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

from collections import Counter

import warnings
warnings.filterwarnings('ignore')

sns.set_style('darkgrid')
from matplotlib import pyplot

# importing dataset

df = pd.read_csv('Admission_Predict_Ver1.1.csv')

df.head(10).T
```

	0	1	2	3	4	5	6	7	8	9
Serial No.	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.0	10.00
GRE Score	337.00	324.00	316.00	322.00	314.00	330.00	321.00	308.00	302.0	323.00
TOEFL Score	118.00	107.00	104.00	110.00	103.00	115.00	109.00	101.00	102.0	108.00
University Rating	4.00	4.00	3.00	3.00	2.00	5.00	3.00	2.00	1.0	3.00
SOP	4.50	4.00	3.00	3.50	2.00	4.50	3.00	3.00	2.0	3.50
LOR	4.50	4.50	3.50	2.50	3.00	3.00	4.00	4.00	1.5	3.00
CGPA	9.65	8.87	8.00	8.67	8.21	9.34	8.20	7.90	8.0	8.60
Research	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00
Chance of Admit	0.92	0.76	0.72	0.80	0.65	0.90	0.75	0.68	0.5	0.45

```
df=df.rename(columns = {'Chance of Admit ':'Chance of Admit'})

l = df.columns
print('The columns are: ',l)
```

```
The columns are:  Index(['Serial No.', 'GRE Score', 'TOEFL Score',
'University Rating', 'SOP',
       'LOR ', 'CGPA', 'Research', 'Chance of Admit'],
      dtype='object')
```

```
# checking null

print(df.isnull().sum())
print('\n\nNo null values')
```

```
Serial No.           0
GRE Score            0
TOEFL Score          0
University Rating    0
SOP                  0
LOR                  0
CGPA                 0
Research             0
Chance of Admit      0
dtype: int64


No null values
```

```
df.describe().T
```

```
                    count       mean         std     min       25%
50%  \
Serial No.          500.0  250.50000  144.481833    1.00  125.7500
250.50
GRE Score           500.0  316.47200   11.295148  290.00  308.0000
317.00
TOEFL Score         500.0  107.19200    6.081868   92.00  103.0000
107.00
University Rating   500.0    3.11400    1.143512    1.00    2.0000
3.00
SOP                 500.0    3.37400    0.991004    1.00    2.5000
3.50
LOR                 500.0    3.48400    0.925450    1.00    3.0000
3.50
CGPA                500.0    8.57644    0.604813    6.80    8.1275
8.56
Research            500.0    0.56000    0.496884    0.00    0.0000
1.00
Chance of Admit     500.0    0.72174    0.141140    0.34    0.6300
0.72
```

```
                      75%     max
Serial No.         375.25  500.00
GRE Score          325.00  340.00
TOEFL Score        112.00  120.00
University Rating    4.00    5.00
SOP                  4.00    5.00
LOR                  4.00    5.00
CGPA                 9.04    9.92
Research             1.00    1.00
Chance of Admit      0.82    0.97
```

```
def detect_outliers(df,n,features):
    """
    Takes a dataframe df of features and returns a list of the indices
    corresponding to the observations containing more than n outliers
according
    to the Tukey method.
    """
    outlier_indices = []

    # iterate over features(columns)
    for col in features:
        # 1st quartile (25%)
        Q1 = np.percentile(df[col], 25)
        # 3rd quartile (75%)
        Q3 = np.percentile(df[col],75)
        # Interquartile range (IQR)
        IQR = Q3 - Q1

        # outlier step
        outlier_step = 1.5 * IQR

        # Determine a list of indices of outliers for feature col
        outlier_list_col = df[(df[col] < Q1 - outlier_step) | (df[col]
> Q3 + outlier_step )].index

        # append the found outlier indices for col to the list of
outlier indices
        outlier_indices.extend(outlier_list_col)

    # select observations containing more than 2 outliers
    outlier_indices = Counter(outlier_indices)
    multiple_outliers = list( k for k, v in outlier_indices.items() if
v > n )

    return multiple_outliers
outliers_to_drop=detect_outliers(df,2,['GRE Score', 'TOEFL Score',
'University Rating', 'SOP',
       'LOR ', 'CGPA', 'Research'])
```

```
df.loc[outliers_to_drop] # Show the outliers rows
```

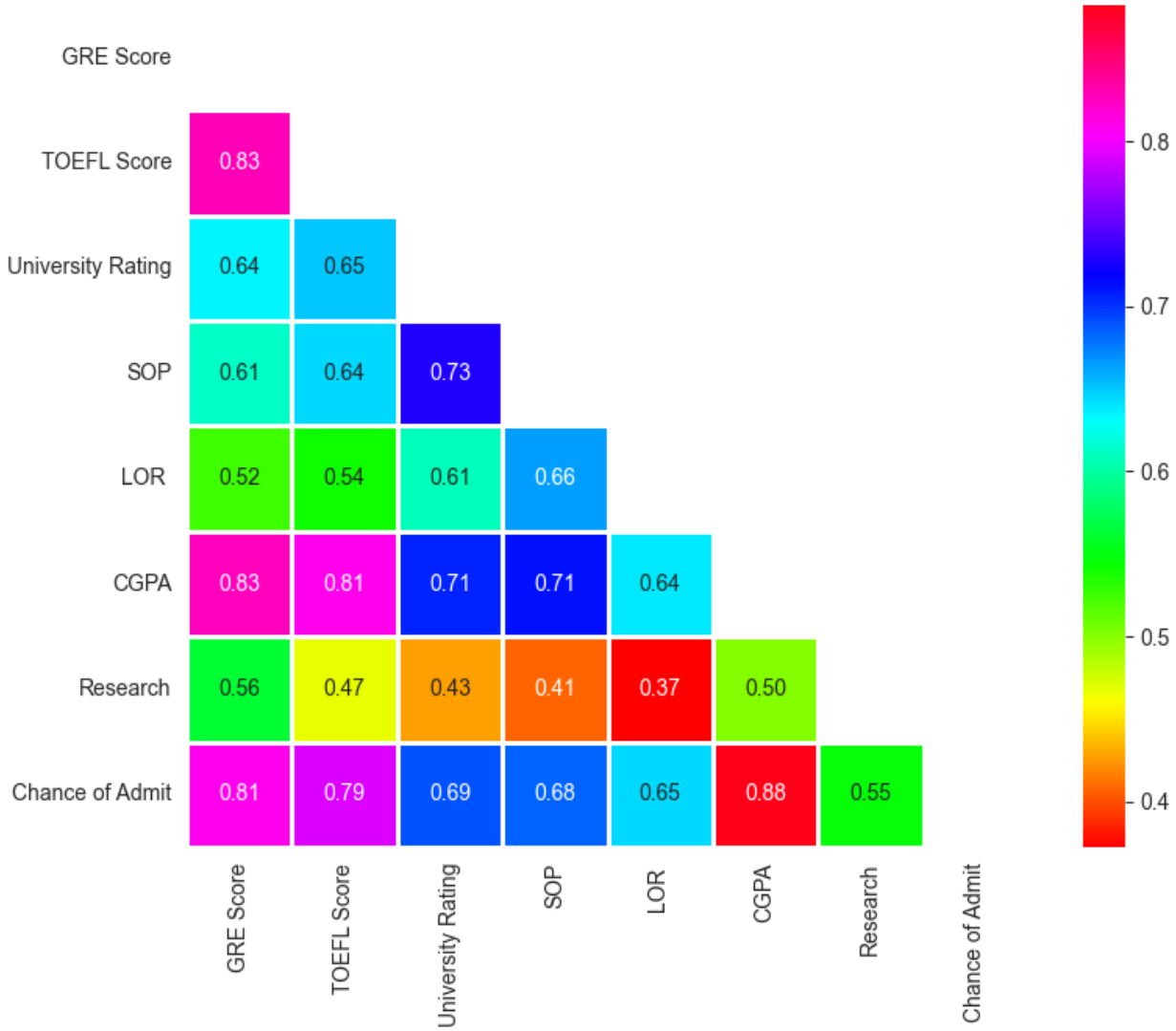
```
Empty DataFrame
Columns: [Serial No., GRE Score, TOEFL Score, University Rating, SOP,
LOR , CGPA, Research, Chance of Admit]
Index: []
```

```
cols=df.drop(labels='Serial No.',axis=1)
cols.head().T
```

	0	1	2	3	4
GRE Score	337.00	324.00	316.00	322.00	314.00
TOEFL Score	118.00	107.00	104.00	110.00	103.00
University Rating	4.00	4.00	3.00	3.00	2.00
SOP	4.50	4.00	3.00	3.50	2.00
LOR	4.50	4.50	3.50	2.50	3.00
CGPA	9.65	8.87	8.00	8.67	8.21
Research	1.00	1.00	1.00	1.00	0.00
Chance of Admit	0.92	0.76	0.72	0.80	0.65

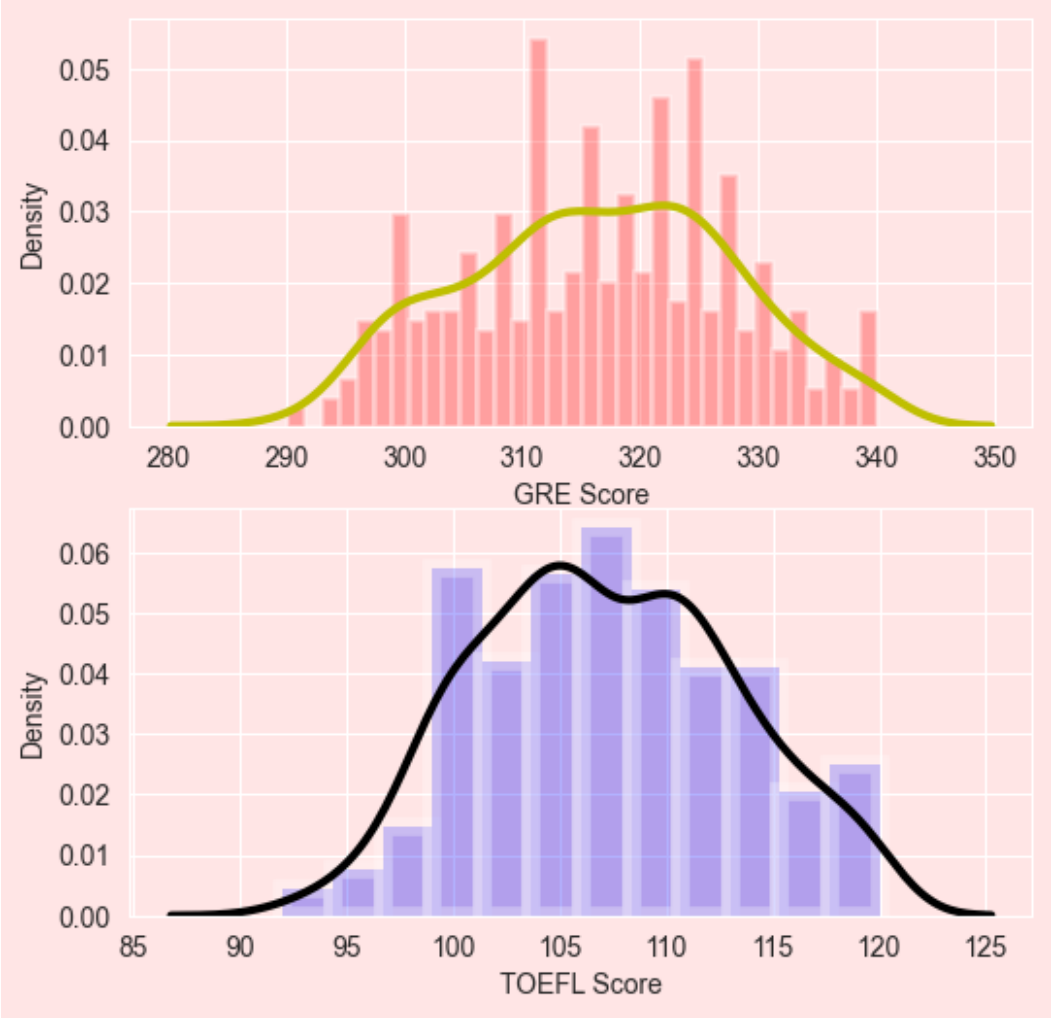
Data Analysis

```
corr = cols.corr()
mask = np.zeros_like(corr)
mask[np.triu_indices_from(mask)] = True
with sns.axes_style("white"):
    f, ax = plt.subplots(figsize=(9, 7))
    ax =
sns.heatmap(corr,mask=mask,square=True,annot=True,fmt='0.2f',linewidth
s=.8,cmap="hsv")
```




```
plt.rcParams['axes.facecolor'] = "#ffe5e5"
plt.rcParams['figure.facecolor'] = "#ffe5e5"
plt.figure(figsize=(6,6))
plt.subplot(2, 1, 1)
sns.distplot(df['GRE Score'],bins=34,color='Red',  kde_kws={"color":
"y", "lw": 3, "label": "KDE"},hist_kws={"linewidth": 2,"alpha": 0.3 })
plt.subplot(2, 1, 2)
sns.distplot(df['TOEFL Score'],bins=12,color='Blue' ,kde_kws={"color":
"k", "lw": 3, "label": "KDE"},hist_kws={"linewidth": 7,"alpha": 0.3 })
```

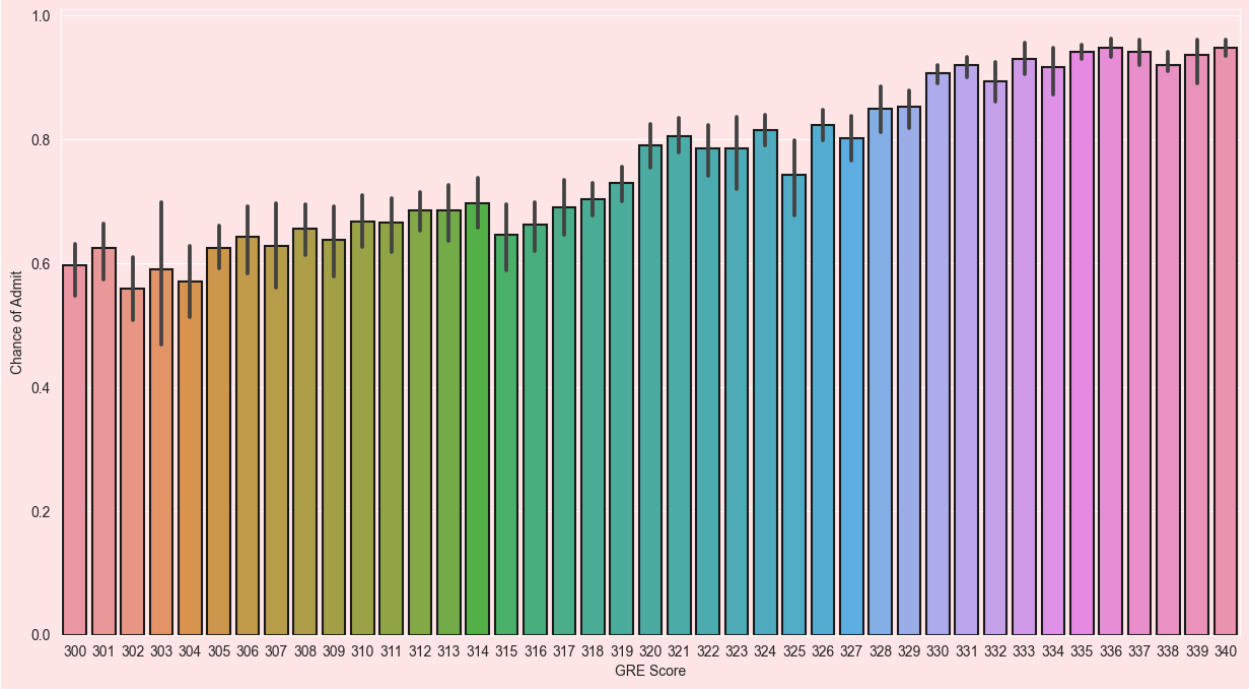
```
<Axes: xlabel='TOEFL Score', ylabel='Density'>
```



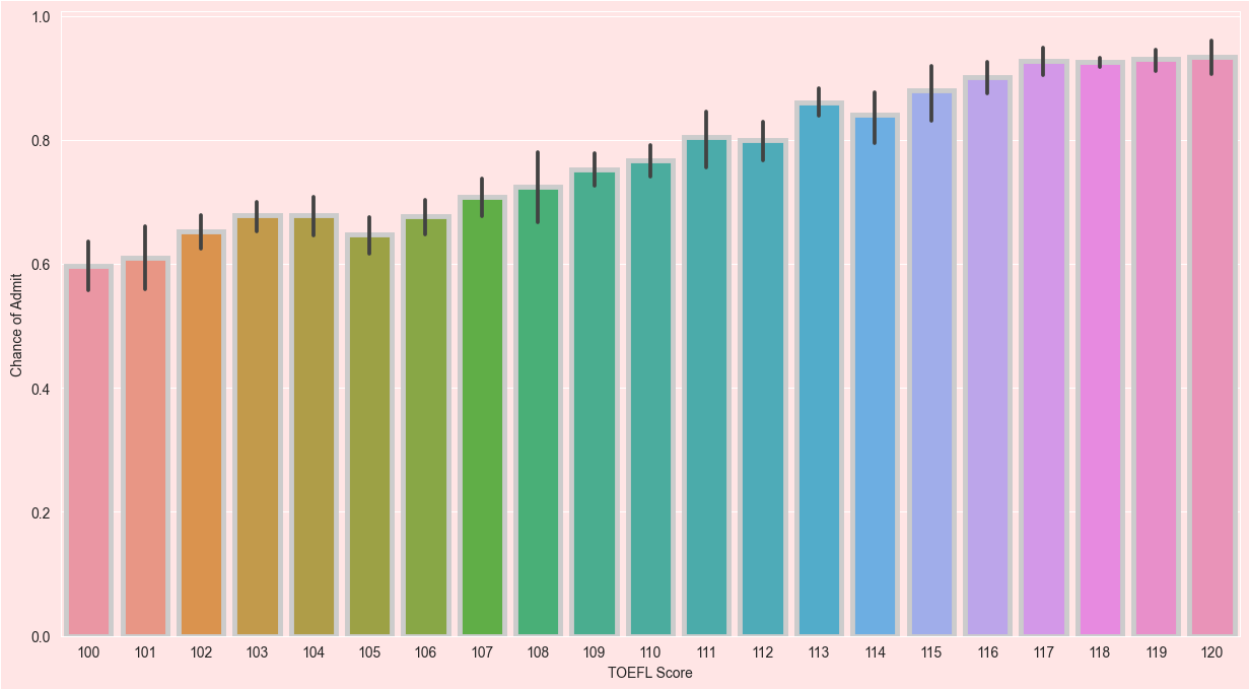

```
sns.scatterplot(x='University Rating',y='CGPA',data=df,color='Red',
marker="^", s=100)
```

```
<Axes: xlabel='University Rating', ylabel='CGPA'>
```


```
co_gre=df[df["GRE Score"]>=300]
co_toefel=df[df["TOEFL Score"]>=100]

fig, ax = pyplot.subplots(figsize=(15,8))
sns.barplot(x='GRE Score',y='Chance of Admit',data=co_gre,
linewidth=1.5,edgecolor="0.1")
plt.show()
```

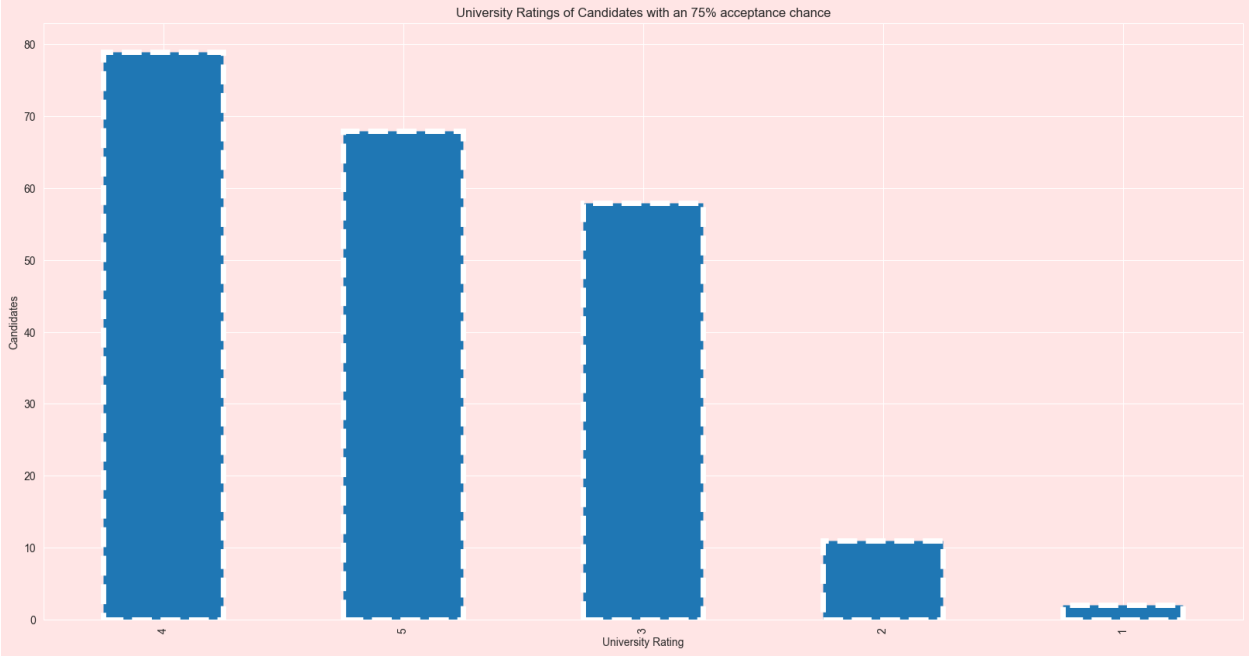



```
fig, ax = pyplot.subplots(figsize=(15,8))
sns.barplot(x='TOEFL Score',y='Chance of Admit',data=co_toefel,
linewidth=3.5,edgecolor="0.8")
plt.show()
```




```
s = df[df["Chance of Admit"] >= 0.75]["University
Rating"].value_counts().head(5)
```

```
plt.title("University Ratings of Candidates with an 75% acceptance chance")
s.plot(kind='bar',figsize=(20, 10),linestyle='dashed',linewidth=5)
plt.xlabel("University Rating")
plt.ylabel("Candidates")
plt.show()
```




```
print("Average GRE Score :{0:.2f} out of 340".format(df['GRE Score'].mean()))
print('Average TOEFL Score:{0:.2f} out of 120'.format(df['TOEFL Score'].mean()))
print('Average CGPA:{0:.2f} out of 10'.format(df['CGPA'].mean()))
print('Average Chance of getting admitted:{0:.2f}%'.format(df['Chance of Admit'].mean()*100))
```

```
Average GRE Score :316.47 out of 340
Average TOEFL Score:107.19 out of 120
Average CGPA:8.58 out of 10
Average Chance of getting admitted:72.17%
```

```
toppers=df[(df['GRE Score']>=330) & (df['TOEFL Score']>=115) & (df['CGPA']>=9.5)].sort_values(by=['Chance of Admit'],ascending=False)
toppers
```

```
     Serial No.  GRE Score  TOEFL Score  University Rating  SOP  LOR  CGPA  \
202         203        340          120                  5  4.5   4.5  9.91
143         144        340          120                  4  4.5   4.0
```

```
9.92
24           25         336          119                   5  4.0   3.5
9.80
203         204         334          120                   5  4.0   5.0
9.87
213         214         333          119                   5  5.0   4.5
9.78
385         386         335          117                   5  5.0   5.0
9.82
148         149         339          116                   4  4.0   3.5
9.80
81           82         340          120                   4  5.0   5.0
9.50
496         497         337          117                   5  5.0   5.0
9.87
23           24         334          119                   5  5.0   4.5
9.70
212         213         338          120                   4  5.0   5.0
9.66
399         400         333          117                   4  5.0   4.0
9.66
372         373         336          119                   4  4.5   4.0
9.62
120         121         335          117                   5  5.0   5.0
9.56
70           71         332          118                   5  5.0   5.0
9.64
193         194         336          118                   5  4.5   5.0
9.53
25           26         340          120                   5  4.5   4.5
9.60
423         424         334          119                   5  4.5   5.0
9.54
497         498         330          120                   5  4.5   5.0
9.56
361         362         334          116                   4  4.0   3.5
9.54
253         254         335          115                   4  4.5   4.5
9.68
0             1         337          118                   4  4.5   4.5
9.65
47           48         339          119                   5  4.5   4.0
9.70

     Research  Chance of Admit
202         1              0.97
143         1              0.97
24          1              0.97
203         1              0.97
```

```
213          1              0.96
385          1              0.96
148          1              0.96
81           1              0.96
496          1              0.96
23           1              0.95
212          1              0.95
399          1              0.95
372          1              0.95
120          1              0.94
70           1              0.94
193          1              0.94
25           1              0.94
423          1              0.94
497          1              0.93
361          1              0.93
253          1              0.93
0            1              0.92
47           0              0.89
```

Modelling

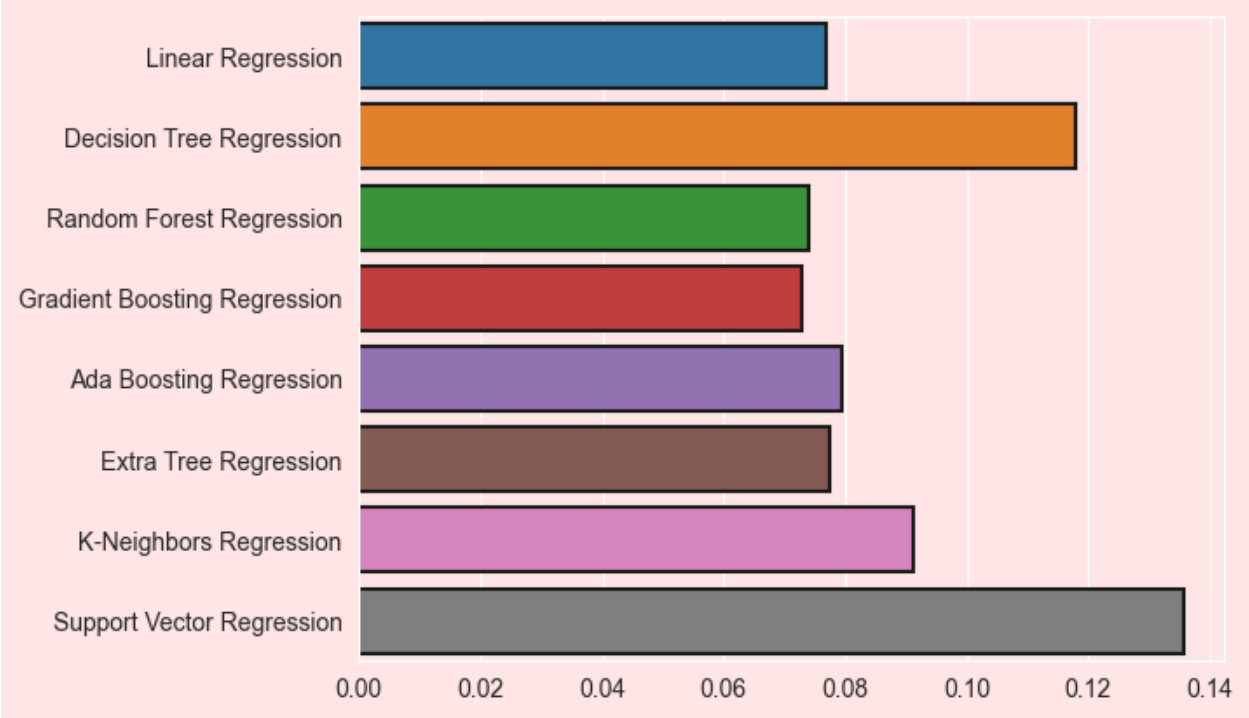
```
# reading the dataset
df = pd.read_csv("Admission_Predict.csv",sep = ",")

# it may be needed in the future.
serialNo = df["Serial No."].values

df.drop(["Serial No."],axis=1,inplace = True)

df=df.rename(columns = {'Chance of Admit ':'Chance of Admit'})
X=df.drop('Chance of Admit',axis=1)
y=df['Chance of Admit']

from sklearn.model_selection import train_test_split
from sklearn import preprocessing

#Normalisation works slightly better for Regression.
X_norm=preprocessing.normalize(X)
X_train,X_test,y_train,y_test=train_test_split(X_norm,y,test_size=0.20
,random_state=101)
from sklearn.linear_model import LinearRegression,LogisticRegression
from sklearn.tree import DecisionTreeRegressor,DecisionTreeClassifier
from sklearn.ensemble import
RandomForestRegressor,RandomForestClassifier
from sklearn.ensemble import
GradientBoostingRegressor,GradientBoostingClassifier
from sklearn.ensemble import AdaBoostRegressor,AdaBoostClassifier
```

```
from sklearn.ensemble import ExtraTreesRegressor,ExtraTreesClassifier
from sklearn.neighbors import KNeighborsRegressor,KNeighborsClassifier
from sklearn.svm import SVR,SVC
from sklearn.naive_bayes import GaussianNB

from sklearn.metrics import accuracy_score,mean_squared_error

# Regression

regressors=[['Linear Regression :',LinearRegression()],
       ['Decision Tree Regression :',DecisionTreeRegressor()],
       ['Random Forest Regression :',RandomForestRegressor()],
       ['Gradient Boosting Regression :',
GradientBoostingRegressor()],
       ['Ada Boosting Regression :',AdaBoostRegressor()],
       ['Extra Tree Regression :', ExtraTreesRegressor()],
       ['K-Neighbors Regression :',KNeighborsRegressor()],
       ['Support Vector Regression :',SVR()]]
reg_pred=[]
print('Results...\n')
for name,model in regressors:
    model=model
    model.fit(X_train,y_train)
    predictions = model.predict(X_test)
    rms=np.sqrt(mean_squared_error(y_test, predictions))
    reg_pred.append(rms)
    print(name,rms)
```

```
Results...

Linear Regression : 0.07697452196086595
Decision Tree Regression : 0.11801482957662567
Random Forest Regression : 0.07385940952241632
Gradient Boosting Regression : 0.07284615776435902
Ada Boosting Regression : 0.07936392437935581
Extra Tree Regression : 0.07740406077848887
K-Neighbors Regression : 0.09130553104823387
Support Vector Regression : 0.13567695865096108
```

```
y_ax=['Linear Regression' ,'Decision Tree Regression', 'Random Forest
Regression','Gradient Boosting Regression', 'Ada Boosting
Regression','Extra Tree Regression' ,'K-Neighbors Regression',
'Support Vector Regression' ]
x_ax=reg_pred
sns.barplot(x=x_ax,y=y_ax,linewidth=1.5,edgecolor="0.1")
```

```
<Axes: >
```

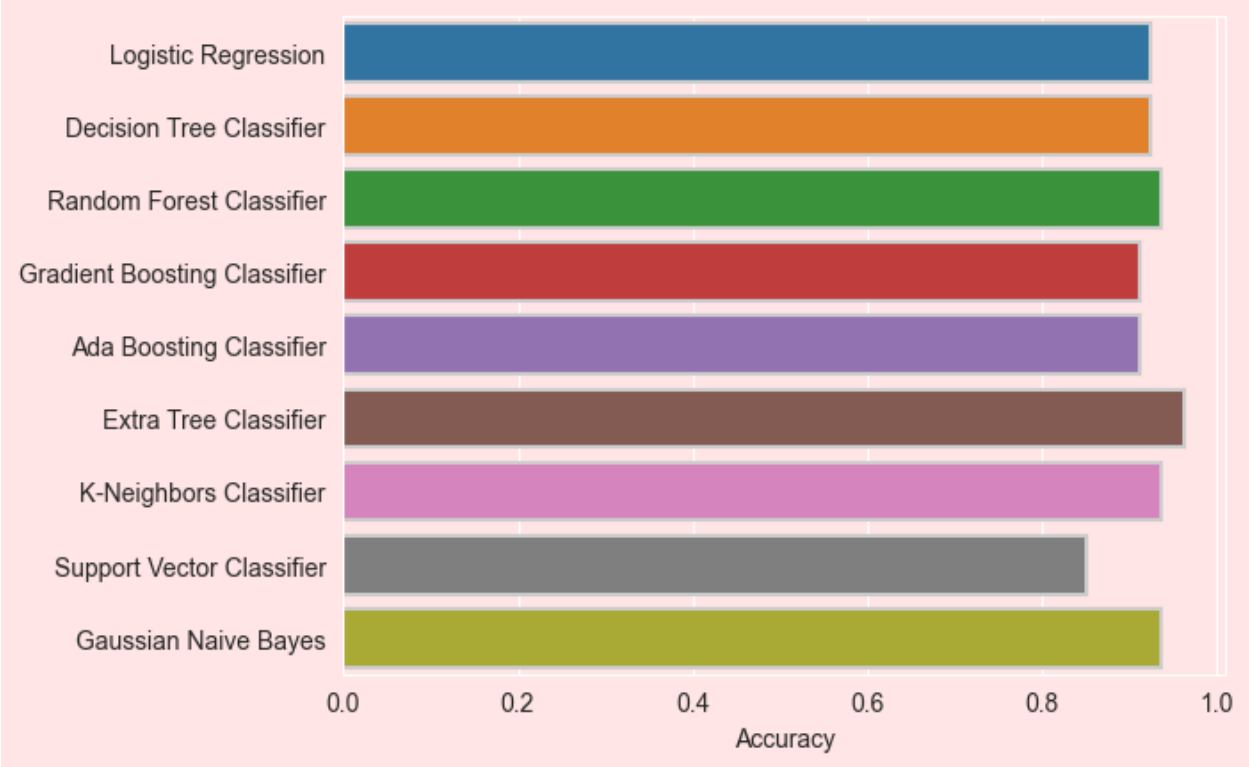



```
# classification

from sklearn.model_selection import train_test_split

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.20,rand
om_state=101)
#If Chance of Admit greater than 80% we classify it as 1
y_train_c = [1 if each > 0.8 else 0 for each in y_train]
y_test_c  = [1 if each > 0.8 else 0 for each in y_test]

classifiers=[['Logistic Regression :',LogisticRegression()],
       ['Decision Tree Classification :',DecisionTreeClassifier()],
       ['Random Forest Classification :',RandomForestClassifier()],
       ['Gradient Boosting Classification :',
GradientBoostingClassifier()],
       ['Ada Boosting Classification :',AdaBoostClassifier()],
       ['Extra Tree Classification :', ExtraTreesClassifier()],
       ['K-Neighbors Classification :',KNeighborsClassifier()],
       ['Support Vector Classification :',SVC()],
       ['Gausian Naive Bayes :',GaussianNB()]]
cla_pred=[]
for name,model in classifiers:
    model=model
    model.fit(X_train,y_train_c)
    predictions = model.predict(X_test)
    cla_pred.append(accuracy_score(y_test_c,predictions))
    print(name,accuracy_score(y_test_c,predictions))
```

```
Logistic Regression : 0.925
Decision Tree Classification : 0.925
Random Forest Classification : 0.9375
Gradient Boosting Classification : 0.9125
Ada Boosting Classification : 0.9125
Extra Tree Classification : 0.9625
K-Neighbors Classification : 0.9375
Support Vector Classification : 0.85
Gausian Naive Bayes : 0.9375
```

```
y_ax=['Logistic Regression' ,
      'Decision Tree Classifier',
      'Random Forest Classifier',
      'Gradient Boosting Classifier',
      'Ada Boosting Classifier',
      'Extra Tree Classifier' ,
      'K-Neighbors Classifier',
      'Support Vector Classifier',
       'Gaussian Naive Bayes']
x_ax=cla_pred

sns.barplot(x=x_ax,y=y_ax,linewidth=1.5,edgecolor="0.8")
plt.xlabel('Accuracy')
```

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



So the winner in Regression is : Linear Regression

And the winner in Classification is : Extra Tree Classifier