DS_HW7

November 27, 2019

[1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from scipy import stats

import plotly.tools as tls
import plotly
import plotly.offline as py
from plotly.offline import init_notebook_mode, iplot, plot
import plotly.graph_objs as go
init_notebook_mode(connected=True)
```

0.1 Today, I will use my original dataset of the kickstarter projects. And I will utilize suh dataset and try to apply classifier model to predict it.

[29]:
```
df_kick=pd.read_csv("./ks-projects.csv")
df_kick=df_kick.sample(10000,random_state=42).reset_index().drop('index',axis=1)

def resumetable(df):
    print(f"Dataset Shape: {df.shape}")
    summary = pd.DataFrame(df.dtypes,columns=['dtypes'])
    summary = summary.reset_index()
    summary['Name'] = summary['index']
    summary = summary[['Name','dtypes']]
    summary['Missing'] = df.isnull().sum().values
    summary['Uniques'] = df.nunique().values
    summary['First Value'] = df.loc[0].values
    summary['Second Value'] = df.loc[1].values
    summary['Third Value'] = df.loc[2].values

    for name in summary['Name'].value_counts().index:
        summary.loc[summary['Name'] == name, 'Entropy'] = round(stats.
 ↪entropy(df[name].value_counts(normalize=True), base=2),2)

    return summary
```

```
resumetable(df_kick)
```

```
Dataset Shape: (10000, 15)
```

[29]:

	Name	dtypes	Missing	Uniques	First Value	Second Value	Third Value	Entropy
0	ID	int64	0	10000	1576537356	675907016	361890770	13.29
1	name	object	0	9999	Deko	Westside BJ's: The Gluten-Free, Organic Food T…	Crepe Diem Food Truck	13.29
2	category	object	0	158	Hardware	Food Trucks	Food	6.24
3	main_category	object	0	15	Technology	Food	Food	3.57
4	currency	object	0	14	USD	USD	USD	1.27
5	deadline	object	0	2617	2015-10-24	2015-02-01	2014-01-17	11.06
6	goal	float64	0	779	70000	250000	30000	6.50
7	launched	object	0	10000	2015-09-24 03:12:52	2015-01-02 20:55:07	2013-12-18 03:26:04	
8	pledged	float64	0	4601	1888	1466	5723	
9	state	object	0	6	failed	failed	failed	
10	backers	int64	0	718	41	9	90	
11	country	object	0	23	US	US	US	
12	usd pledged	float64	105	5165	1888	1466	5723	
13	usd_pledged_real	float64	0	5660	1888	1466	5723	
14	usd_goal_real	float64	0	2769	70000	250000	30000	

```
7     13.29
8     10.16
9      1.52
10     6.52
11     1.47
12    10.16
13    10.67
14     8.19
```

0.2 Importin ML needed libraries

[18]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import minmax_scale

#Importing the auxiliar and preprocessing librarys
from sklearn.metrics import accuracy_score, confusion_matrix,␣
 ↪classification_report
from sklearn.model_selection import cross_val_score
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.pipeline import Pipeline

from sklearn.model_selection import train_test_split, KFold, cross_validate
from sklearn.metrics import accuracy_score

from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
from sklearn.svm import SVC
from sklearn.linear_model import RidgeClassifier, SGDClassifier,␣
 ↪LogisticRegression
from sklearn.svm import SVC, LinearSVC
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
# from xgboost import XGBClassifier
from sklearn.naive_bayes import MultinomialNB
from sklearn.feature_selection import SelectFromModel
from sklearn.ensemble import RandomForestClassifier,␣
 ↪GradientBoostingClassifier, ExtraTreesClassifier, BaggingClassifier,␣
 ↪VotingClassifier, RandomTreesEmbedding
```

[30]:
```
df_kick.loc[df_kick.state.isin(['suspended', 'canceled','live']), 'state'] =␣
 ↪'failed'
```

[31]:
```
df_kick = df_kick.loc[df_kick['state'].isin(['failed','successful'])]
print(df_kick.state.value_counts())
```

```
failed        6297
```

```
successful    3602
Name: state, dtype: int64
```

0.3 Encoding state

[32]:
```
targ_dict = {'failed': 0,
             'successful': 1
            }

df_kick['state'] = df_kick['state'].map(targ_dict)
```

0.4 Dealing with date

[33]:
```
df_kick['launched'] = pd.to_datetime(df_kick['launched'])
df_kick['launched_date'] = df_kick['launched'].dt.date

df_kick['deadline'] = pd.to_datetime(df_kick['deadline'])
df_kick['deadline_date'] = df_kick['deadline'].dt.date

#Creating a new columns with Campaign total months
df_kick['time_campaign_d'] = (df_kick['deadline_date'] -␣
 ↪df_kick['launched_date']).dt.days
df_kick['time_campaign_d'] = df_kick['time_campaign_d'].astype(int)

#removing outlier value
df_kick = df_kick[df_kick['time_campaign_d'] != 14867]
```

[35]:
```
to_drop = ['ID', 'name', 'deadline', 'pledged', 'backers', 'goal',
           'usd pledged', 'usd_pledged_real','launched_date', 'deadline_date']
df_kick.drop(to_drop,axis=1,inplace=True)
```

[36]:
```
df_kick.head()
```

[36]:

	category	main_category	currency	launched	state	country	usd_goal_real	time_campaign_d
0	Hardware	Technology	USD	2015-09-24 03:12:52	0	US	70000.00	30
1	Food Trucks	Food	USD	2015-01-02 20:55:07	0	US	250000.00	30
2	Food	Food	USD	2013-12-18 03:26:04	0	US	30000.00	30
3	Fiction	Publishing	GBP	2016-10-24 15:44:36	0	GB	6839.01	30
4	Restaurants	Food	USD	2015-03-14 05:18:34	0	US		

```
4        30000.00                60
```

[37]:
```
df_kick = df_kick.assign(hour=df_kick.launched.dt.hour,
                         day=df_kick.launched.dt.day,
                         month=df_kick.launched.dt.month,
                         year=df_kick.launched.dt.year).drop('launched', axis=1)
print(f'Shape before dummy transformation: {df_kick.shape}')
df_kick = pd.get_dummies(df_kick, columns=['category', 'main_category',␣
↪'currency', 'country'],\
                         prefix=['cat', 'main_cat', 'currency', 'country'],␣
↪drop_first=True)

print(f'Shape after dummy transformation: {df_kick.shape}')
```

```
Shape before dummy transformation: (9899, 11)
Shape after dummy transformation: (9899, 213)
```

0.5 MinMax Scaler¶

[ ]:
```
num_cols = ['usd_goal_real', 'time_campaign_d']

for col in num_cols:
    df_kick[col] = (minmax_scale(df_kick[col], feature_range=(0,1)))
```

[40]:
```
X_train, X_test, y_train, y_test = train_test_split(df_kick.drop('state',␣
↪axis=1), df_kick['state'],
                                                    test_size=.20,␣
↪random_state=42)
```

[41]:
```
print(f'Shape train: {X_train.shape}')
print(f'Shape test: {X_test.shape}')
```

```
Shape train: (7919, 212)
Shape test: (1980, 212)
```

[53]:
```
clfs = []
seed = 3

clfs.append(('LogReg',
             Pipeline([("Scalar", StandardScaler()),
                       ("LogReg", LogisticRegression(n_jobs=-1,␣
↪random_state=42))
                       ])))
clfs.append(("KNN",
            Pipeline([("Scaler", StandardScaler()),
                      ("KNN", KNeighborsClassifier(n_jobs=-1))])))
```

```
clfs.append(("DecisionTreeClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("DecisionTrees",␣
 ↪DecisionTreeClassifier(random_state=42))])))

clfs.append(("RandomForestClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("RandomForest",␣
 ↪RandomForestClassifier(n_estimators=200, n_jobs=-1,
                                                                  ␣
 ↪random_state=42))])))

clfs.append(("GradientBoostingClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("GradientBoosting",␣
 ↪GradientBoostingClassifier(n_estimators=200,
                                                                      ␣
 ↪random_state=42))])))

clfs.append(("RidgeClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("RidgeClassifier", RidgeClassifier(random_state=42))])))

clfs.append(("BaggingRidgeClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("BaggingClassifier", BaggingClassifier(n_jobs=-1,␣
 ↪random_state=42))])))

clfs.append(("ExtraTreesClassifier",
             Pipeline([("Scaler", StandardScaler()),
                       ("ExtraTrees", ExtraTreesClassifier(n_jobs=-1,␣
 ↪random_state=42))])))
```

0.6 Following is the roc_auc score of all the classifier

[54]:
```
scoring = 'roc_auc'
n_folds = 5
results, names  = [], []


for name, model  in clfs:
    kfold = KFold(n_splits=n_folds, random_state=seed)
    cv_results = cross_val_score(model, X_train, y_train,
```

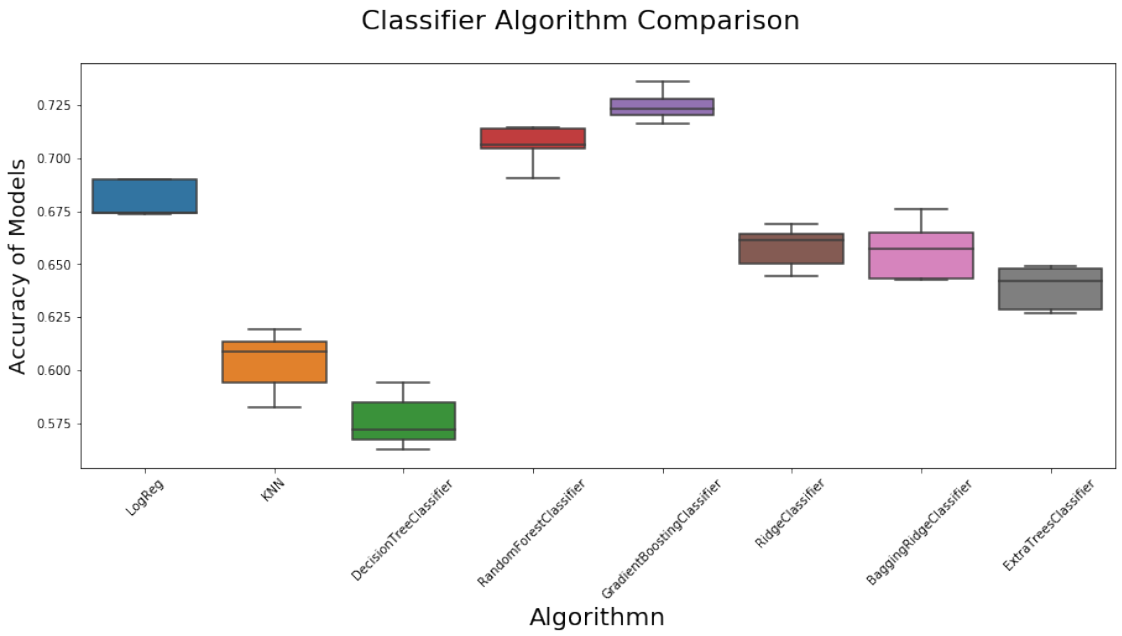
```
                                    cv= n_folds, scoring=scoring,
                                    n_jobs=-1)
    names.append(name)
    results.append(cv_results)
    msg = "%s: %f (+/- %f)" % (name, cv_results.mean(),  cv_results.std())
    print(msg)
```

```
LogReg: 0.680471 (+/- 0.007900)
KNN: 0.603801 (+/- 0.013365)
DecisionTreeClassifier: 0.576319 (+/- 0.011532)
RandomForestClassifier: 0.705844 (+/- 0.008732)
GradientBoostingClassifier: 0.724583 (+/- 0.006805)
RidgeClassifier: 0.657799 (+/- 0.009037)
BaggingRidgeClassifier: 0.656814 (+/- 0.012739)
ExtraTreesClassifier: 0.639005 (+/- 0.009557)
```

0.7 We visualize the performance of all the classifier

[55]:
```
fig = plt.figure(figsize=(15,6))
fig.suptitle('Classifier Algorithm Comparison', fontsize=22)
ax = fig.add_subplot(111)
sns.boxplot(x=names, y=results)
ax.set_xticklabels(names)
ax.set_xlabel("Algorithmn", fontsize=20)
ax.set_ylabel("Accuracy of Models", fontsize=18)
ax.set_xticklabels(ax.get_xticklabels(),rotation=45)

plt.show()
```



[56]:
```
from sklearn.metrics import roc_auc_score
def get_models_score(model, X, y, X_val, y_val):
    # Using the model in X_train and y_train desired
    model.fit(X, y)

    # Predicting our validation test
    y_pred = model.predict_proba(X_val)[:,1]
    score = roc_auc_score(y_val, y_pred)

    return score, y_pred
```

[59]:
```
gb_clf = GradientBoostingClassifier(n_estimators=500, random_state=42)

score, pred = get_models_score(gb_clf, X_train, y_train,
                               X_test, y_test)

print(f'Score of: {score} \n')
# print(pred)
```

```
Score of: 0.7410131765528873
```

0.8 Among all classfier model, we can see that the decision tree classifier and the KNN classifier has the worst performance.

0.9 In contrast, the Gradient Boosting Classifier and the Random Forest Classifier has the best performance. And the ROC_AUC score of the Gradient Boosting Classifier is 0.741

0.10 And such difference may due to the distribution of the data is more nonlinear, and using decision tree and KNN is harder is distinguish the data

[ ]: