第一题：

1. 用一个你觉得效果最好的分类算法（e.g., SVM，RF，ANN，etc.）对Test1的data进行classification建模，用5-fold crossvalidation来计算预测的AUC或F-measure。若电脑计算能力不足可用3-fold。对于有些本身就含有cross validation功能的算法可以不用cross validation来稳定结果。（PS，对于非计算机系的同学，以python或R为例，各种分类算法以及AUC的计算都可以在网上找到对应参考代码。）

答：

通过使用4种算法：分别为DecisionTreeClassifier、RandomForestClassifier、SVM、KNeighborsClassifier.

RandomForestClassifier的代码：test\_01\_rf.py

best\_score\_：0.979868402315463

Fl scores的范围：0.976--0.98

DecisionTreeClassifier的代码：test\_02\_dt.py

best\_score\_：0.968356292009768

Fl scores的范围：0.889--0.969

SVM的代码：test\_03\_svm.py

best\_score\_：0.9524605384180242

Fl scores的范围：0.76--0.95

KNN的代码：test\_04\_knn.py

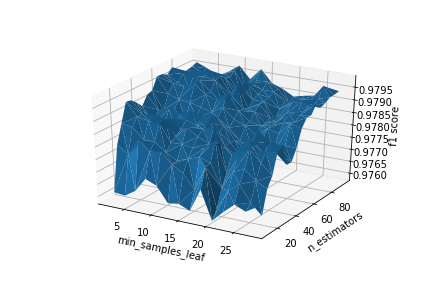
best\_score\_：0.9210408663031916

Fl scores的范围：0.90--0.92

由4种算法中best\_score\_对比和F1 scores的范围，RandomForestClassifier更加适合该数据集。

1. 把你认为这个算法里的最重要的两个参数用网格优化（grid search）的方式进行优化，并把过程画出来。输出参数优化过程的三维图（2个参数变量 + 5 or 3 fold的AUC或者F-measure的值），示意图如下。

使用的是：RandomForestClassifier,3 flod的F-measure的结果图：



RamdomForestClassifier的输出结果：

RadomForestClassifier

训练数据集(shape):

(20536, 61)

训练数据标签(shape):

(20536,)

Fitting 3 folds for each of 252 candidates, totalling 756 fits

[Parallel(n\_jobs=1)]: Done 756 out of 756 | elapsed: 78.4min finished

Best parameters set found on development set:

{'min\_samples\_leaf': 8, 'n\_estimators': 75}

Grid scores on development set:

best\_score\_

0.979868402315463

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0.978 (+/-0.011) for {'min\_samples\_leaf': 28, 'n\_estimators': 40}

0.978 (+/-0.012) for {'min\_samples\_leaf': 28, 'n\_estimators': 45}

0.978 (+/-0.012) for {'min\_samples\_leaf': 28, 'n\_estimators': 50}

0.979 (+/-0.012) for {'min\_samples\_leaf': 28, 'n\_estimators': 55}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 60}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 65}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 70}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 75}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 80}

0.979 (+/-0.014) for {'min\_samples\_leaf': 28, 'n\_estimators': 85}

0.979 (+/-0.013) for {'min\_samples\_leaf': 28, 'n\_estimators': 90}

0.979 (+/-0.014) for {'min\_samples\_leaf': 28, 'n\_estimators': 95}