K近邻算法

使用sklearn库来进行K近邻算法的运算

In [8]:
```
import pandas as pd
import warnings
warnings.filterwarnings("ignore")

df = pd.read_excel('葡萄酒.xlsx')
# 特征变量和目标变量的切分
X_train = df[['酒精含量(%)','苹果酸含量(%)']]
y_train = df['分类']
df
```

Out[8]:

	原始样本	酒精含量(%)	苹果酸含量(%)	分类
0	样本1	5	2	0
1	样本2	6	1	0
2	样本3	4	1	0
3	样本4	8	3	1
4	样本5	10	2	1

In [9]:
```
# 模型训练
from sklearn.neighbors import KNeighborsClassifier as KNN
knn = KNN(n_neighbors=3)
knn.fit(X_train, y_train)
# 模型预测：预测多个样本
X_test = [[7, 1], [8, 3],[7, 3]]  # 这里能帮助理解为什么要写成二维数组的样式
answer = knn.predict(X_test)
print(answer)
```

```
[0 1 0]
```

编写代码实现K近邻算法。其中距离计算使用了欧氏距离，同时提供了计算马氏距离的实现代码（第7行到第9行）：

In [10]:
```
from sklearn.metrics import accuracy_score
from scipy.spatial import distance
import numpy as np
import operator

def classify(inX, dataSet, labels, k):
    #S=np.cov(dataSet.T)   #协方差矩阵，为计算马氏距离
    #SI = np.linalg.inv(S)  #协方差矩阵的逆矩阵
    #distances = np.array(distance.cdist(dataSet, [inX], 'mahalanobis', VI=SI)).reshape(-1)
    distances = np.array(distance.cdist(dataSet, [inX], 'euclidean').reshape(-1))
    sortedDistIndicies = distances.argsort() # 取排序的索引，用于label排序
    classCount={}
    for i in range(k): # 访问距离最近的k个实例
        voteILabel = labels[sortedDistIndicies[i]]
        classCount[voteILabel]=classCount.get(voteILabel,0)+1
    sortedClassCount = sorted(classCount.items(),
            key=operator.itemgetter(1), reverse=True)
    return sortedClassCount[0][0] # 取最多的分类

ret = [classify(X_test[i], X_train, y_train, 3) for i in range(len(X_test))]

print(ret)
```

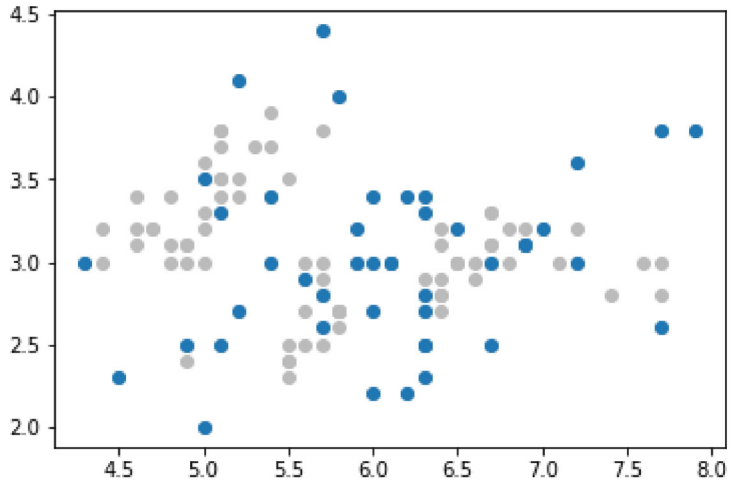
```
[0, 1, 0]
```

SVM算法

In [11]:
```
from sklearn import svm
from sklearn.model_selection import train_test_split
from sklearn.datasets import load_iris
import matplotlib.pyplot as plt
%matplotlib inline

iris=load_iris()
X = iris.data  # 获取自变量
y = iris.target  # 获取因变量
X_train, X_test, y_train ,y_test = train_test_split(X,y,test_size=0.2,random_state=0)
clf = svm.SVC(C=0.8, kernel='rbf', gamma=1) # 高斯核，松弛度0.8
#clf = svm.SVC(C=0.5, kernel='linear') # 线性核，松弛度0.5
clf.fit(X_train, y_train.ravel())

print('trian pred:%.3f' %(clf.score(X_train, y_train))) # 对训练集打分
print('test pred:%.3f' %(clf.score(X_test, y_test))) # 对测试集打分
print(clf.support_vectors_) #支持向量列表，从中看到切分边界
print(clf.n_support_) # 每类别持向量个数

plt.plot(X_train[:,0], X_train[:,1],'o', color = '#bbbbbb')
plt.plot(clf.support_vectors_[:,0], clf.support_vectors_[:,1],'o')
```

```
trian pred:0.967
test pred:1.000
[[5.   3.5  1.6  0.6]
 [4.3  3.   1.1  0.1]
 [5.4  3.4  1.7  0.2]
 [5.7  4.4  1.5  0.4]
 [4.5  2.3  1.3  0.3]
 [5.1  3.3  1.7  0.5]
 [5.2  4.1  1.5  0.1]
 [5.8  4.   1.2  0.2]
 [5.4  3.   4.5  1.5]
 [5.2  2.7  3.9  1.4]
 [6.   2.7  5.1  1.6]
 [5.   2.   3.5  1. ]
 [6.3  3.3  4.7  1.6]
 [7.   3.2  4.7  1.4]
 [6.   3.4  4.5  1.6]
 [5.6  2.9  3.6  1.3]
 [6.1  3.   4.6  1.4]
 [6.9  3.1  4.9  1.5]
 [5.1  2.5  3.   1.1]
 [6.2  2.2  4.5  1.5]
 [5.7  2.8  4.5  1.3]
 [5.7  2.6  3.5  1. ]
 [6.3  2.5  4.9  1.5]
 [6.7  3.   5.   1.7]
 [5.9  3.2  4.8  1.8]
 [6.3  2.3  4.4  1.3]
 [6.1  3.   4.9  1.8]
 [6.9  3.1  5.1  2.3]
 [6.   2.2  5.   1.5]
 [6.7  2.5  5.8  1.8]
 [6.3  2.7  4.9  1.8]
 [6.3  2.8  5.1  1.5]
 [4.9  2.5  4.5  1.7]
 [6.3  2.5  5.   1.9]
 [5.9  3.   5.1  1.8]
 [7.2  3.6  6.1  2.5]
 [6.5  3.2  5.1  2. ]
 [6.2  3.4  5.4  2.3]
 [7.2  3.   5.8  1.6]
 [7.7  2.6  6.9  2.3]
 [7.9  3.8  6.4  2. ]
 [6.   3.   4.8  1.8]
 [6.3  3.4  5.6  2.4]
 [7.7  3.8  6.7  2.2]]
[ 8 18 18]
```

Out[11]: [<matplotlib.lines.Line2D at 0x1ec4ecbea30>]


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