In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [4]:
```
df = pd.read_csv("/Users/dev/Personal/DS & AI Class Notes/Data Sets/Adaboos
```

Columns are ['variance' , 'skewness' , 'curtosis' , 'entropy' , 'class']

In [7]:
```
df.columns = ['variance' , 'skewness' , 'curtosis' , 'entropy' , 'class']
```

In [8]:
```
df
```

Out[8]:

	variance	skewness	curtosis	entropy	class
0	3.62160	8.66610	-2.8073	-0.44699	0
1	4.54590	8.16740	-2.4586	-1.46210	0
2	3.86600	-2.63830	1.9242	0.10645	0
3	3.45660	9.52280	-4.0112	-3.59440	0
4	0.32924	-4.45520	4.5718	-0.98880	0
...	...	...	...	...	...
1367	0.40614	1.34920	-1.4501	-0.55949	1
1368	-1.38870	-4.87730	6.4774	0.34179	1
1369	-3.75030	-13.45860	17.5932	-2.77710	1
1370	-3.56370	-8.38270	12.3930	-1.28230	1
1371	-2.54190	-0.65804	2.6842	1.19520	1

1372 rows × 5 columns

In [13]:
```
df.isna().sum()
```

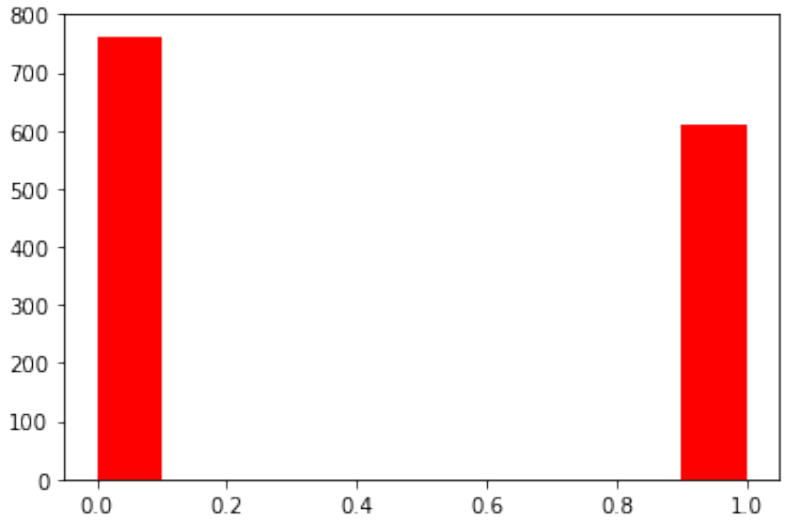
Out[13]:
```
variance    0
skewness    0
curtosis    0
entropy     0
class       0
dtype: int64
```

Checking Balance of DF

In [14]:
```
df["class"].value_counts()
```

Out[14]:
```
0    762
1    610
Name: class, dtype: int64
```

In [16]:
```
plt.hist(df["class"],color='Red',)
plt.show()
```



Checking And Removing 0's IF

In [17]:
```
def checkz(df):
    return df[df == 0].value_counts()
```

In [18]:
```
for i in df.columns:
    print(checkz(df[i]))
```

```
Series([], Name: variance, dtype: int64)
Series([], Name: skewness, dtype: int64)
Series([], Name: curtosis, dtype: int64)
Series([], Name: entropy, dtype: int64)
0    762
Name: class, dtype: int64
```

OD_Tech With The help of Skew

In [25]:
```
df.columns
```

Out[25]:
```
Index(['variance', 'skewness', 'curtosis', 'entropy', 'class'], dtype='obje
ct')
```

In [26]:
```
clist = ['variance', 'skewness', 'curtosis', 'entropy' ]
```

In [27]:
```
def odiqr(df):
    q1 = df.quantile(0.25)
    q3 = df.quantile(0.75)
    iqr = q3 - q1
    low = q1 - (1.5 * iqr)
    high = q3 + (1.5 * iqr)
    m = df.mean()
    df = df.apply(lambda x : m if x < low else (m if x > high else x ) )
    return df
```

In [28]:
```
def odmsd(df):
    m = round(df.mean(),2)
    s = round(df.std(),2)
    low = round(m-(3*s),2)
    high = round(m+(3*s),2)
    ft1 = df[df<low]
    ft2 = df[df>high]
    df = df.map(lambda x : low if x < low else (high if x > high else x ))
```

In [29]:
```
for i in clist:
    print(f'{i} is {df[i].skew()}')
```

```
variance is -0.14938770055109993
skewness is -0.39410347444624066
curtosis is 1.088568543275335
entropy is -1.0222430438083978
```

In [32]:
```
for i in clist:
    if df[i].skew() >= 0.5:
        odmsd(df[i])
    else:
        df[i] = odiqr(df[i])
```

In [33]:
```
for i in clist:
    print(f'{i} is {df[i].skew()}')
```

```
variance is -0.14938770055109993
skewness is -0.39410347444624066
curtosis is 0.5977165081154234
entropy is -0.8377778918389013
```

Shuffling

In [77]:
```
df = df.sample(frac=1)
```

In [78]:
```
df
```

Out[78]:

	variance	skewness	curtosis	entropy	class
1226	-4.06790	2.4955	0.795710	-1.10390	1
887	-3.26920	-12.7406	1.397627	-0.14182	1
794	-1.62440	-6.3444	4.657500	0.16981	1
136	5.43800	9.4669	-4.941700	-3.92020	0
594	5.20320	3.5116	-1.253800	1.01290	0
...	...	...	...	...	...
1304	-5.29430	-5.1463	1.397627	-1.11810	1
560	4.04460	11.1741	-4.358200	-4.74010	0
1082	-1.39460	2.3134	-0.444990	-1.49050	1
501	1.29990	2.5762	2.010700	-0.18967	0
390	-0.36279	8.2895	-1.921300	-3.33320	0

1372 rows × 5 columns

Splitting

In [79]:
```
X = df.drop("class",axis=1)
```

In [80]:
```
X.sample()
```

Out[80]:

	variance	skewness	curtosis	entropy
146	3.8584	0.78425	1.1033	1.7008

In [81]:
```
y = df["class"]
```

In [82]:
```
y.sample()
```

Out[82]:
```
214    0
Name: class, dtype: int64
```

In [83]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import KFold , cross_val_score
from sklearn.svm import SVC
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier , AdaBoostClassifier
```

In [84]:
```
Xtrain,Xtest,ytrain,ytest = train_test_split(X,y,test_size=.20)
```

In [85]:
```
X.shape , Xtrain.shape , Xtest.shape
```

Out[85]:
```
((1372, 4), (1097, 4), (275, 4))
```

In [86]:
```
y.shape , ytrain.shape , ytest.shape
```

Out[86]:
```
((1372,), (1097,), (275,))
```

In [87]:
```
kf = KFold(n_splits=11)
```

In [88]:
```
dct = DecisionTreeClassifier()
```

In [89]:
```
rfc = RandomForestClassifier(criterion='entropy')
```

In [90]:
```
algo = [ dct , rfc ]
```

Without Feature Scaling

In [91]:
```
for i in algo:
    i.fit(Xtrain,ytrain)
    s = i.score(Xtest,ytest)
    print(f'{i} = {s}')
```

```
DecisionTreeClassifier() = 0.9818181818181818
RandomForestClassifier(criterion='entropy') = 0.9854545454545455
```

With Feature Scaling

In [92]:
```
ss = StandardScaler()
```

In [93]:
```
ss.fit(Xtrain)
```

Out[93]:
```
StandardScaler()
```

In [94]:
```
Xtrain_ss = ss.transform(Xtrain)
```

In [95]:
```
Xtest_ss = ss.transform(Xtest)
```

In [96]:
```
for i in algo:
    i.fit(Xtrain_ss,ytrain)
    s = i.score(Xtest_ss,ytest)
    print(f'{i} = {s}')
```

```
DecisionTreeClassifier() = 0.9818181818181818
RandomForestClassifier(criterion='entropy') = 0.9854545454545455
```

With Cross Validation

In [97]:
```
for i in algo:
    s = cross_val_score(i,X,y,cv = kf)
    print(f'{i} = {s.mean()}')
```

```
DecisionTreeClassifier() = 0.983958944281525
RandomForestClassifier(criterion='entropy') = 0.9919765395894428
```

Boosting

In [98]:
```
rfc1 = RandomForestClassifier(n_estimators=150,max_depth=2,max_leaf_nodes=3
```

In [99]:
```
abc = AdaBoostClassifier()
```

In [100…
```
algo1 = [rfc1   , abc ]
```

In [101…
```
for i in algo1:
    print(i)
```

```
RandomForestClassifier(max_depth=2, max_leaf_nodes=3, n_estimators=150)
AdaBoostClassifier()
```

Without Feature Scaling

In [102…
```
for i in algo1:
    i.fit(Xtrain,ytrain)
    s = i.score(Xtest,ytest)
    print(f'{i} = {s}')
```

```
RandomForestClassifier(max_depth=2, max_leaf_nodes=3, n_estimators=150) = 0
.8909090909090909
AdaBoostClassifier() = 0.9890909090909091
```

With Feature Scaling

In [103…
```
for i in algo1:
    i.fit(Xtrain_ss,ytrain)
    s = i.score(Xtest_ss,ytest)
    print(f'{i} = {s}')
```

```
RandomForestClassifier(max_depth=2, max_leaf_nodes=3, n_estimators=150) = 0
.8872727272727273
AdaBoostClassifier() = 0.9890909090909091
```

With Cross Validation (Boosting)

In [104…
```
%%time
for i in algo1:
    s = cross_val_score(i,X,y,cv = kf)
    print(f'{i} = {s.mean()}')
```

```
RandomForestClassifier(max_depth=2, max_leaf_nodes=3, n_estimators=150) = 0
.9008680351906158
AdaBoostClassifier() = 0.9970850439882697
CPU times: user 2.21 s, sys: 12.1 ms, total: 2.22 s
Wall time: 2.22 s
```

With GridSearch CV

In [105…
```
from sklearn.model_selection import GridSearchCV
```

In [106…
```
dic = { 'n_estimators' : [100,125,180],'criterion': ['gini', 'entropy'], 'r
       ,'min_samples_leaf' : [ 1,5]  }
```

In [107…
```
kf1 = KFold(n_splits=12)
```

In [108…
```
gvc = GridSearchCV(RandomForestClassifier(),param_grid=dic,cv = kf1)
```

In [109…
```
%%time
gvc.fit(X,y)
```

```
CPU times: user 1min 5s, sys: 370 ms, total: 1min 5s
Wall time: 1min 5s
```

Out[109…
```
GridSearchCV(cv=KFold(n_splits=12, random_state=None, shuffle=False),
             estimator=RandomForestClassifier(),
             param_grid={'criterion': ['gini', 'entropy'],
                         'max_depth': [2, 3, 10], 'min_samples_leaf': [1, 5
],
                         'n_estimators': [100, 125, 180]})
```

In [110…
```
gvc.best_params_
```

Out[110…
```
{'criterion': 'gini',
 'max_depth': 10,
 'min_samples_leaf': 1,
 'n_estimators': 100}
```

In [111…
```
gvc.best_estimator_
```

Out[111…
```
RandomForestClassifier(max_depth=10)
```

In [112…
```
gvc.best_score_
```

Out[112…
```
0.9948957538774472
```

With RandomSearch CV

In [113…
```
from sklearn.model_selection import RandomizedSearchCV
```

In [116…
```
rvc = RandomizedSearchCV(RandomForestClassifier(),param_distributions=dic,c
```

In [117…
```
%%time
rvc.fit(X,y)
```

Out[117…
```
CPU times: user 15.9 s, sys: 97.7 ms, total: 16 s
Wall time: 16 s
RandomizedSearchCV(cv=KFold(n_splits=12, random_state=None, shuffle=False),
                   estimator=RandomForestClassifier(),
                   param_distributions={'criterion': ['gini', 'entropy'],
                                        'max_depth': [2, 3, 10],
                                        'min_samples_leaf': [1, 5],
                                        'n_estimators': [100, 125, 180]})
```

In [118…
```
rvc.best_params_
```

Out[118…
```
{'n_estimators': 100,
 'min_samples_leaf': 1,
 'max_depth': 10,
 'criterion': 'entropy'}
```

In [119…
```
rvc.best_estimator_
```

Out[119…
```
RandomForestClassifier(criterion='entropy', max_depth=10)
```

In [120…
```
rvc.best_score_
```

Out[120…
```
0.993440122044241
```

In [ ]: