CS156 (Introduction to AI), Spring 2022

Homework 5 submission

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References and sources

List all your references and sources here. This includes all sites/discussion boards/blogs/posts/etc. where you grabbed some code examples.

Solution

Load libraries and set random number generator seed

```
# Citation :
# 1. From Canvas Project Example (Jupyter Notebook, DecisionTrees.Breast.ipynb)
# 2. https://pbpython.com/categorical-encoding.html (One Hot Encoding Guidance, from Assignme

import numpy as np
import pandas as pd
from sklearn import datasets
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import cross_val_score
from sklearn.metrics import plot_confusion_matrix
from sklearn.ensemble import RandomForestClassifier
from sklearn import tree
```

```
np.random.seed(2)
```

Code the solution

```
# Load Dataset

df = pd.read_csv (r'homework5_input_data.csv')

Y = df ['Class']
X = df.drop (['Class'], axis = 1)

target = ['e', 'p']


# Convert Categorical Variable to Numeric (X only, using One Hot Encoding)

X_ohe = pd.get_dummies (X, columns = X.columns, prefix = X.columns)


# Break the data into the training and test datasets

X_train, X_test, Y_train, Y_test = train_test_split(X_ohe, Y, test_size=0.2, random_state=0)
X_train.shape, Y_train.shape, X_test.shape, Y_test.shape
```

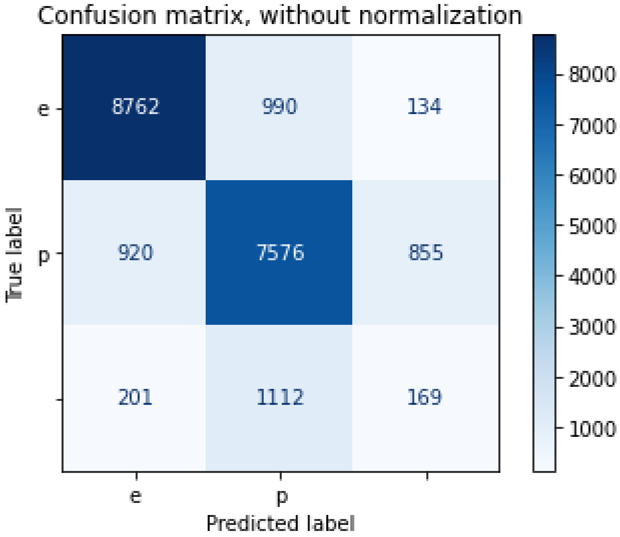
```
     ((82875, 4868), (82875,), (20719, 4868), (20719,))
```

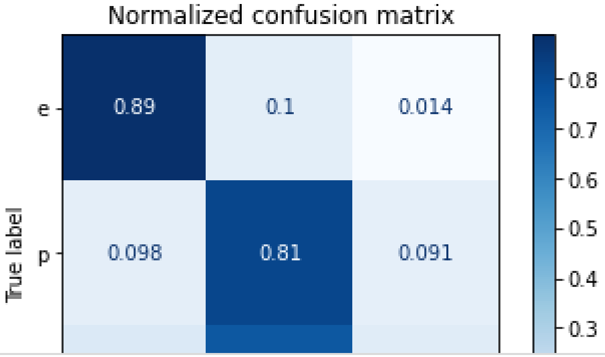
```
# Train a decision tree model (5-fold cross-validation)

model = DecisionTreeClassifier(random_state=0)

cvs = cross_val_score(model, X_train, Y_train, cv=5)


# Report Accuracies

print('Individual Cross-Validation Accuracies : ')
print (cvs)
print('Mean Cross-Validation Accuracies : ')
print (cvs.mean())
```

```
     Individual Cross-Validation Accuracies :
     [0.79909502 0.79831071 0.79939668 0.79360483 0.7986727 ]
     Mean Cross-Validation Accuracies :
     0.7978159879336351
```

```
# Train a decision tree model

model.fit(X_train, Y_train)

print('Accuracy of linear SVC on training set: {:.2f}'.format(model.score(X_train, Y_train))
print('Accuracy of linear SVC on test set: {:.2f}'.format(model.score(X_test, Y_test)))

     Accuracy of linear SVC on training set: 1.00
     Accuracy of linear SVC on test set: 0.80


# Plot two confusion matrices for test set predictions

np.set_printoptions(precision=2)
titles_options = [("Confusion matrix, without normalization", None),
                  ("Normalized confusion matrix", 'true')]

for title, normalize in titles_options:
    disp = plot_confusion_matrix(model, X_test, Y_test,
                                 display_labels= target,
                                 cmap=plt.cm.Blues,
                                 normalize=normalize)
    disp.ax_.set_title(title)



plt.show()
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/utils/deprecation.py:87: FutureWarning:
  warnings.warn(msg, category=FutureWarning)
/usr/local/lib/python3.7/dist-packages/sklearn/utils/deprecation.py:87: FutureWarning:
  warnings.warn(msg, category=FutureWarning)
```





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