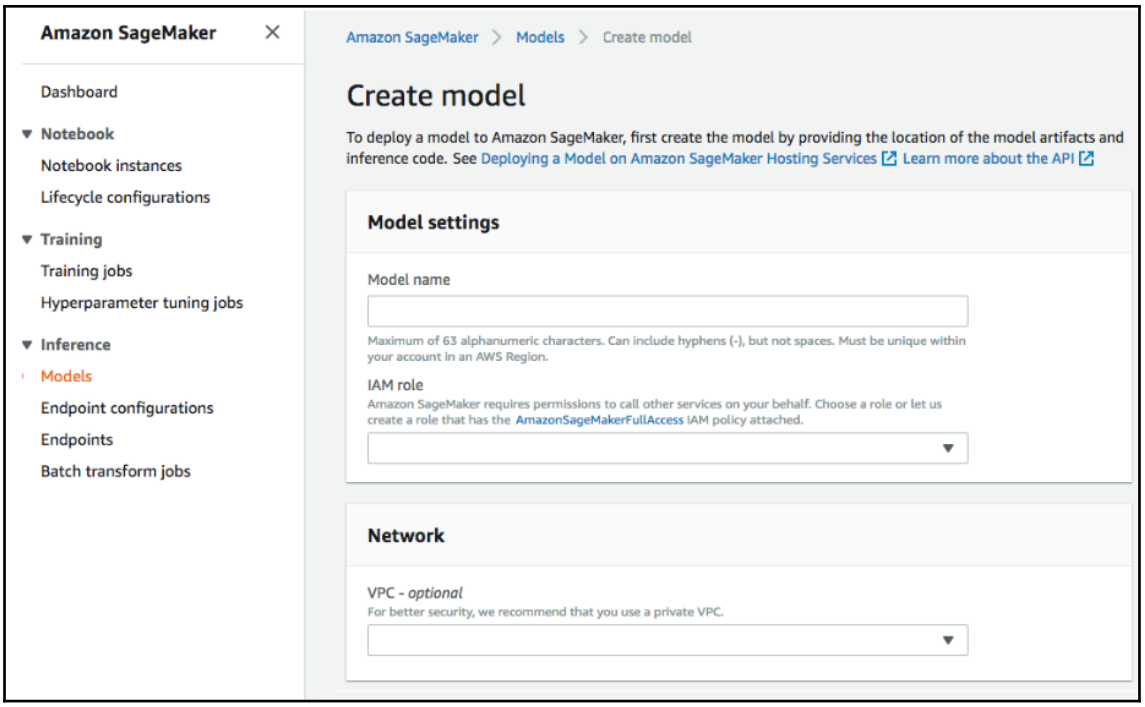
Chapter 15: Automated Machine Learning and Transfer Learning

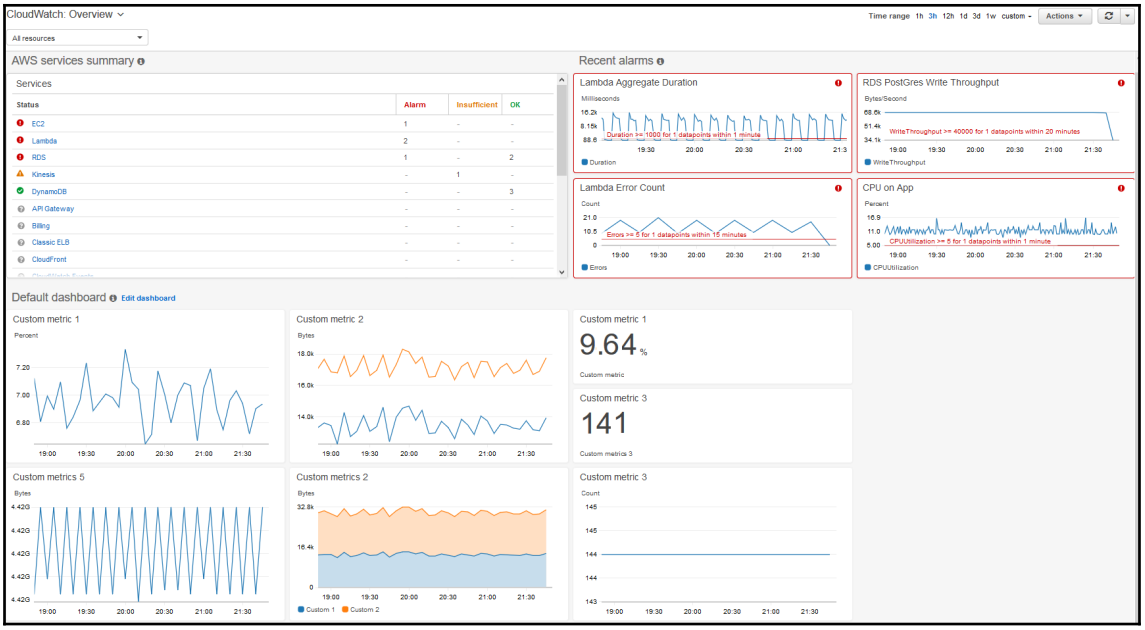
Chapter 16: Unlocking Production Issues

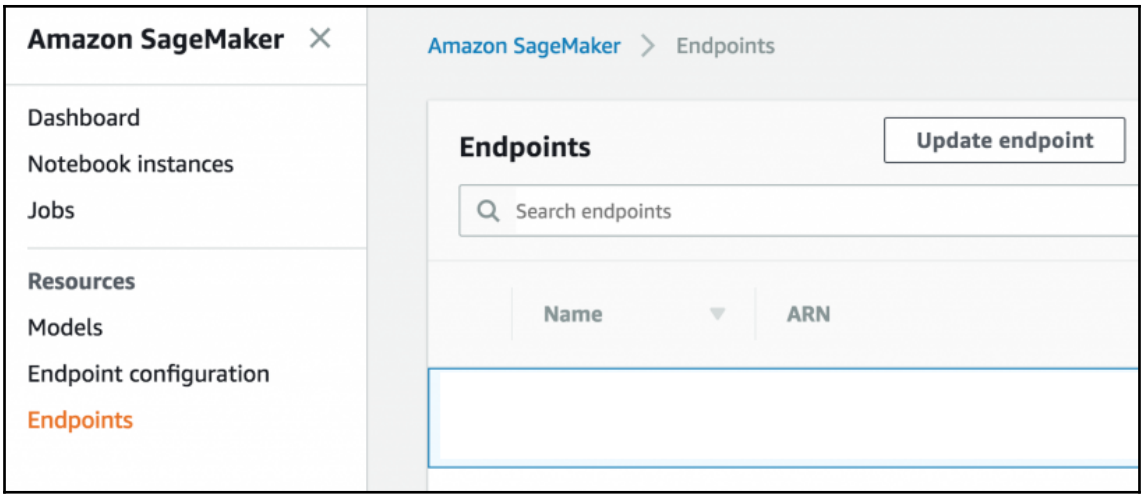
```
Shaksperean Revival ! ! !                    shaksperean revival
Wonderful Attraction!                        wonderful attraction
For One Night Only!                          for one night only
The world renowned tragedians,               the world renowned tragedians
David Garrick the Younger, of Drury Lane Theatre London,   david garrick the younger of drury lane theatre london
and                                          and
Edmund Kean the elder, of the Royal Haymarket Theatre,     edmund kean the elder of the royal haymarket theatre
Whitechapel, Pudding Lane, Piccadilly, London, and the     whitechapel pudding lane piccadilly london and the
Royal Continental Theatres, in their sublime               royal continental theatres in their sublime
Shaksperean Spectacle entitled               shaksperean spectacle entitled
The Balcony Scene                            the balcony scene
in                                           in
Romeo and Juliet ! ! !                       romeo and juliet
Romeo...................Mr. Garrick         romeo mr garrick
Juliet..................Mr. Kean            juliet mr kean
Assisted by the whole strength of the company!   assisted by the whole strength of the company
New costumes, new scenes, new appointments!      new costumes new scenes new appointments
Also:                                        also
The thrilling, masterly, and blood-curdling      the thrilling masterly and blood curdling
Broad-sword conflict In Richard III. ! ! !       broad sword conflict in richard iii
Richard III.............Mr. Garrick         richard iii mr garrick
Richmond................Mr. Kean            richmond mr kean
Also:                                        also
(by special request)                          by special request
Hamlet's Immortal Soliloquy ! !              hamlet's immortal soliloquy
By The Illustrious Kean!                     by the illustrious kean
Done by him 300 consecutive nights in Paris!     done by him consecutive nights in paris
For One Night Only, On account of imperative European engagements!   for one night only on account of imperative european engagements
Admission 25 cents; children and servants, 10 cents.   admission cents children and servants cents
```




Amazon SageMaker
Dashboard
Notebook instances
Lifecycle configuration
Jobs
Resources
Models
Endpoint configuration
Endpoints
Amazon SageMaker > Notebook instances > Create notebook instance
Create notebook instance
Amazon SageMaker provides pre-built fully managed notebook instances that run Jupyter notebooks. The notebook instances include example code for common model training and hosting exercises. Learn More
Notebook instance settings
Notebook instance name
Maximum of 63 alphanumeric characters. Can include hyphens (-), but not spaces. Must be unique within your account in an AWS Region.
Notebook instance type
IAM role
Notebook instances require permissions to call other services including SageMaker and S3. Choose a role or let us create a role with the AmazonSageMakerFullAccess IAM policy attached.
VPC - optional
Your notebook instance will be provided with SageMaker provided internet access because a VPC setting is not specified.
Lifecycle configuration - optional
Customize your notebook environment with default scripts and plugins.
Encryption key - optional
Encrypt your notebook data. Choose an existing KMS key or enter a key's ARN.


Amazon SageMaker
Dashboard
Notebook
Notebook instances
Lifecycle configurations
Training
Training jobs
Hyperparameter tuning jobs
Inference
Models
Endpoint configurations
Endpoints
Batch transform jobs
Amazon SageMaker > Models > Create model
Create model
To deploy a model to Amazon SageMaker, first create the model by providing the location of the model artifacts and inference code. See Deploying a Model on Amazon SageMaker Hosting Services Learn more about the API
Model settings
Model name
Maximum of 63 alphanumeric characters. Can include hyphens (-), but not spaces. Must be unique within your account in an AWS Region.
IAM role
Amazon SageMaker requires permissions to call other services on your behalf. Choose a role or let us create a role that has the AmazonSageMakerFullAccess IAM policy attached.
Network
VPC - optional
For better security, we recommend that you use a private VPC.


CloudWatch: Overview
AWS services summary
Recent alarms
Lambda Aggregate Duration
RDS PostGres Write Throughput
Lambda Error Count
CPU on App
Default dashboard
Edit dashboard
Custom metric 1
9.64
Custom metric 3
141
Custom metrics 5
Custom metrics 2


Amazon SageMaker
Dashboard
Notebook instances
Jobs
Resources
Models
Endpoint configuration
Endpoints
Amazon SageMaker
Endpoints
Endpoints
Update endpoint
Search endpoints
Name
ARN