Lab10_homework

2018 年 12 月 12 日

1 数据预处理

```
In [1]: ! cd /d D:\jupyter_notebook\bigdata_homework
        ! python prepro.py
```

```
The accuracy of Dtree is 97.36842105263158
```

2 构造决策树分类器

```
In [2]: ! python decisiontree.py
```

```
The accuracy of Dtree is 97.36842105263158
```

```
C:\Users\HASEE\Anaconda3\lib\site-packages\sklearn\cross_validation.py:41: DeprecationWarning:
  "This module will be removed in 0.20.", DeprecationWarning)
```

3 组合模型

```
In [3]: ! python ensemble.py
```

```
the accuracy of Adaboost is 78.94736842105263%
The accuracy of GBDT model is 97.36842105263158
The accuracy of RandomForest model is 97.36842105263158%
```

```
C:\Users\HASEE\Anaconda3\lib\site-packages\sklearn\ensemble\weight_boosting.py:29: DeprecationW
  from numpy.core.umath_tests import inner1d
```

4 完成习题

分别列出三种组合模型的训练结果

In [5]:
```
! python ensemble.py
```

比较三种组合分类器的精度

In [4]:
```
# 导入数据并预处理
import numpy as np
from sklearn.datasets import load_iris
iris=load_iris().data
iris_target=load_iris().target
iris=iris[iris_target != 2]
iris_target = iris_target[iris_target != 2]
from sklearn.preprocessing import MinMaxScaler
MinMaxTransformer=MinMaxScaler()
MinMaxTransformer.fit(iris)
iris_transformed=MinMaxTransformer.transform(iris)
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test=train_test_split(iris_transformed, iris_target, rando
```

In [5]:
```
# adaboost 分类器精度
from sklearn.ensemble import AdaBoostClassifier
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression()
ada=AdaBoostClassifier(base_estimator=lr)
ada.fit(X_train, y_train)
predict_labels=ada.predict((X_test))
accuracy=np.mean(predict_labels==(y_test))*100
accuracy
```

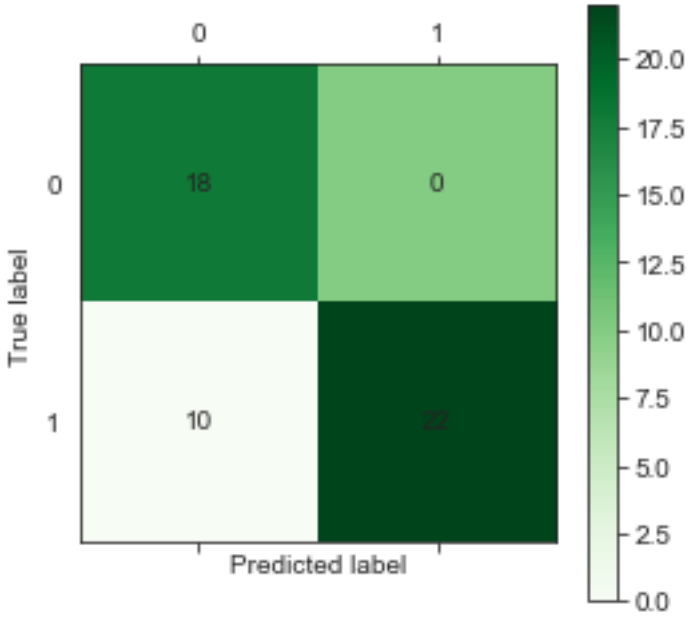
```
C:\Users\HASEE\Anaconda3\lib\site-packages\sklearn\ensemble\weight_boosting.py:29: DeprecationW
  from numpy.core.umath_tests import inner1d
```

Out[5]: 80.0

In [6]:
```
# adaboost 分类器 f1-score
from sklearn import metrics
metrics.f1_score(y_test, predict_labels, average=None)
```

Out[6]: array([0.7826087 , 0.81481481])

In [9]:
```
# adaboost 分类器混淆矩阵
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, predict_labels)
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style('white')
plt.matshow(cm,cmap=plt.cm.Greens)
plt.colorbar()
for x in range(len(cm)):
    for y in range(len(cm)):
        plt.annotate(cm[x,y],xy=(x,y),horizontalalignment='center',verticalalignment='
plt.ylabel('True label')
plt.xlabel('Predicted label')
plt.show()
```



In [15]:
```
# GBDT 分类器精度
from sklearn.ensemble import GradientBoostingClassifier
gdbt=GradientBoostingClassifier()
```

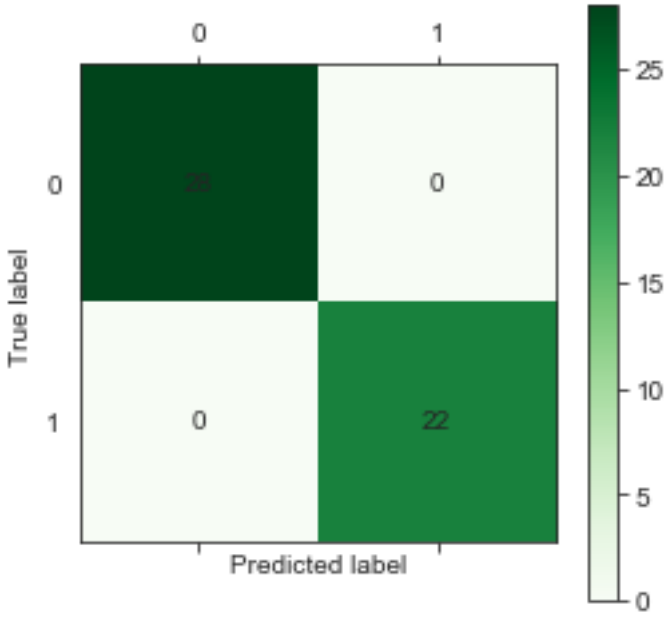
```
gdbt.fit(X_train, y_train)
predict_y=gdbt.predict((X_test))
accuracy=np.mean(predict_y==y_test)*100
accuracy
```

Out[15]: 100.0

In [20]:
```
# GBDT 分类器 f1-score
from sklearn import metrics
metrics.f1_score(y_test, predict_y, average=None)
```

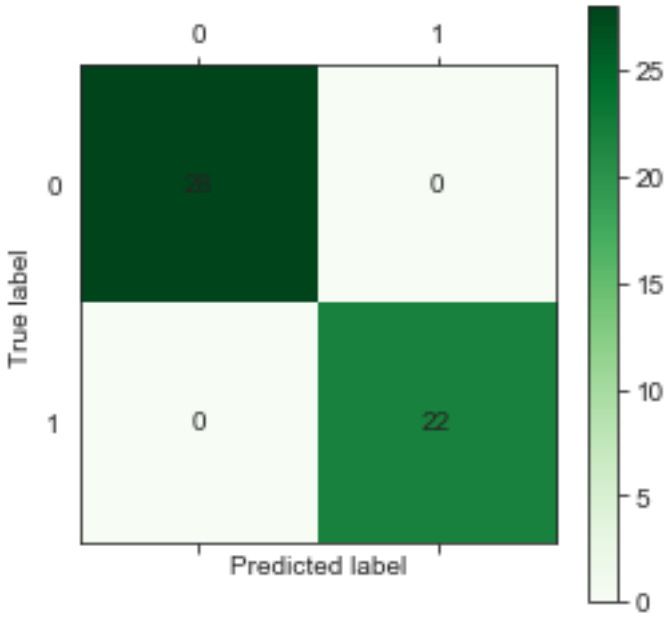
Out[20]: array([1., 1.])

In [17]:
```
# GBDT 分类器混淆矩阵
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, predict_y)
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style('white')
plt.matshow(cm,cmap=plt.cm.Greens)
plt.colorbar()
for x in range(len(cm)):
    for y in range(len(cm)):
        plt.annotate(cm[x,y],xy=(x,y),horizontalalignment='center',verticalalignment=
plt.ylabel('True label')
plt.xlabel('Predicted label')
plt.show()
```




```
In [18]: # 随机森林分类器精度
         from sklearn.ensemble import RandomForestClassifier
         rf=RandomForestClassifier()
         rf.fit(X_train, y_train)
         predict_y=rf.predict((X_test))
         accuracy=np.mean(predict_y==y_test)*100
         accuracy

Out[18]: 100.0

In [21]: # 随机森林分类器 f1-score
         from sklearn import metrics
         metrics.f1_score(y_test, predict_y, average=None)

Out[21]: array([1., 1.])

In [19]: # 随机森林分类器混淆矩阵
         from sklearn.metrics import confusion_matrix
         cm = confusion_matrix(y_test, predict_y)
         import matplotlib.pyplot as plt
         import seaborn as sns
```

```
sns.set_style('white')
plt.matshow(cm,cmap=plt.cm.Greens)
plt.colorbar()
for x in range(len(cm)):
    for y in range(len(cm)):
        plt.annotate(cm[x,y],xy=(x,y),horizontalalignment='center',verticalalignment=
plt.ylabel('True label')
plt.xlabel('Predicted label')
plt.show()
```



比较三种组合分类器的效率

In [27]:
```
# 训练 100 次 adaboost 算法耗时
from timeit import timeit
t = timeit('ada_boost()', 'from ensemble import ada_boost', number=100)
t
```

Out[27]: 7.606000600000016

In [28]:
```
# 训练 100 次 gbdt 算法耗时
from timeit import timeit
```

```
t = timeit('gbdt()', 'from ensemble import gbdt', number=100)
t
```

```
Out[28]: 14.3532285
```

```
In [29]: # 训练 100 次随机森林算法耗时
         from timeit import timeit
         t = timeit('rf()', 'from ensemble import rf', number=100)
         t
```

```
Out[29]: 1.2643783999999982
```

利用网格搜索和随机搜索对三种组合模型进行参数调优

```
In [30]: from sklearn.grid_search import GridSearchCV
         from sklearn.ensemble import AdaBoostClassifier
         from sklearn.linear_model import LogisticRegression
         lr=LogisticRegression()
         ada=AdaBoostClassifier(base_estimator=lr)
         # 候选参数
         tuned_parameters = [{'n_estimators': [10, 50, 100], 'learning_rate': [.5, 1, 2],
         'algorithm': ['SAMME', 'SAMME.R']}]
         clf=GridSearchCV(ada, tuned_parameters)
         clf.fit(X_train, y_train)
         # 输出最优参数
         print("Best parameters: ")
         print(clf.best_params_)
```

```
C:\Users\HASEE\Anaconda3\lib\site-packages\sklearn\cross_validation.py:41: DeprecationWarning:
  "This module will be removed in 0.20.", DeprecationWarning)
C:\Users\HASEE\Anaconda3\lib\site-packages\sklearn\grid_search.py:42: DeprecationWarning: This
  DeprecationWarning)


Best parameters:
{'algorithm': 'SAMME', 'learning_rate': 2, 'n_estimators': 10}
```

```
In [31]: from sklearn.ensemble import AdaBoostClassifier
         from sklearn.ensemble import GradientBoostingClassifier
```

```
        gdbt=GradientBoostingClassifier()
        # 候选参数
        tuned_parameters = [{'loss': ['deviance', 'exponential'], 'learning_rate': [.1, .2, .
        'n_estimators': [10, 50, 100], 'subsample': [.5, 1], 'max_depth': [2, 3, 5]}]
        clf=GridSearchCV(gdbt, tuned_parameters)
        clf.fit(X_train, y_train)
        # 输出最优参数
        print("Best parameters: ")
        print(clf.best_params_)
```

```
Best parameters:
{'learning_rate': 0.1, 'loss': 'deviance', 'max_depth': 2, 'n_estimators': 10, 'subsample': 0.5
```

```
In [34]: from sklearn.ensemble import AdaBoostClassifier
         from sklearn.ensemble import RandomForestClassifier
         rf=RandomForestClassifier()
         # 候选参数
         tuned_parameters = [{'criterion': ['gini', 'entropy'], 'max_depth': [1, 2, 3],
         'n_estimators': [10, 50, 100], 'class_weight': ['balanced', 'balanced_subsample', None
         clf=GridSearchCV(rf, tuned_parameters)
         clf.fit(X_train, y_train)
         # 输出最优参数
         print("Best parameters: ")
         print(clf.best_params_)
```

```
Best parameters:
{'class_weight': 'balanced', 'criterion': 'gini', 'max_depth': 1, 'n_estimators': 10}
```

```
In [43]: from scipy.stats import randint as sp_randint
         from sklearn.ensemble import RandomForestClassifier
         from sklearn.model_selection import RandomizedSearchCV
         rf=RandomForestClassifier(n_estimators=20)
         param_dist={"max_depth":[1,None],
                     "max_features":sp_randint(1,4),
                     "min_samples_split":sp_randint(2,4),
                     "min_samples_leaf":sp_randint(1,4),
                     "bootstrap":[True,False],
```

```
                "criterion":['gini','entropy'],
                "class_weight": ['balanced', 'balanced_subsample', None]
                }
        n_iter_search=20
        random_search=RandomizedSearchCV(rf,param_distributions=param_dist,n_iter=n_iter_searc
        random_search.fit(X_train,y_train)
        random_search.best_params_
```

Out[43]:
```
{'bootstrap': False,
 'class_weight': 'balanced_subsample',
 'criterion': 'entropy',
 'max_depth': 1,
 'max_features': 1,
 'min_samples_leaf': 3,
 'min_samples_split': 2}
```