【python数据挖掘课程】十.Pandas、Matplotlib、PCA绘图实用代码补充

这篇文章主要是最近整理《数据挖掘与分析》课程中的作品及课件过程中，收集了几段比较好的代码供大家学习。同时，做数据分析到后面，除非是研究算法创新的，否则越来越觉得数据非常重要，才是有价值的东西。后面的课程会慢慢讲解Python应用在Hadoop和Spark中，以及networkx数据科学等知识。
如果文章中存在错误或不足之处，还请海涵~希望文章对你有所帮助。

一. Pandas获取数据集并显示

采用Pandas对2002年~2014年的商品房价数据集作时间序列分析，从中抽取几个城市与贵阳做对比，并对贵阳商品房作出分析。

数据库：主要城市年度数据			By：CSDN Eastmount					
商品房平均销售价格(元/平方米)								
year	北京	重庆	深圳	贵阳	昆明	上海	武汉	长沙
2002	4764	1556	5802	1643	2276	4134	1928	1802
2003	4737	1596	6256	1949	2233	5118	2072	2040
2004	5020.93	1766.24	6756.24	1801.68	2473.78	5855	2516.32	2039.09
2005	6788.09	2134.99	7582.27	2168.9	2639.72	6842	3061.77	2313.73
2006	8279.51	2269.21	9385.34	2372.66	2903.32	7196	3689.64	2644.15
2007	11553.26	2722.58	14049.69	2901.63	3108.12	8361	4664.03	3304.74
2008	12418	2785	12665	3149	3750	8195	4781	3288
2009	13799	3442	14615	3762	3807	12840	5329	3648
2010	17782	4281	19170	4410	3660	14464	5746	4418
2011	16851.95	4733.84	21350.13	5069.52	4715.23	14603.24	7192.9	5862.39
2012	17021.63	5079.93	19589.82	4846.14	5744.68	14061.37	7344.05	6100.87
2013	18553	5569	24402	5025	5795	16420	7717	6292
2014	18833	5519	24723	5608	6384	16787	7951	6116

数据集位32.csv，具体值如下：（读者可直接复制）

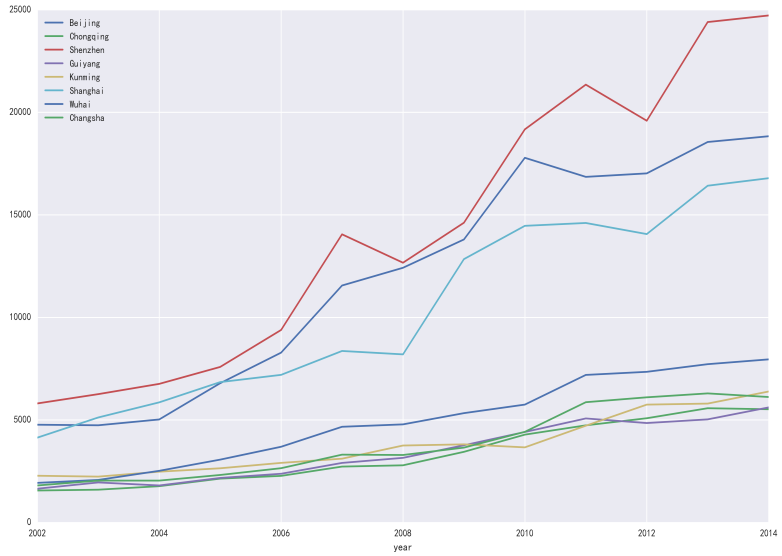
```
year    Beijing Chongqing       Shenzhen        Guiyang Kunming
Shanghai        Wuhai   Changsha
2002    4764.00         1556.00         5802.00         1643.00
2276.00         4134.00         1928.00         1802.00
2003    4737.00         1596.00         6256.00         1949.00
2233.00         5118.00         2072.00         2040.00
2004    5020.93         1766.24         6756.24         1801.68
2473.78         5855.00         2516.32         2039.09
2005    6788.09         2134.99         7582.27         2168.90
2639.72         6842.00         3061.77         2313.73
2006    8279.51         2269.21         9385.34         2372.66
2903.32         7196.00         3689.64         2644.15
2007    11553.26        2722.58         14049.69        2901.63
3108.12         8361.00         4664.03         3304.74
2008    12418.00        2785.00         12665.00        3149.00
3750.00         8195.00         4781.00         3288.00
2009    13799.00        3442.00         14615.00        3762.00
3807.00         12840.00        5329.00         3648.00
2010    17782.00        4281.00         19170.00        4410.00
3660.00         14464.00        5746.00         4418.00
2011    16851.95        4733.84         21350.13        5069.52
4715.23         14603.24        7192.90         5862.39
2012    17021.63        5079.93         19589.82        4846.14
5744.68         14061.37        7344.05         6100.87
2013    18553.00        5569.00         24402.00        5025.00
5795.00         16420.00        7717.00         6292.00
2014    18833.00        5519.00         24723.00        5608.00
6384.00         16787.00        7951.00         6116.00
```

绘制对比各个城市的商品房价数据代码如下所示：

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 10:55:17 2017

@author: eastmount
"""

import pandas as pd
data = pd.read_csv("32.csv",index_col='year') #index_col用作行索引的列名
#显示前6行数据
print(data.shape)
```

```
print(data.head(6))
import matplotlib.pyplot as plt
plt.rcParams['font.sans-serif'] = ['simHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus'] = False   #用来正常显示负号
data.plot()
plt.savefig(u'时序图.png', dpi=500)
plt.show()
```

输出如下所示：



重点知识：

1、plt.rcParams显示中文及负号；

2、plt.savefig保存图片至本地；

3、pandas直接读取数据显示绘制图形，index_col获取索引。

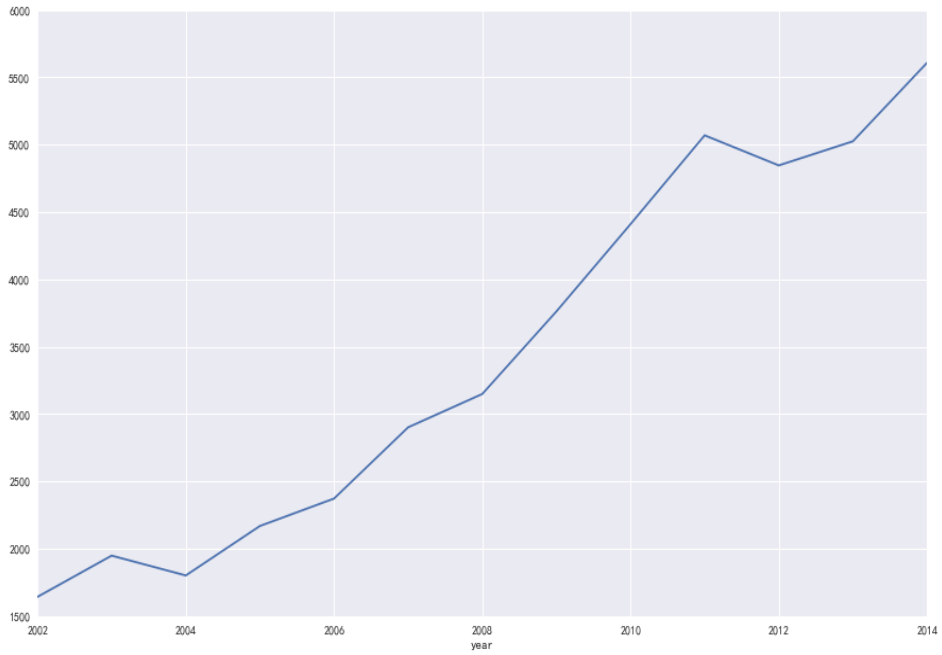
二. Pandas获取某列数据绘制柱状图

接着上面的实验，我们需要获取贵阳那列数据，再绘制相关图形。

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 10:55:17 2017
```

```
@author: eastmount
"""

import pandas as pd
data = pd.read_csv("32.csv",index_col='year') #index_col用作行索引的列名
#显示前6行数据
print(data.shape)
print(data.head(6))

import matplotlib.pyplot as plt
plt.rcParams['font.sans-serif'] = ['simHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus'] = False   #用来正常显示负号
data.plot()
plt.savefig(u'时序图.png', dpi=500)
plt.show()

#获取贵阳数据集并绘图
gy = data['Guiyang']
print u'输出贵阳数据'
print gy
gy.plot()
plt.show()
```

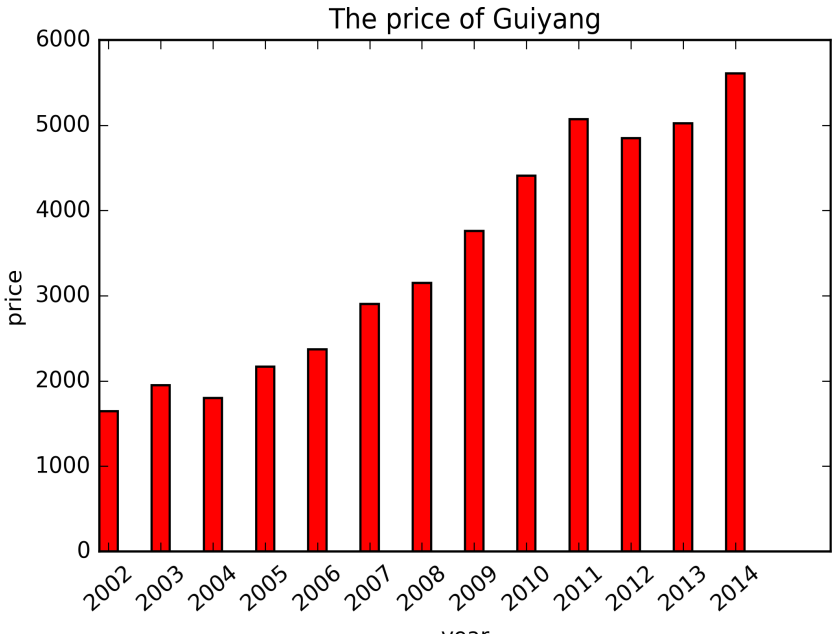
通过data['Guiyang']获取某列数据，然后再进行绘制如下所示：



通过这个数据集调用bar函数可以绘制对应的柱状图，如下所示，需要注意x轴位年份，获取两列数据进行绘图。

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 10:55:17 2017

@author: eastmount
"""

import pandas as pd
data = pd.read_csv("32.csv",index_col='year') #index_col用作行索引的列名
#显示前6行数据
print(data.shape)
print(data.head(6))
#获取贵阳数据集并绘图
gy = data['Guiyang']
print u'输出贵阳数据'
print gy

import numpy as np
x = ['2002','2003','2004','2005','2006','2007','2008',
     '2009','2010','2011','2012','2013','2014']
N = 13
ind = np.arange(N)  #赋值0-13
width=0.35
plt.bar(ind, gy, width, color='r', label='sum num')
#设置底部名称
plt.xticks(ind+width/2, x, rotation=40) #旋转40度
plt.title('The price of Guiyang')
plt.xlabel('year')
plt.ylabel('price')
plt.savefig('guiyang.png',dpi=400)
plt.show()
```

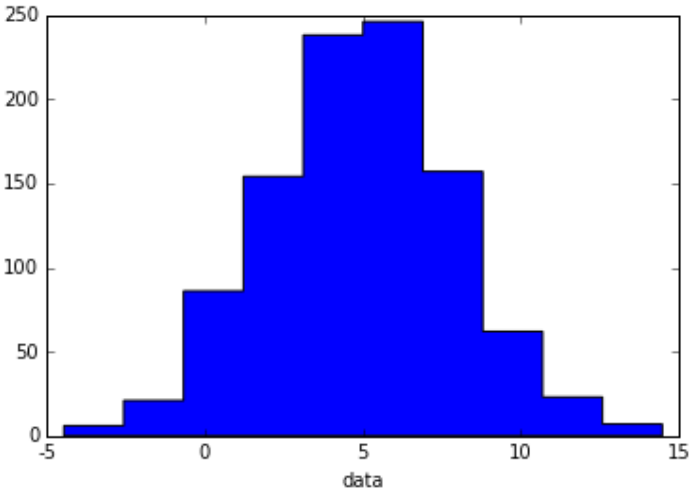
输出如下图所示:



补充一段hist绘制柱状图的代码：

```
import numpy as np
import pylab as pl
# make an array of random numbers with a gaussian distribution with
# mean = 5.0
# rms = 3.0
# number of points = 1000
data = np.random.normal(5.0, 3.0, 1000)
# make a histogram of the data array
pl.hist(data, histtype='stepfilled') #去掉黑色轮廓
# make plot labels
pl.xlabel('data')
pl.show()
```

输出如下图所示：



推荐文章：http://www.cnblogs.com/jasonfreak/p/5441512.html

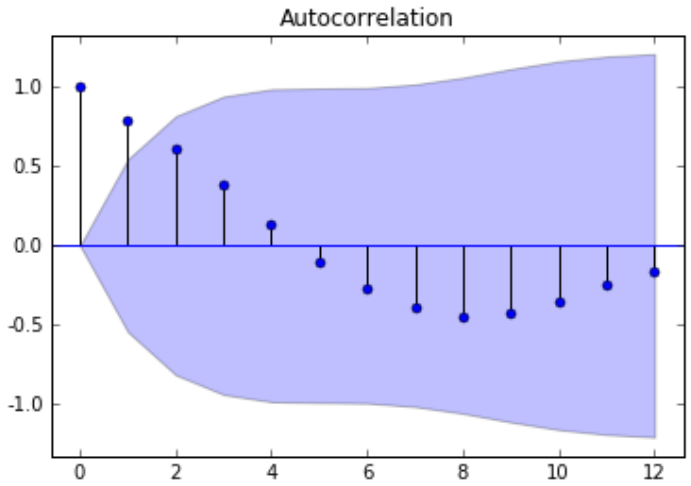
三. Python绘制时间序列-自相关图

核心代码如下所示：

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 10:55:17 2017

@author: yxz15
"""

import pandas as pd
data = pd.read_csv("32.csv",index_col='year')
#显示前6行数据
print(data.shape)
print(data.head(6))

import matplotlib.pyplot as plt
plt.rcParams['font.sans-serif'] = ['simHei']
plt.rcParams['axes.unicode_minus'] = False
data.plot()
plt.savefig(u'时序图.png', dpi=500)
plt.show()

from statsmodels.graphics.tsaplots import plot_acf
gy = data['Guiyang']
print gy
```

```
plot_acf(gy).show()                plt.savefig(u'贵阳自相关图',dpi=300)

from statsmodels.tsa.stattools import adfuller as ADF
print 'ADF:',ADF(gy)
```

输出结果如下所示：

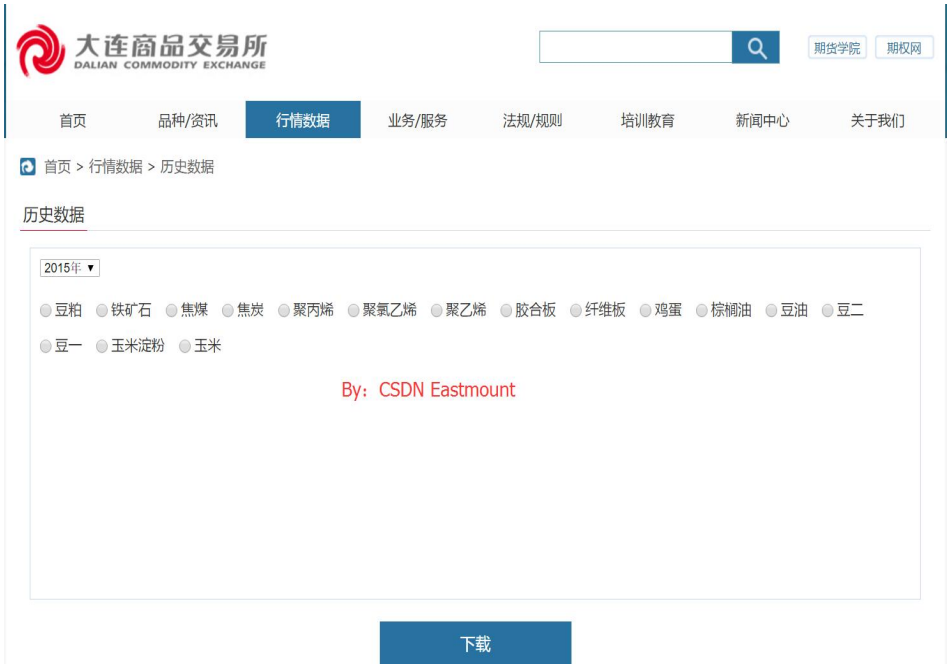


时间序列相关文章推荐：

python时间序列分析
个股与指数的回归分析（python）
Python_Statsmodels包_时间序列分析_ARIMA模型

四. 聚类分析大连交易所数据集

这部分主要提供一个网址给大家下载数据集，前面文章说过sklearn自带一些数据集以及UCI官网提供大量的数据集。这里讲述一个大连商品交易所的数据集。
地址：http://www.dce.com.cn/dalianshangpin/xqsj/lssj/index.html#



比如下载"焦炭"数据集，命名为"35.csv"，在对其进行聚类分析。

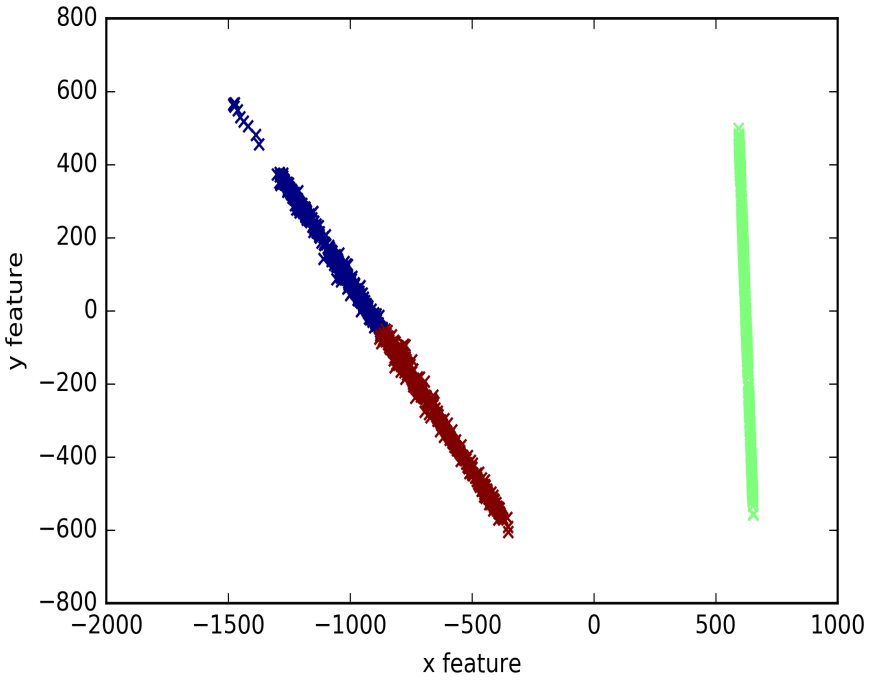
	合约	日期	前收盘价	前结算价	开盘价	最高价	最低价	收盘价	结算价	涨跌1	涨跌2	成交量	成交金额	持仓量
1	j1501	20150105	1133	1113	1125	1156	1125	1137	1147	24	34	12336	1.415E+09	29182
2	j1501	20150106	1137	1147	1139	1155	1132	1152	1147	5	0	5522	633491200	26362
3	j1501	20150107	1152	1147	1149	1181	1149	1169	1166	22	19	4898	571559800	23410
4	j1501	20150108	1169	1166	1174	1195	1163	1177	1175	11	9	2116	248631200	22596
5	j1501	20150109	1177	1175	1179	1193	1176	1190	1184	15	9	3050	361314600	20328
6	j1501	20150112	1190	1184	1190	1200	1189	1189	1195	5	11	4220	504406400	16906
7	j1501	20150113	1189	1195	1189	1193	1185	1192	1190	-3	-5	1430	170261400	15898
8	j1501	20150114	1192	1190	1192	1195	1190	1191	1190	1	0	2052	244240600	15474
9	j1501	20150115	1191	1190	1193	1210	1168	1168	1199	-22	9	2372	284496600	14040
10	j1501	20150116	1168	1199	1190	1191	1128	1128	1167	-71	-32	3018	355091200	0
11	j1502	20150105	1045	1045	1030	1030	1030	1030	1030	-15	-15	10	1030000	76
12	j1502	20150106	1030	1030	1034	1036	1034	1036	1035	6	5	6	621000	82
13	j1502	20150107	1036	1035	1014	1039	1014	1030	1023	-5	-12	130	13311400	86
14	j1502	20150108	1030	1023	1053	1053	1031	1048	1038	25	15	100	10380200	104
15	j1502	20150109	1048	1038	0	0	0	1038	1038	0	0	0	0	104
16	j1502	20150112	1038	1038	0	0	0	1030	1030	-8	-8	0	0	104

代码如下：

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 10:19:15 2017

@author: yxz15
"""

#第一部分：导入数据集
import pandas as pd
Coke1 =pd.read_csv("35.csv")
print Coke1 [:4]


#第二部分：聚类
```

```
from sklearn.cluster import KMeans
clf=KMeans(n_clusters=3)
pre=clf.fit_predict(Coke1)
print pre[:4]

#第三部分：降维
from sklearn.decomposition import PCA
pca=PCA(n_components=2)
newData=pca.fit_transform(Coke1)
print newData[:4]
x1=[n[0] for n in newData]
x2=[n[1] for n in newData]


#第四部分：用matplotlib包画图
import matplotlib.pyplot as plt
plt.title
plt.xlabel("x feature")
plt.ylabel("y feature")
plt.scatter(x1,x2,c=pre, marker='x')
plt.savefig("bankloan.png",dpi=400)
plt.show()
```

输出如下图所示:



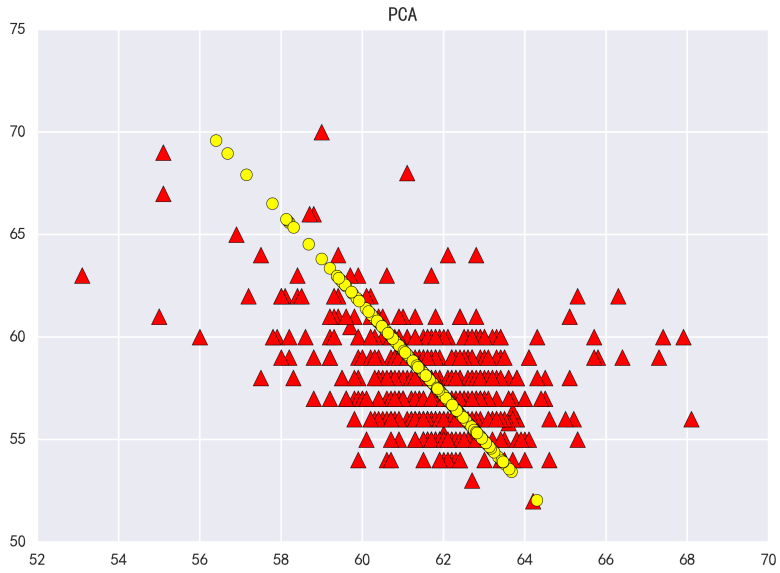
五. PCA降维及绘图代码

PCA降维绘图参考这篇博客。
http://blog.csdn.net/xiaolewennofollow/article/details/46127485
代码如下：

```
# -*- coding: utf-8 -*-
"""
Created on Mon Mar 06 21:47:46 2017

@author: yxz
"""

from numpy import *

def loadDataSet(fileName,delim='\t'):
    fr=open(fileName)
    stringArr=[line.strip().split(delim) for line in fr.readlines()]
    datArr=[map(float,line) for line in stringArr]
    return mat(datArr)

def pca(dataMat,topNfeat=9999999):
    meanVals=mean(dataMat,axis=0)
    meanRemoved=dataMat-meanVals
    covMat=cov(meanRemoved,rowvar=0)
    eigVals,eigVets=linalg.eig(mat(covMat))
    eigValInd=argsort(eigVals)
    eigValInd=eigValInd[:-(topNfeat+1):-1]
    redEigVects=eigVets[:,eigValInd]
    print meanRemoved
    print redEigVects
    lowDDatMat=meanRemoved*redEigVects
    reconMat=(lowDDatMat*redEigVects.T)+meanVals
    return lowDDatMat,reconMat
dataMat=loadDataSet('41.txt')
lowDMat,reconMat=pca(dataMat,1)

def plotPCA(dataMat,reconMat):
    import matplotlib
    import matplotlib.pyplot as plt
    datArr=array(dataMat)
    reconArr=array(reconMat)
    n1=shape(datArr)[0]
```

```
    n2=shape(reconArr)[0]
                                xcord1=[];ycord1=[]
    xcord2=[];ycord2=[]
    for i in range(n1):
        xcord1.append(datArr[i,0]);ycord1.append(datArr[i,1])
    for i in range(n2):
        xcord2.append(reconArr[i,0]);ycord2.append(reconArr[i,1])
    fig=plt.figure()
    ax=fig.add_subplot(111)
    ax.scatter(xcord1,ycord1,s=90,c='red',marker='^')
    ax.scatter(xcord2,ycord2,s=50,c='yellow',marker='o')
    plt.title('PCA')
    plt.savefig('ccc.png',dpi=400)
    plt.show()
plotPCA(dataMat,reconMat)
```

输出结果如下图所示：



采用PCA方法对数据集进行降维操作，即将红色三角形数据降维至黄色直线上，一个平面降低成一条直线。PCA的本质就是对角化协方差矩阵，对一个n*n的对称矩阵进行分解，然后把矩阵投影到这N个基上。

数据集为41.txt，值如下：

```
61.5    55
59.8    61
56.9    65
62.4    58
63.3    58
```

62.8	57
62.3	57
61.9	55
65.1	61
59.4	61
64	55
62.8	56
60.4	61
62.2	54
60.2	62
60.9	58
62	54
63.4	54
63.8	56
62.7	59
63.3	56
63.8	55
61	57
59.4	62
58.1	62
60.4	58
62.5	57
62.2	57
60.5	61
60.9	57
60	57
59.8	57
60.7	59
59.5	58
61.9	58
58.2	59
64.1	59
64	54
60.8	59
61.8	55
61.2	56
61.1	56
65.2	56
58.4	63
63.1	56
62.4	58
61.8	55
63.8	56
63.3	60
60.7	60
60.9	61

61.9	54	60.9	55
61.6	58		
59.3	62		
61	59		
59.3	61		
62.6	57		
63	57		
63.2	55		
60.9	57		
62.6	59		
62.5	57		
62.1	56		
61.5	59		
61.4	56		
62	55.3		
63.3	57		
61.8	58		
60.7	58		
61.5	60		
63.1	56		
62.9	59		
62.5	57		
63.7	57		
59.2	60		
59.9	58		
62.4	54		
62.8	60		
62.6	59		
63.4	59		
62.1	60		
62.9	58		
61.6	56		
57.9	60		
62.3	59		
61.2	58		
60.8	59		
60.7	58		
62.9	58		
62.5	57		
55.1	69		
61.6	56		
62.4	57		
63.8	56		
57.5	58		
59.4	62		
66.3	62		

61.6 59
61.5 58
63.2 56
59.9 54
61.6 55
61.7 58
62.9 56
62.2 55
63 59
62.3 55
58.8 57
62 55
61.4 57
62.2 56
63 58
62.2 59
62.6 56
62.7 53
61.7 58
62.4 54
60.7 58
59.9 59
62.3 56
62.3 54
61.7 63
64.5 57
65.3 55
61.6 60
61.4 56
59.6 57
64.4 57
65.7 60
62 56
63.6 58
61.9 59
62.6 60
61.3 60
60.9 60
60.1 62
61.8 59
61.2 57
61.9 56
60.9 57
59.8 56
61.8 55
60 57

61.6	55	62.1	64
63.3	59		
60.2	56		
61.1	58		
60.9	57		
61.7	59		
61.3	56		
62.5	60		
61.4	59		
62.9	57		
62.4	57		
60.7	56		
60.7	58		
61.5	58		
59.9	57		
59.2	59		
60.3	56		
61.7	60		
61.9	57		
61.9	55		
60.4	59		
61	57		
61.5	55		
61.7	56		
59.2	61		
61.3	56		
58	62		
60.2	61		
61.7	55		
62.7	55		
64.6	54		
61.3	61		
63.7	56.4		
62.7	58		
62.2	57		
61.6	56		
61.5	57		
61.8	56		
60.7	56		
59.7	60.5		
60.5	56		
62.7	58		
62.1	58		
62.8	57		
63.8	58		

57.8	60	62.1	55
61.1	60		
60	59		
61.2	57		
62.7	59		
61	57		
61	58		
61.4	57		
61.8	61		
59.9	63		
61.3	58		
60.5	58		
64.1	59		
67.9	60		
62.4	58		
63.2	60		
61.3	55		
60.8	56		
61.7	56		
63.6	57		
61.2	58		
62.1	54		
61.5	55		
61.4	59		
61.8	60		
62.2	56		
61.2	56		
60.6	63		
57.5	64		
61.3	56		
57.2	62		
62.9	60		
63.1	58		
60.8	57		
62.7	59		
62.8	60		
55.1	67		
61.4	59		
62.2	55		
63	54		
63.7	56		
63.6	58		
62	57		
61.5	56		
60.5	60		
61.1	60		

61.8 56
63.3 56
59.4 64
62.5 55
64.5 58
62.7 59
64.2 52
63.7 54
60.4 58
61.8 58
63.2 56
61.6 56
61.6 56
60.9 57
61 61
62.1 57
60.9 60
61.3 60
65.8 59
61.3 56
58.8 59
62.3 55
60.1 62
61.8 59
63.6 55.8
62.2 56
59.2 59
61.8 59
61.3 55
62.1 60
60.7 60
59.6 57
62.2 56
60.6 57
62.9 57
64.1 55
61.3 56
62.7 55
63.2 56
60.7 56
61.9 60
62.6 55
60.7 60
62 60
63 57
58 59

62.9 57
58.2 60
63.2 58
61.3 59
60.3 60
62.7 60
61.3 58
61.6 60
61.9 55
61.7 56
61.9 58
61.8 58
61.6 56
58.8 66
61 57
67.4 60
63.4 60
61.5 59
58 62
62.4 54
61.9 57
61.6 56
62.2 59
62.2 58
61.3 56
62.3 57
61.8 57
62.5 59
62.9 60
61.8 59
62.3 56
59 70
60.7 55
62.5 55
62.7 58
60.4 57
62.1 58
57.8 60
63.8 58
62.8 57
62.2 58
62.3 58
59.9 58
61.9 54
63 55
62.4 58

62.9	58	63.5	56
61.3	56		
60.6	54		
65.1	58		
62.6	58		
58	62		
62.4	61		
61.3	57		
59.9	60		
60.8	58		
63.5	55		
62.2	57		
63.8	58		
64	57		
62.5	56		
62.3	58		
61.7	57		
62.2	58		
61.5	56		
61	59		
62.2	56		
61.5	54		
67.3	59		
61.7	58		
61.9	56		
61.8	58		
58.7	66		
62.5	57		
62.8	56		
61.1	68		
64	57		
62.5	60		
60.6	58		
61.6	55		
62.2	58		
60	57		
61.9	57		
62.8	57		
62	57		
66.4	59		
63.4	56		
60.9	56		
63.1	57		
63.1	59		
59.2	57		

60.7	54	64.6	56
61.8	56		
59.9	60		
61.7	55		
62.8	61		
62.7	57		
63.4	58		
63.5	54		
65.7	59		
68.1	56		
63	60		
59.5	58		
63.5	59		
61.7	58		
62.7	58		
62.8	58		
62.4	57		
61	59		
63.1	56		
60.7	57		
60.9	59		
60.1	55		
62.9	58		
63.3	56		
63.8	55		
62.9	57		
63.4	60		
63.9	55		
61.4	56		
61.9	55		
62.4	55		
61.8	58		
61.5	56		
60.4	57		
61.8	55		
62	56		
62.3	56		
61.6	56		
60.6	56		
58.4	62		
61.4	58		
61.9	56		
62	56		
61.5	57		
62.3	58		
60.9	61		

62.4 57
55 61
58.6 60
62 57
59.8 58
63.4 55
64.3 58
62.2 59
61.7 57
61.1 59
61.5 56
58.5 62
61.7 58
60.4 56
61.4 56
61.5 55
61.4 56
65 56
56 60
60.2 59
58.3 58
53.1 63
60.3 58
61.4 56
60.1 57
63.4 55
61.5 59
62.7 56
62.5 55
61.3 56
60.2 56
62.7 57
62.3 58
61.5 56
59.2 59
61.8 59
61.3 55
61.4 58
62.8 55
62.8 64
62.4 61
59.3 60
63 60
61.3 60
59.3 62
61 57

```
62.9    57
        59.6    57
61.8    60
62.7    57
65.3    62
63.8    58
62.3    56
59.7    63
64.3    60
62.9    58
62      57
61.6    59
61.9    55
61.3    58
63.6    57
59.6    61
62.2    59
61.7    55
63.2    58
60.8    60
60.3    59
60.9    60
62.4    59
60.2    60
62      55
60.8    57
62.1    55
62.7    60
61.3    58
60.2    60
60.7    56
```

最后希望这篇文章对你有所帮助，尤其是我的学生和接触数据挖掘、**机器学习**的博友。这篇文字主要是记录一些代码片段，作为在线笔记，也希望对你有所帮助。

一醉一轻舞，一梦一轮回。一曲一人生，一世一心愿。

(By:Eastmount 2017-03-07 下午3点半 http://blog.csdn.net/eastmount/)

点赞 4 收藏 分享

Eastmount 博客专家

发布了444 篇原创文章 · 获赞 5908 · 访问量 484万+