Importing Necesary Libraries

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
```

Reading the csv file as the dataframe

```
df=pd.read_csv('2.csv')
```

```
df.head(10)
```

	buying	maint	doors	persons	lug_boot	safety	car
0	vhigh	vhigh	two	two	small	low	unacc
1	vhigh	vhigh	two	two	small	med	unacc
2	vhigh	vhigh	two	two	small	high	unacc
3	vhigh	vhigh	two	two	med	low	unacc
4	vhigh	vhigh	two	two	med	med	unacc
5	vhigh	vhigh	two	two	med	high	unacc
6	vhigh	vhigh	two	two	big	low	unacc
7	vhigh	vhigh	two	two	big	med	unacc
8	vhigh	vhigh	two	two	big	high	unacc
9	vhigh	high	two	two	small	low	unacc

Category Count

```
df['car'].value_counts()
```

```
unacc    1210
acc       384
good       69
vgood      65
Name: car, dtype: int64
```

```
df['buying'].value_counts()
```

```
low      432
med      432
vhigh    432
high     432
Name: buying, dtype: int64
```

```
df['doors'].value_counts()
```

```
three    432
four     432
5more    432
two      432
Name: doors, dtype: int64
```

```
df['persons'].value_counts()
```

```
four    576
two     576
more    576
Name: persons, dtype: int64
```

```
df['lug_boot'].value_counts()
```

```
med      576
big      576
```

```
small    576
Name: lug_boot, dtype: int64
```

```
df['safety'].value_counts()
```

```
low     576
med     576
high    576
Name: safety, dtype: int64
```

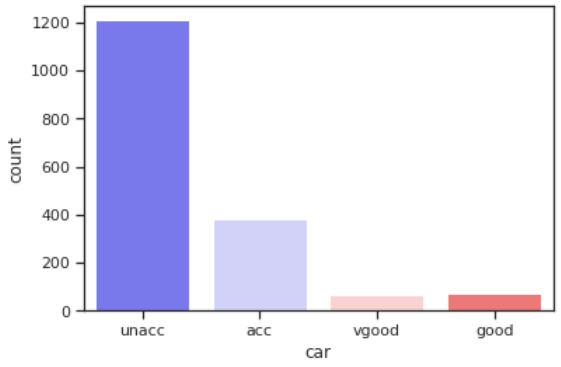
Null Values

```
df.isna().sum()
```

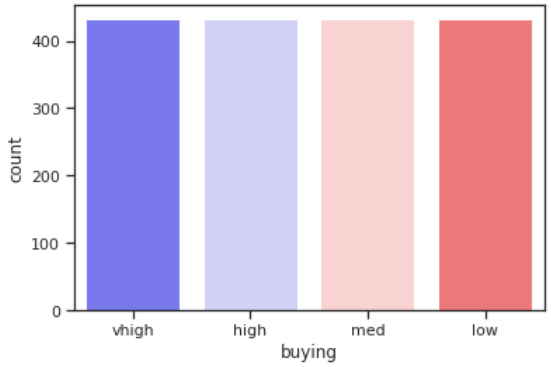
```
buying      0
maint       0
doors       0
persons     0
lug_boot    0
safety      0
car         0
dtype: int64
```

Data VIZ

```
sns.set(style="ticks")
f = sns.countplot(x="car", data=df, palette="bwr")
plt.show()
```




```
sns.set(style="ticks")
f = sns.countplot(x="buying", data=df, palette="bwr")
plt.show()
```




```
sns.set(style="ticks")
f = sns.countplot(x="doors", data=df, palette="tab10")
plt.show()
```

Label Encoding

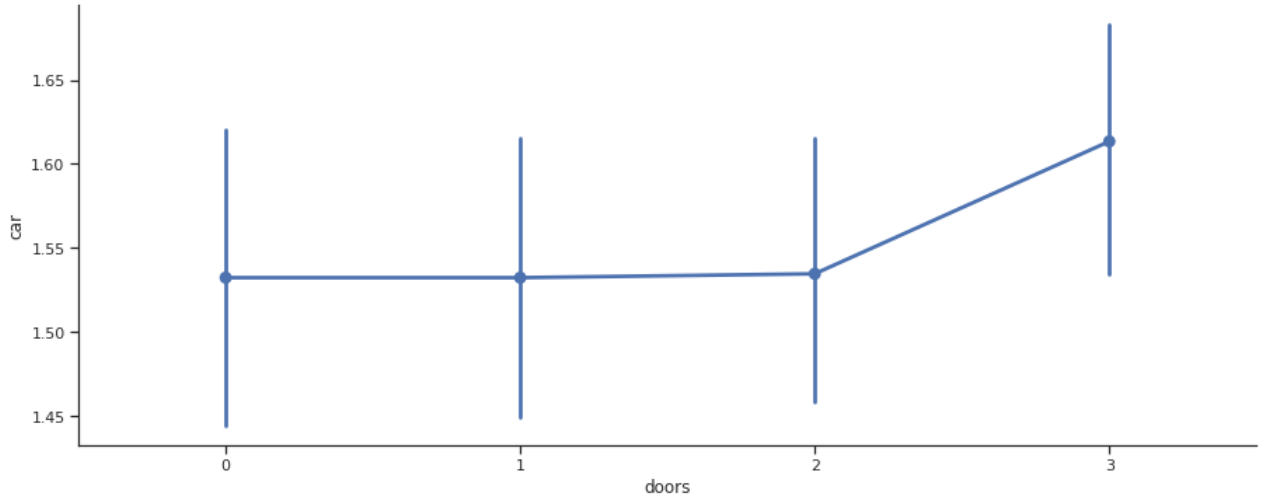
two three four 5more

```
col=list(df.columns)

from sklearn import preprocessing
label_encoder = preprocessing.LabelEncoder()

for i in col:
  df[i]= label_encoder.fit_transform(df[i])
```

Data Viz Continued...

```
axes = sns.factorplot('doors','car',
                      data=df, aspect = 2.5, );
```

```
/usr/local/lib/python3.6/dist-packages/seaborn/categorical.py:3704: UserWarning: The `factorplot` function has been renamed
  warnings.warn(msg)
/usr/local/lib/python3.6/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variables as keyword arg
  FutureWarning
```

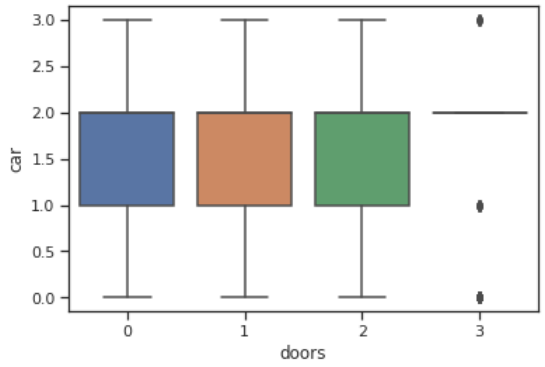



```
axes = sns.factorplot('maint','car',
                      data=df, aspect = 2, );
```

```
/usr/local/lib/python3.6/dist-packages/seaborn/categorical.py:3704: UserWarning: The `factorplot` function has been renamed
  warnings.warn(msg)
/usr/local/lib/python3.6/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass the following variables as keyword arg
```

```
sns.boxplot(x='doors',y='car',data=df)
```

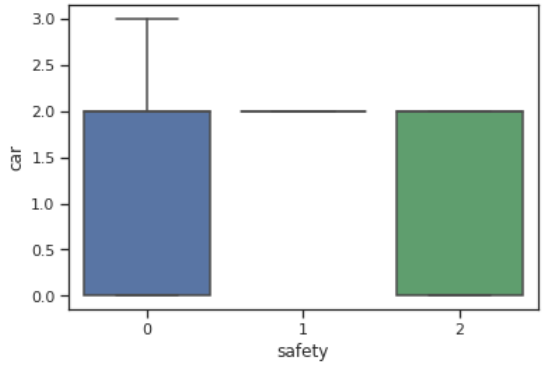
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f245a842ac8>
```



0 1 2 3

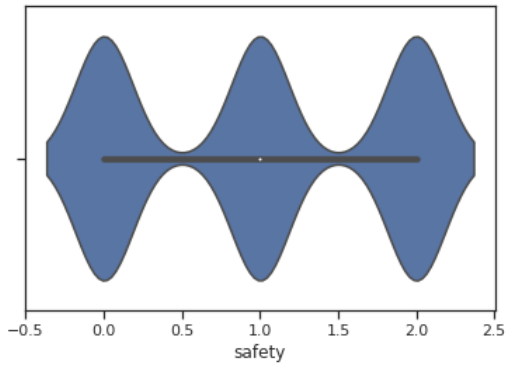
```
sns.boxplot(x='safety',y='car',data=df)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f245a7e4710>
```



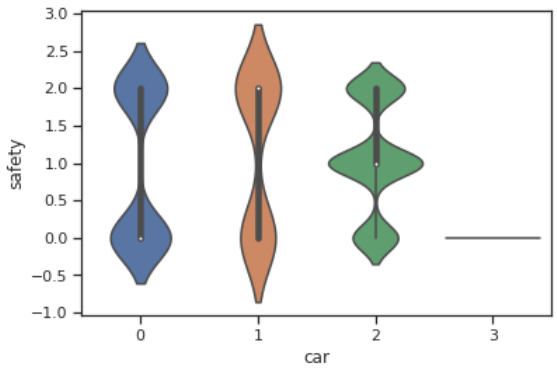

```
sns.violinplot(x='safety',data=df,size=6)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f245a6fb6a0>
```



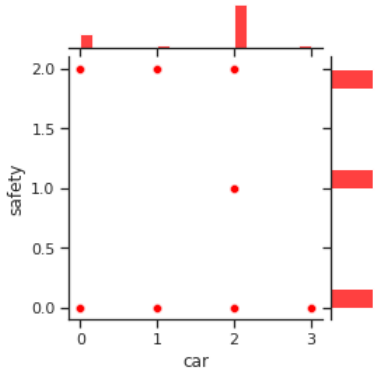

```
sns.violinplot(x='car',y='safety', data=df,size=6)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f245a6de2e8>
```



```
sns.jointplot(x='car',y='safety', data=df,size=4,color='red')
```

```
/usr/local/lib/python3.6/dist-packages/seaborn/axisgrid.py:2015: UserWarning: The `size` parameter has been renamed to `heig
  warnings.warn(msg, UserWarning)
<seaborn.axisgrid.JointGrid at 0x7f245a854080>
```




```
df.head()
```

	buying	maint	doors	persons	lug_boot	safety	car
0	3	3	3	2	2	1	2
1	3	3	3	2	2	2	2
2	3	3	3	2	2	0	2
3	3	3	3	2	1	1	2
4	3	3	3	2	1	2	2

Taking **Car** as the **Target variable**

```
x=df.iloc[:,:-1].values
y=df.iloc[:,6].values
```

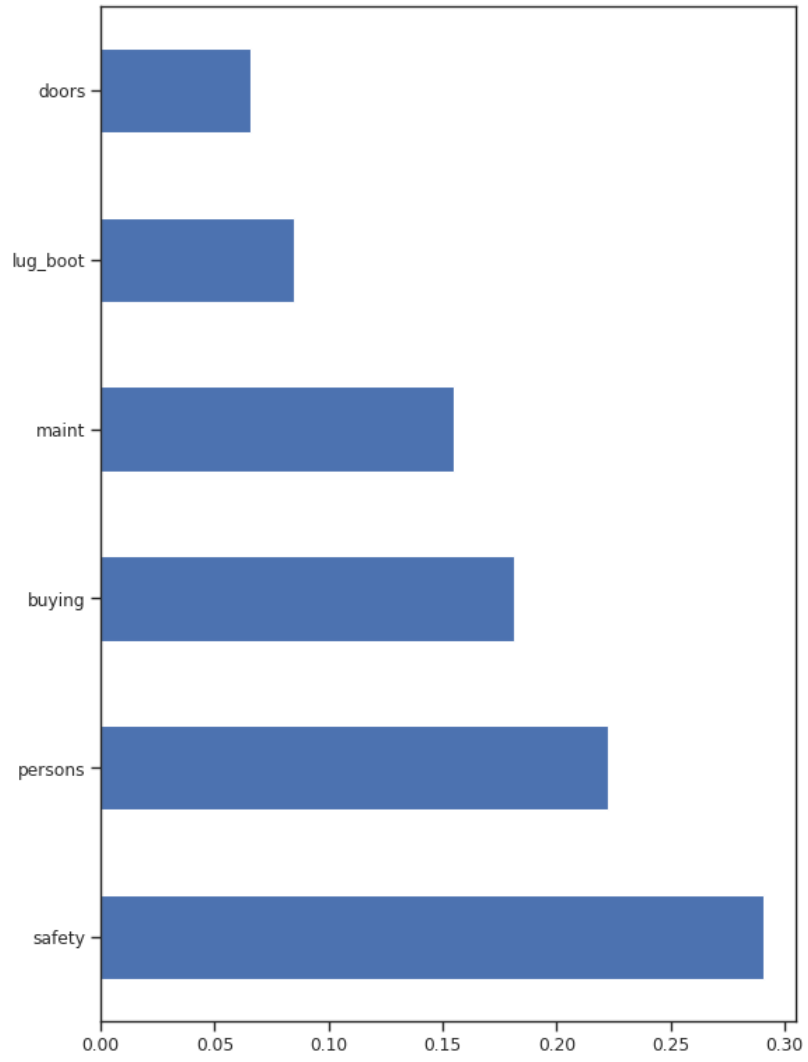
JUST DOING **RANDOM Forest** for checking which feature are important , **SVM** is done below

```
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report,confusion_matrix
from sklearn.linear_model import LogisticRegression
from sklearn import svm
from sklearn import tree
from sklearn.ensemble import RandomForestClassifier

X_Train, X_Test, Y_Train, Y_Test = train_test_split(x, y, test_size = 0.30, random_state = 101)


import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib.pyplot import figure
from sklearn.utils import shuffle
from sklearn import preprocessing
from sklearn.preprocessing import LabelEncoder
import time
import os



start = time.process_time()
trainedforest = RandomForestClassifier(n_estimators=700).fit(X_Train,Y_Train)
print(time.process_time() - start)
predictionforest = trainedforest.predict(X_Test)
print(confusion_matrix(Y_Test,predictionforest))
print(classification_report(Y_Test,predictionforest))
```

```
1.3010273109999986
[[112   3   0   0]
 [  4  20   0   1]
 [  7   0 359   0]
 [  0   0   0  13]]
              precision    recall  f1-score   support

           0       0.91      0.97      0.94       115
           1       0.87      0.80      0.83        25
           2       1.00      0.98      0.99       366
           3       0.93      1.00      0.96        13

    accuracy                           0.97       519
   macro avg       0.93      0.94      0.93       519
weighted avg       0.97      0.97      0.97       519
```

```
figure(num=None, figsize=(8, 12), dpi=80, facecolor='w', edgecolor='k')
X=df.iloc[:,:-1]
feat_importances = pd.Series(trainedforest.feature_importances_, index= X.columns)
feat_importances.nlargest(19).plot(kind='barh')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f245aa4ebe0>
```



Feature Scaling

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_Train = sc.fit_transform(X_Train)
X_Test = sc.transform(X_Test)
```

Support Vector Classifier using RBF Kernel

```
from sklearn.svm import SVC
classifier = SVC(kernel = 'rbf',degree=2 ,random_state = 0)
classifier.fit(X_Train, Y_Train)
```

```
SVC(C=1.0, break_ties=False, cache_size=200, class_weight=None, coef0=0.0,
    decision_function_shape='ovr', degree=2, gamma='scale', kernel='rbf',
    max_iter=-1, probability=False, random_state=0, shrinking=True, tol=0.001,
    verbose=False)
```

```
# Predicting the Test set results
y_pred = classifier.predict(X_Test)

# Making the Confusion Matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(Y_Test, y_pred)
```

Classification Report

```
print(confusion_matrix(Y_Test,y_pred))
print(classification_report(Y_Test,y_pred))
```

```
[[112   0   3   0]
 [ 24   0   0   1]
 [ 12   0 354   0]
 [  2   0   0  11]]
              precision    recall  f1-score   support

           0       0.75      0.97      0.85       115
           1       0.00      0.00      0.00        25
           2       0.99      0.97      0.98       366
           3       0.92      0.85      0.88        13

    accuracy                           0.92       519
   macro avg       0.66      0.70      0.68       519
weighted avg       0.89      0.92      0.90       519

/usr/local/lib/python3.6/dist-packages/sklearn/metrics/_classification.py:1272: UndefinedMetricWarning: Precision and F-scor
  _warn_prf(average, modifier, msg_start, len(result))
```

```
from sklearn.metrics import accuracy_score
print("Accurrcay:", accuracy_score(Y_Test, y_pred))
```

```
Accurrcay: 0.9190751445086706
```

```
Y_Test.shape
```

```
(519,)
```

```
print(Y_Test[:30])
print(y_pred[:30])
```

```
[2 0 2 2 2 0 2 2 0 2 2 2 0 2 2 1 2 2 2 0 1 2 2 2 2 2 2 2 2 2]
[2 0 2 2 2 0 2 2 0 2 2 2 0 2 2 0 2 2 2 0 0 2 2 2 0 2 2 2 2 2]
```

Residual plot

```
plt.scatter(y_pred, y_pred - Y_Test, c='g', s = 40)
plt.hlines(y=0, xmin=-5, xmax=10)
plt.title('Residual plot')
plt.ylabel('Residual')
```

```
Text(0, 0.5, 'Residual')
```