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

from sklearn.preprocessing import StandardScaler
from sklearn import metrics
from sklearn.model_selection import train_test_split
from sklearn import svm
from sklearn.model_selection import GridSearchCV

import warnings
warnings.simplefilter("ignore")
warnings.filterwarnings("ignore")
```

Making Path for the Datasets

In [2]:
```
WineDataPath = "https://raw.githubusercontent.com/aniruddhachoudhury/Red-Wine-Quality/master/winequality-red.csv'
AdmissionDataPath = "https://raw.githubusercontent.com/srinivasav22/Graduate-Admission-Prediction/master/Admissic
```

Loading the Datasets

In [3]:
```
WineData = pd.read_csv(WineDataPath)
WD = pd.read_csv(WineDataPath)
AdmitData = pd.read_csv(AdmissionDataPath)
```

Wine Quality Dataset

In [4]:
```
WineData.sample(6)
```

Out[4]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
1417	7.3	0.34	0.33	2.5	0.064	21.0	37.0	0.99520	3.35	0.77	12.1	7
150	7.3	0.33	0.47	2.1	0.077	5.0	11.0	0.99580	3.33	0.53	10.3	6
1267	10.4	0.43	0.50	2.3	0.068	13.0	19.0	0.99600	3.10	0.87	11.4	6
1232	7.6	0.43	0.29	2.1	0.075	19.0	66.0	0.99718	3.40	0.64	9.5	5
152	7.5	0.60	0.03	1.8	0.095	25.0	99.0	0.99500	3.35	0.54	10.1	5
429	12.8	0.84	0.63	2.4	0.088	13.0	35.0	0.99970	3.10	0.60	10.4	6

Admition Dataset

In [5]:
```
AdmitData.sample(6)
```

Out[5]:

	Serial No.	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research	Chance of Admit
299	300	305	112	3	3.0	3.5	8.65	0	0.71
6	7	321	109	3	3.0	4.0	8.20	1	0.75
172	173	322	110	4	4.0	5.0	9.13	1	0.86
388	389	296	97	2	1.5	2.0	7.80	0	0.49
21	22	325	114	4	3.0	2.0	8.40	0	0.70
183	184	314	110	3	4.0	4.0	8.80	0	0.75

EDA (Exploratory Data Analysis)

EDA for Wine Dataset

Striping the Column Names If any

In [6]:

```python
WineData.columns
```

Out[6]:

```
Index(['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar',
       'chlorides', 'free sulfur dioxide', 'total sulfur dioxide', 'density',
       'pH', 'sulphates', 'alcohol', 'quality'],
      dtype='object')
```

In [7]:

```python
[i.strip() for i in WineData.columns]
```

Out[7]:

```
['fixed acidity',
 'volatile acidity',
 'citric acid',
 'residual sugar',
 'chlorides',
 'free sulfur dioxide',
 'total sulfur dioxide',
 'density',
 'pH',
 'sulphates',
 'alcohol',
 'quality']
```

Checking the Numerical and Categorical Columns

In [8]:

```python
WineDataNumericalFeatures = [feature for feature in WineData.columns if WineData[feature].dtype != 'O']
WineDataCategoricalFeatures = [feature for feature in WineData.columns if WineData[feature].dtype != 'O']

print(f"We have {len(WineDataNumericalFeatures)} Numerical Feature: {WineDataNumericalFeatures}")
print(f"We have {len(WineDataCategoricalFeatures)} Categorical Feature: {WineDataCategoricalFeatures}")
```

```
We have 12 Numerical Feature: ['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar', 'chlorides',
'free sulfur dioxide', 'total sulfur dioxide', 'density', 'pH', 'sulphates', 'alcohol', 'quality']
We have 12 Categorical Feature: ['fixed acidity', 'volatile acidity', 'citric acid', 'residual sugar', 'chlorides
', 'free sulfur dioxide', 'total sulfur dioxide', 'density', 'pH', 'sulphates', 'alcohol', 'quality']
```

As above we can see that there are only Numerical Feature are present in this Wine Dataset

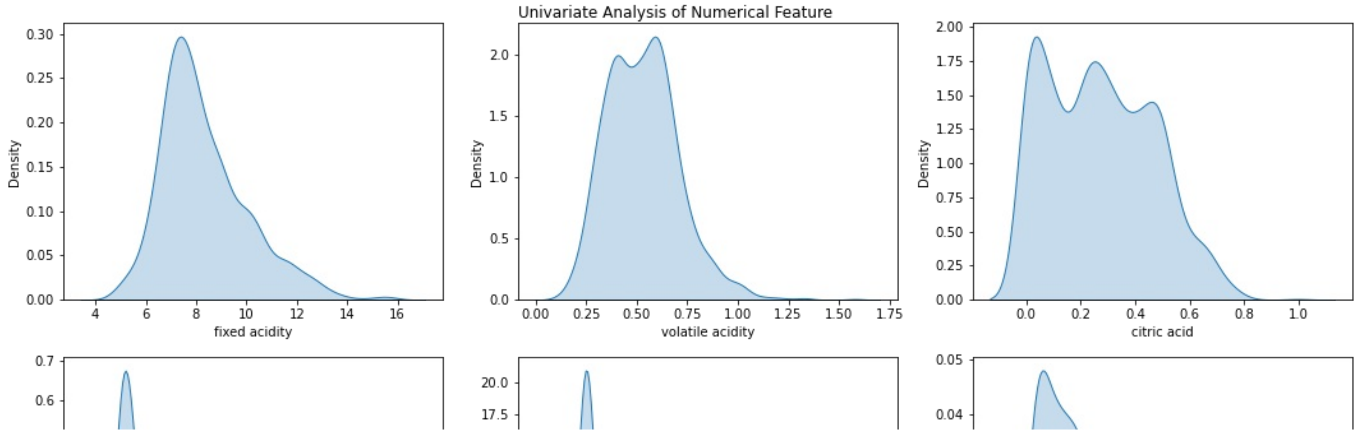
Univariate Analysis

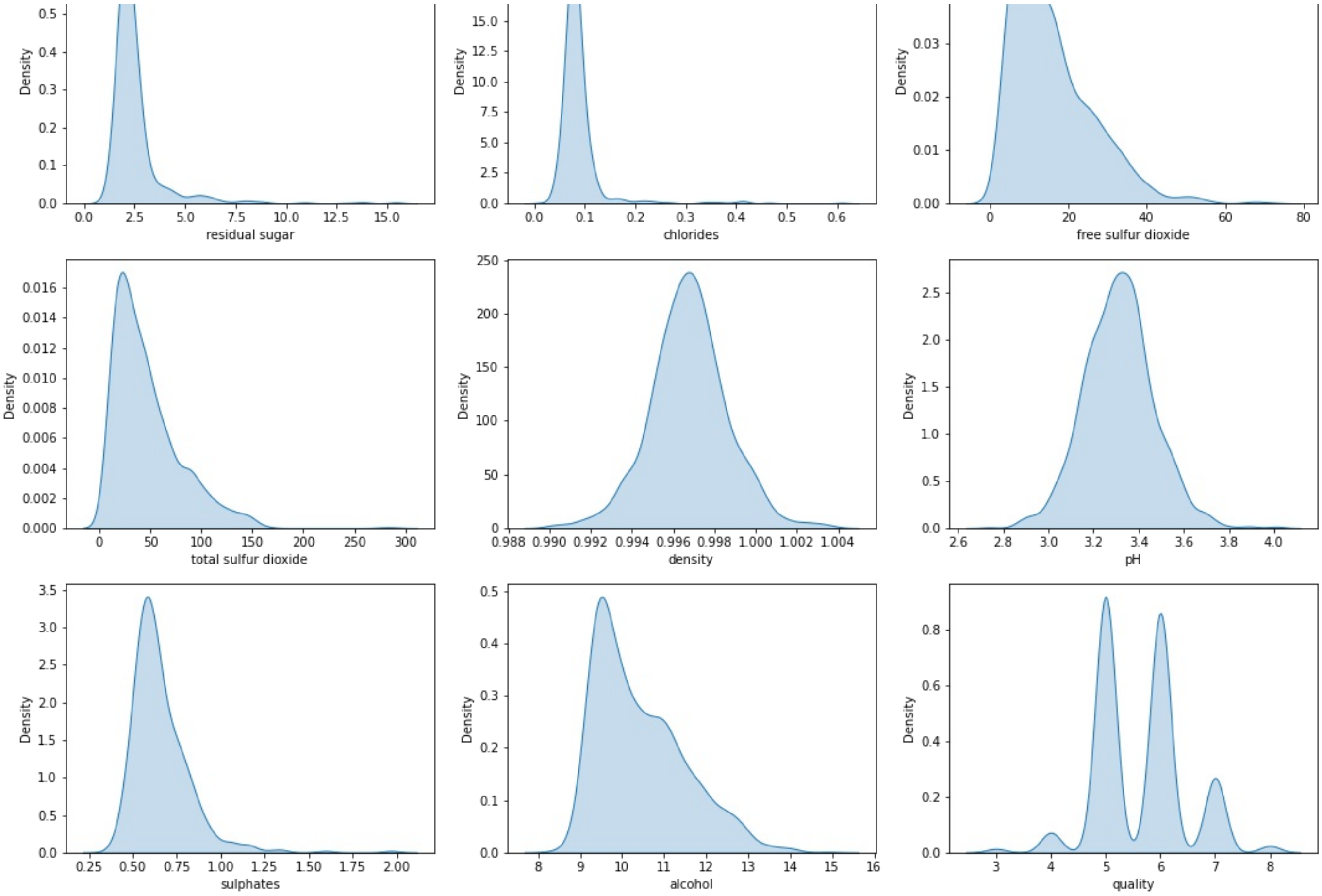
The term univariate analysis refers to the analysis of one varaible prefix "uni" means "one". The purpose of univariate analysis is to understand the distribution of values for single variable.

We have only Numerical Features

In [15]:

```python
plt.figure(figsize=(15, 15))
plt.suptitle("Univariate Analysis of Numerical Feature")

for i in range(0, len(WineDataNumericalFeatures)):
    plt.subplot(4, 3, i+1)
    sns.kdeplot(x=WineData[WineDataNumericalFeatures[i]], shade=True)
    plt.xlabel(WineDataNumericalFeatures[i])
    plt.ylabel("Density")
    plt.tight_layout();
```





Wine Dataset is Skewed Dataset

Multivariate Analysis

Multivariate analysis is the analysis of more than one variable.

Checking Multicolinearity in Numerical Features

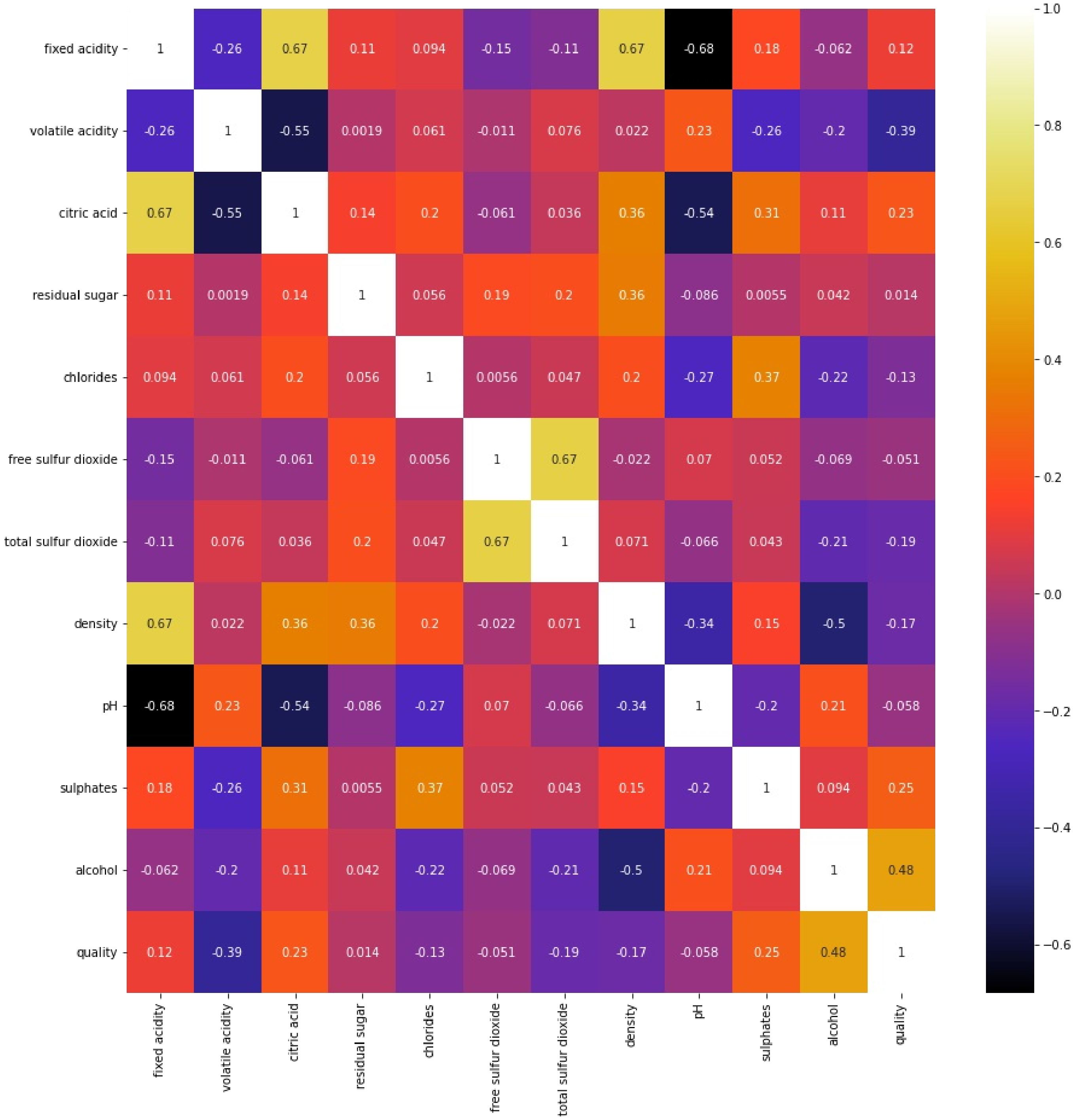
In [16]:
```
WineData[(WineData.columns)].corr()
```

Out[16]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
fixed acidity	1.000000	-0.256131	0.671703	0.114777	0.093705	-0.153794	-0.113181	0.668047	-0.682978	0.183006	-0.061668	0.124052
volatile acidity	-0.256131	1.000000	-0.552496	0.001918	0.061298	-0.010504	0.076470	0.022026	0.234937	-0.260987	-0.202288	-0.390558
citric acid	0.671703	-0.552496	1.000000	0.143577	0.203823	-0.060978	0.035533	0.364947	-0.541904	0.312770	0.109903	0.226373
residual sugar	0.114777	0.001918	0.143577	1.000000	0.055610	0.187049	0.203028	0.355283	-0.085652	0.005527	0.042075	0.013732
chlorides	0.093705	0.061298	0.203823	0.055610	1.000000	0.005562	0.047400	0.200632	-0.265026	0.371260	-0.221141	-0.128907
free sulfur dioxide	-0.153794	-0.010504	-0.060978	0.187049	0.005562	1.000000	0.667666	-0.021946	0.070377	0.051658	-0.069408	-0.050656
total sulfur dioxide	-0.113181	0.076470	0.035533	0.203028	0.047400	0.667666	1.000000	0.071269	-0.066495	0.042947	-0.205654	-0.185100
density	0.668047	0.022026	0.364947	0.355283	0.200632	-0.021946	0.071269	1.000000	-0.341699	0.148506	-0.496180	-0.174919
pH	-0.682978	0.234937	-0.541904	-0.085652	-0.265026	0.070377	-0.066495	-0.341699	1.000000	-0.196648	0.205633	-0.057731
sulphates	0.183006	-0.260987	0.312770	0.005527	0.371260	0.051658	0.042947	0.148506	-0.196648	1.000000	0.093595	0.251397
alcohol	-0.061668	-0.202288	0.109903	0.042075	-0.221141	-0.069408	-0.205654	-0.496180	0.205633	0.093595	1.000000	0.476166
quality	0.124052	-0.390558	0.226373	0.013732	-0.128907	-0.050656	-0.185100	-0.174919	-0.057731	0.251397	0.476166	1.000000

In [17]:
```
plt.figure(figsize=(15, 15))
sns.heatmap(WineData.corr(), cmap="CMRmap", annot=True)
```

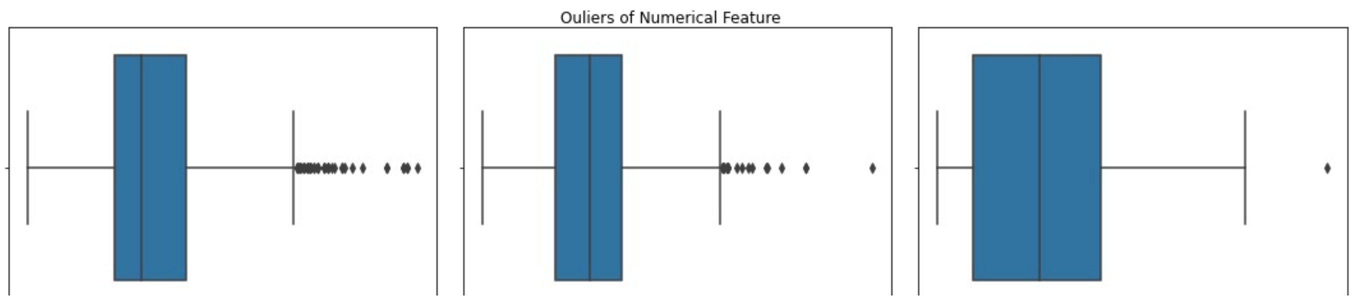
```
plt.show()
```

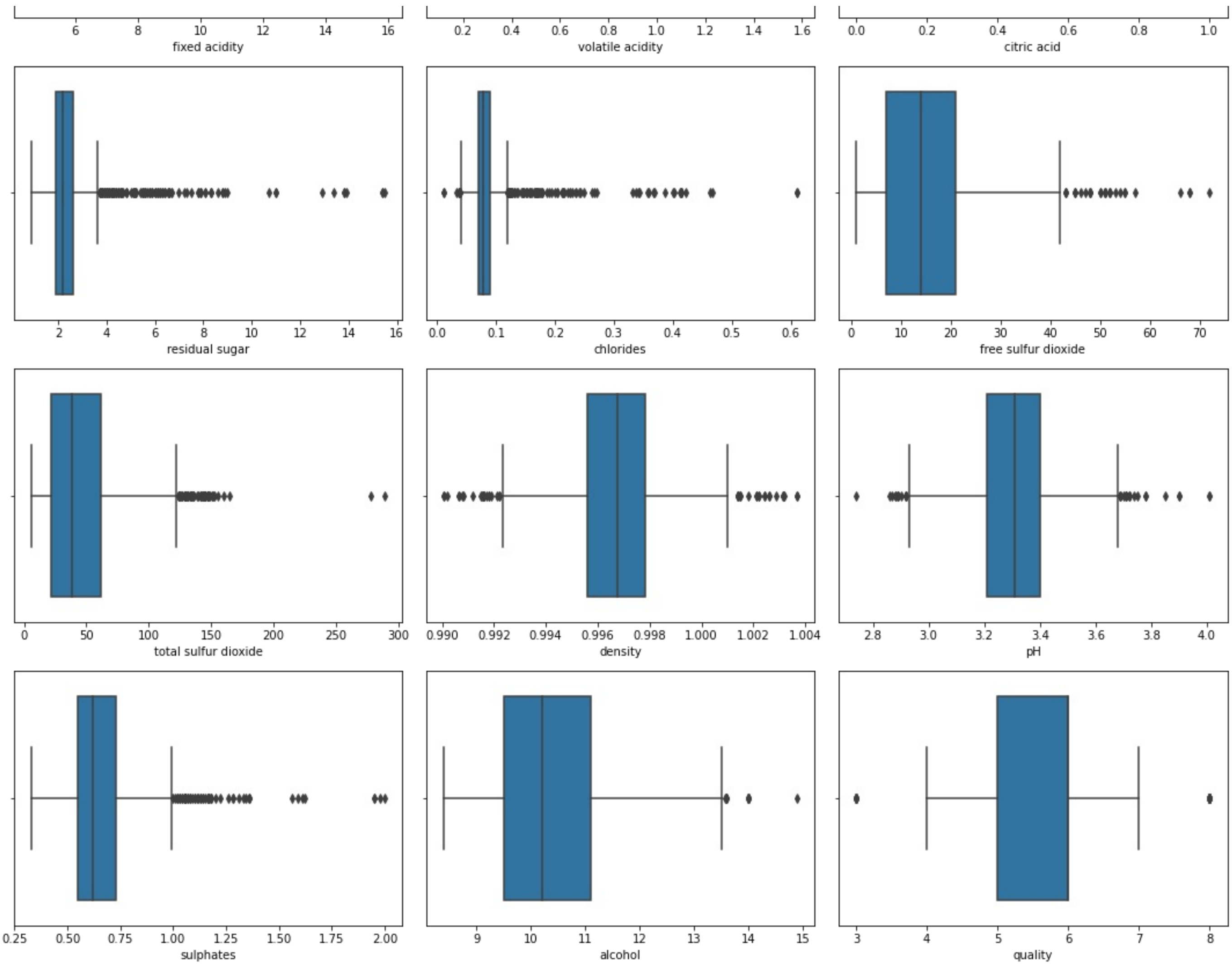


Checking Outliers for Wine Dataset

In [18]:

```
plt.figure(figsize=(15, 15))
plt.suptitle("Ouliers of Numerical Feature")

for i in range(0, len(WineDataNumericalFeatures)):
    plt.subplot(4, 3, i+1)
    sns.boxplot(x=WineData[WineDataNumericalFeatures[i]])
    plt.xlabel(WineDataNumericalFeatures[i])
    # plt.ylabel("Density")
    plt.tight_layout();
```





As we can see there are many outliers present in the Wine Data

EDA for Admition Dataset

Striping the Column Names If any

In [19]:
```
AdmitData.columns
```

Out[19]:
```
Index(['Serial No.', 'GRE Score', 'TOEFL Score', 'University Rating', 'SOP',
       'LOR ', 'CGPA', 'Research', 'Chance of Admit '],
      dtype='object')
```

In [20]:
```
AdmitData.columns = [i.strip() for i in AdmitData.columns]
AdmitData.columns
```

Out[20]:
```
Index(['Serial No.', 'GRE Score', 'TOEFL Score', 'University Rating', 'SOP',
       'LOR', 'CGPA', 'Research', 'Chance of Admit'],
      dtype='object')
```

Checking the Numerical and Categorical Columns

In [21]:
```
AdmitDataNumericalFeatures = [feature for feature in AdmitData.columns if AdmitData[feature].dtype != 'O']
AdmitDataCategoricalFeature = [feature for feature in AdmitData.columns if AdmitData[feature].dtype != 'O']

print(f"We have {len(AdmitDataNumericalFeatures)} Numerical Feature: {AdmitDataNumericalFeatures}")
print(f"We have {len(AdmitDataCategoricalFeature)} Categorical Feature: {AdmitDataCategoricalFeature}")
```

```
We have 9 Numerical Feature: ['Serial No.', 'GRE Score', 'TOEFL Score', 'University Rating', 'SOP', 'LOR', 'CGPA'
, 'Research', 'Chance of Admit']
We have 9 Categorical Feature: ['Serial No.', 'GRE Score', 'TOEFL Score', 'University Rating', 'SOP', 'LOR', 'CGP
A', 'Research', 'Chance of Admit']
```

As above we can see that there are only Numerical Features in Admition Dataset Also

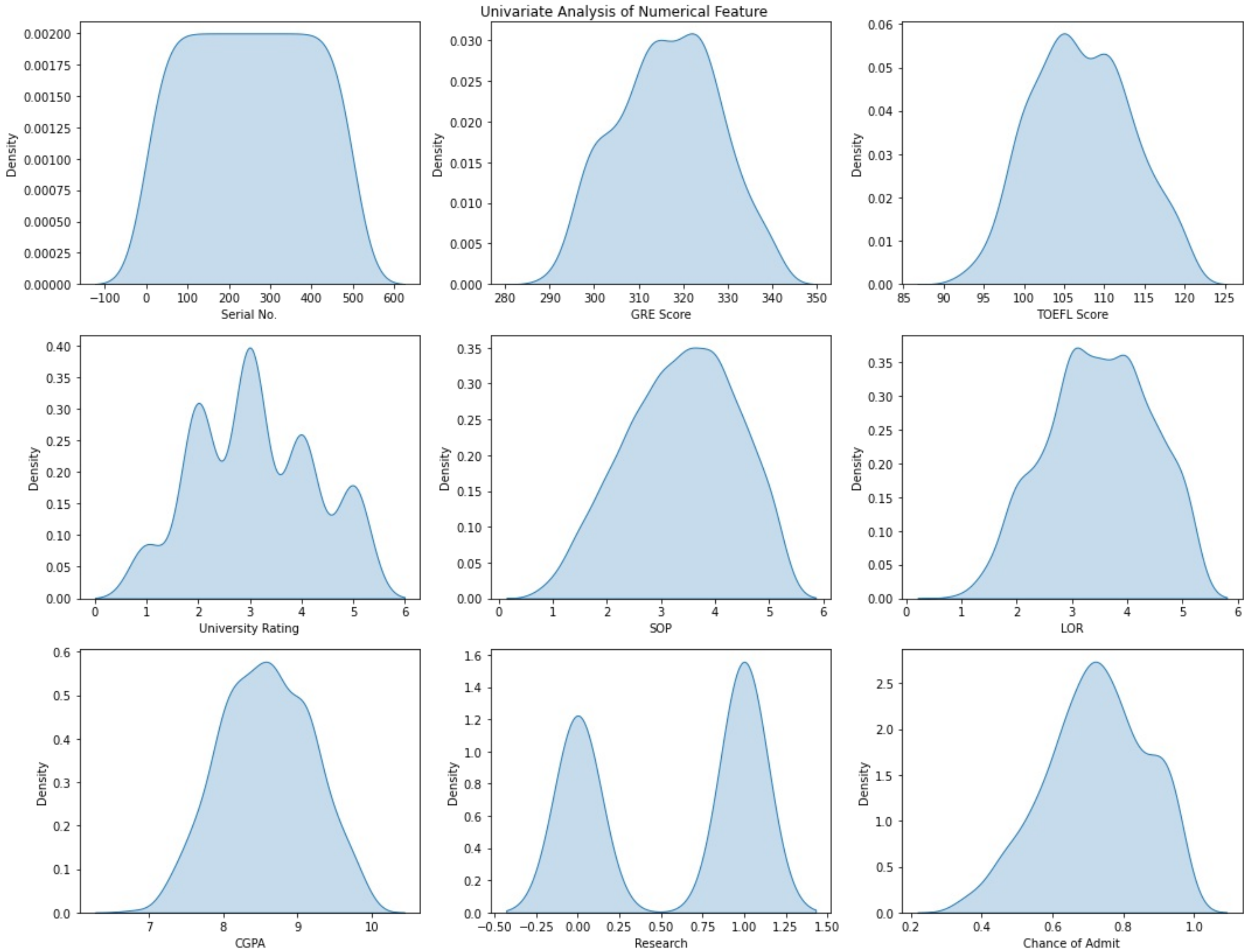
Univariate Analysis

the term univariate analysis refers to the analusis of one variable prefix "uni" means "one". The purpose of univariate analysis is to understand the distribution of values for a single variable.

We have only Numerical Features

In [22]:

```
plt.figure(figsize=(15, 15))
plt.suptitle("Univariate Analysis of Numerical Feature")

for i in range(0, len(AdmitDataNumericalFeatures)):
    plt.subplot(4, 3, i+1)
    sns.kdeplot(x=AdmitData[AdmitDataNumericalFeatures[i]], shade=True)
    plt.xlabel(AdmitDataNumericalFeatures[i])
    plt.ylabel("Density")
    plt.tight_layout();
```



Admition Data seems like Normal Distribution

Multivariate Analysis

Multivariate analysis is the analysis of more than one variable.

Checking Multicolinearity in Numerical Features

In [23]:

```
AdmitData[(AdmitData.columns)].corr()
```

Out[23]:

	Serial No.	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research	Chance of Admit

Serial No.	1.000000	-0.103839	-0.141696	-0.067641	-0.137352	-0.003694	-0.074289	-0.005332	0.008505
GRE Score	-0.103839	1.000000	0.827200	0.635376	0.613498	0.524679	0.825878	0.563398	0.810351
TOEFL Score	-0.141696	0.827200	1.000000	0.649799	0.644410	0.541563	0.810574	0.467012	0.792228
University Rating	-0.067641	0.635376	0.649799	1.000000	0.728024	0.608651	0.705254	0.427047	0.690132
SOP	-0.137352	0.613498	0.644410	0.728024	1.000000	0.663707	0.712154	0.408116	0.684137
LOR	-0.003694	0.524679	0.541563	0.608651	0.663707	1.000000	0.637469	0.372526	0.645365
CGPA	-0.074289	0.825878	0.810574	0.705254	0.712154	0.637469	1.000000	0.501311	0.882413
Research	-0.005332	0.563398	0.467012	0.427047	0.408116	0.372526	0.501311	1.000000	0.545871
Chance of Admit	0.008505	0.810351	0.792228	0.690132	0.684137	0.645365	0.882413	0.545871	1.000000

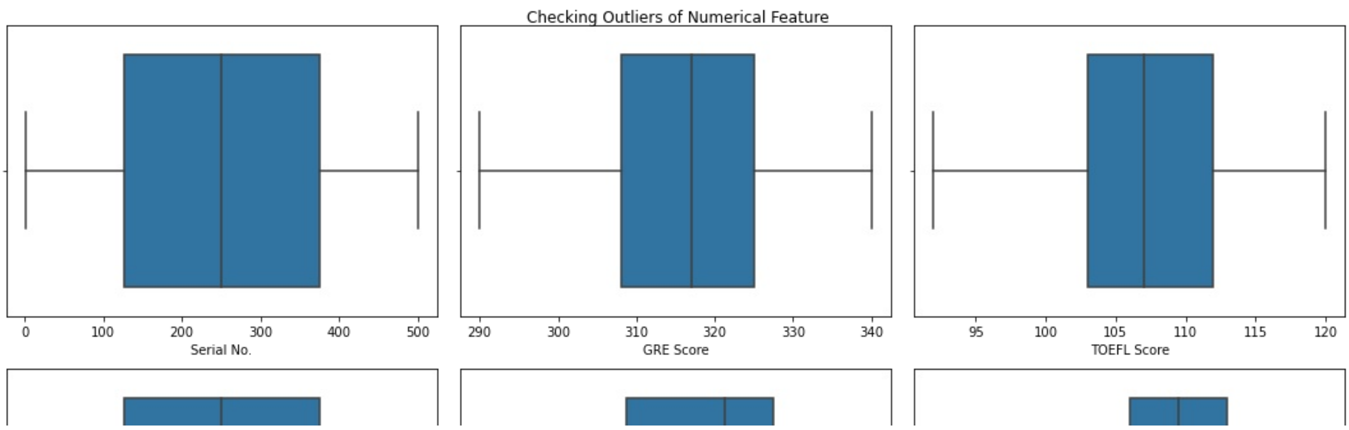
In [24]:

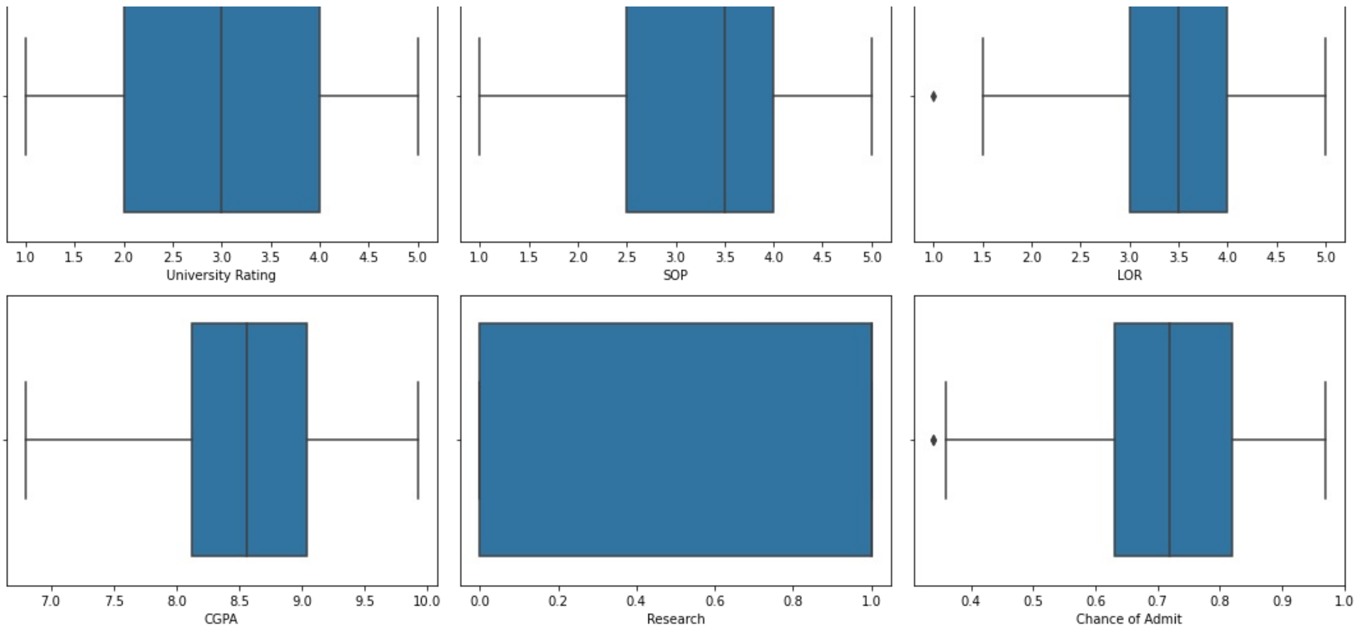
```
plt.figure(figsize=(18, 10))
sns.heatmap(AdmitData.corr(), cmap="CMRmap", annot=True)
plt.show()
```

Checking Outliers

In [25]:

```
plt.figure(figsize=(15, 15))
plt.suptitle("Checking Outliers of Numerical Feature")

for i in range(0, len(AdmitDataNumericalFeatures)):
    plt.subplot(4, 3, i+1)
    sns.boxplot(x=AdmitData[AdmitDataNumericalFeatures[i]])
    plt.xlabel(AdmitDataNumericalFeatures[i])
    # plt.ylabel(Density)
    plt.tight_layout();
```





Preprocession the Data

Preprocessing of Wine Dataset

Removing Outliers

In [39]:

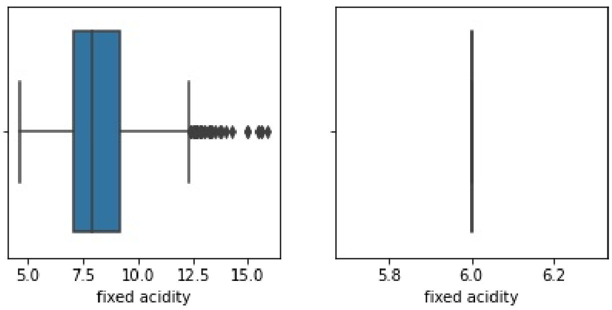
```
MaxFixedAcidity = int(WineData['fixed acidity'].quantile(0.96))
MinFixedAcidity = int(WineData['fixed acidity'].quantile(0.1))
print("Maximum Limit: ", MaxFixedAcidity)
print("Minimum Limit: ", MinFixedAcidity)

WineDataMeanFixedAcidity = int(WineData.loc[WineData['fixed acidity']<=12, 'fixed acidity'].mean())
print("\nMean: ", WineDataMeanFixedAcidity)

WineData['fixed acidity'] = np.where(WineData['fixed acidity'] >= MaxFixedAcidity, WineDataMeanFixedAcidity, Wine
WineData['fixed acidity'] = np.where(WineData['fixed acidity'] < MinFixedAcidity, WineDataMeanFixedAcidity, WineD
```

```
Maximum Limit:  6
Minimum Limit:  6

Mean:  6
```

In [40]:

```
plt.figure(figsize=(7, 3))
plt.subplot(1, 2, 1)
sns.boxplot(WD['fixed acidity'])

plt.subplot(1, 2, 2)
sns.boxplot(WineData['fixed acidity'])
```

Out[40]: <AxesSubplot:xlabel='fixed acidity'>



Preprocessing of Admition Dataset

In Admition Dataset Outliers are not present

Model Training

Training for Wine Dataset

Creating X and y for Wine Data

In [42]:
```
XWine = WineData.drop("quality", axis=1)
yWine = WineData["quality"]

print(f"Shape of XWine Data: {XWine.shape}")
print(f"Shape of yWine Data: {yWine.shape}")
```

```
Shape of XWine Data: (1599, 11)
Shape of yWine Data: (1599,)
```

Train Test Split the Wine Data

In [44]:
```
Wine_X_train, Wine_X_test, Wine_y_train, Wine_y_test = train_test_split(XWine, yWine, test_size=0.30, random_stat
```

In [45]:
```
print(f"Wine X Train Shape: {Wine_X_train.shape}")
print(f"Wine X Test Shape: {Wine_X_test.shape}")
print(f"Wine y Train Shape: {Wine_y_train.shape}")
print(f"Wine y Test Shape: {Wine_y_test.shape}")
```

```
Wine X Train Shape: (1119, 11)
Wine X Test Shape: (480, 11)
Wine y Train Shape: (1119,)
Wine y Test Shape: (480,)
```

Scalling Wine Data

In [46]:
```
WineScaler = StandardScaler()
WineScaler.fit(Wine_X_train)
```

Out[46]:
```
StandardScaler()
```

In [47]:
```
Wine_X_train_tf = WineScaler.transform(Wine_X_train)
Wine_X_train_tf
```

Out[47]:
```
array([[ 0.00000000e+00, -1.72107140e+00,  4.59303345e-01, ...,
         1.01180685e+00,  1.22661179e+00,  5.50057013e-01],
       [ 0.00000000e+00, -4.01957443e-01,  1.84105501e+00, ...,
        -2.10687612e+00,  1.22661179e+00, -2.05174641e-01],
       [ 0.00000000e+00,  3.77472102e-02, -1.28054303e-03, ...,
         4.92026353e-01,  2.97270776e-01,  5.50057013e-01],
       ...,
       [ 0.00000000e+00,  4.77451864e-01, -1.07597628e+00, ...,
         1.27169710e+00, -6.90154049e-01, -8.66002338e-01],
       [ 0.00000000e+00, -1.83099757e+00,  4.08127357e-01, ...,
         3.72184202e-02,  8.20025095e-01,  1.39969262e+00],
       [ 0.00000000e+00, -1.33632983e+00, -5.24565306e-02, ...,
         4.92026353e-01, -6.90154049e-01,  2.91015593e+00]])
```

In [48]:
```
Wine_SVC_model = svm.SVC()
Wine_SVC_model.fit(Wine_X_train_tf, Wine_y_train)
```

Out[48]:
```
SVC()
```

In [49]:
```
print(f"Traning Accuracy of Wine Data: {Wine_SVC_model.score(Wine_X_train_tf, Wine_y_train)}")
```

```
Traning Accuracy of Wine Data: 0.6729222520107239
```

In [50]:
```
Wine_y_pred = Wine_SVC_model.predict(WineScaler.transform(Wine_X_test))
```

In [51]:
```
print(f"Testing Accuracy of Wine Data: {metrics.accuracy_score(Wine_y_test, Wine_y_pred)}")
```

```
Testing Accuracy of Wine Data: 0.5916666666666667
```

In [52]:
```
print(f"Classification Report of Wine Data\n")
print(metrics.classification_report(Wine_y_test, Wine_y_pred))
```

```
Classification Report of Wine Data

              precision    recall  f1-score   support

           3       0.00      0.00      0.00         1
           4       0.00      0.00      0.00        17
           5       0.63      0.78      0.70       195
           6       0.56      0.57      0.56       200
           7       0.52      0.28      0.36        61
           8       0.00      0.00      0.00         6

    accuracy                           0.59       480
   macro avg       0.28      0.27      0.27       480
weighted avg       0.55      0.59      0.56       480
```

Training for Admition Dataset

Creating X and y for Admition Data

In [53]:
```
AdmitData.columns
```

Out[53]:
```
Index(['Serial No.', 'GRE Score', 'TOEFL Score', 'University Rating', 'SOP',
       'LOR', 'CGPA', 'Research', 'Chance of Admit'],
      dtype='object')
```

In [54]:
```
XAdmit = AdmitData.drop("Chance of Admit", axis=1)
yAdmit = AdmitData["Chance of Admit"]

print(f"Shape of XAdmit Data: {XAdmit.shape}")
print(f"Shape of yAdmit Data: {yAdmit.shape}")
```

```
Shape of XAdmit Data: (500, 8)
Shape of yAdmit Data: (500,)
```

Train Test Split the Admition Data

In [55]:
```
Admit_X_train, Admit_X_test, Admit_y_train, Admit_y_test = train_test_split(XAdmit, yAdmit, test_size=0.30, rando
```

In [56]:
```
print(f"Admition X Train Shape: {Admit_X_train.shape}")
print(f"Admition X Test Shape: {Admit_X_test.shape}")
print(f"Admition y Train Shape: {Admit_y_train.shape}")
print(f"Admition y Test Shape: {Admit_y_test.shape}")
```

```
Admition X Train Shape: (350, 8)
Admition X Test Shape: (150, 8)
Admition y Train Shape: (350,)
Admition y Test Shape: (150,)
```

Scalling Admition Data

In [57]:
```
AdmitScaler = StandardScaler()
```

```
AdmitScaler.fit(Admit_X_train)
```

Out[57]:
```
StandardScaler()
```

In [58]:
```
Admit_X_train_tf = AdmitScaler.transform(Admit_X_train)
Admit_X_train_tf
```

Out[58]:
```
array([[-1.75020856,  1.22318504,  1.27980924, ..., -0.5291228 ,
         1.28550609,  0.88127734],
       [-0.96385041, -1.61322396, -0.86815536, ...,  0.01556244,
         0.07349047, -1.13471657],
       [-1.46683625,  0.49120853,  0.45366901, ...,  0.56024767,
         0.88150088,  0.88127734],
       ...,
       [ 0.67970895, -1.33873276, -1.3638395 , ..., -1.61849327,
        -2.23270591, -1.13471657],
       [ 1.29604372, -0.69825331, -0.37247122, ...,  0.56024767,
        -1.50886325, -1.13471657],
       [-1.06303072, -0.24076799, -0.20724318, ...,  0.01556244,
        -0.54935089, -1.13471657]])
```

In [59]:
```
Admit_SVR_model = svm.SVR()
Admit_SVR_model.fit(Admit_X_train_tf, Admit_y_train)
```

Out[59]:
```
SVR()
```

In [60]:
```
print(f"Traning Accuracy of Admition Data: {Admit_SVR_model.score(Admit_X_train_tf, Admit_y_train)}")
```

```
Traning Accuracy of Admition Data: 0.8056236255122253
```

In [61]:
```
Admit_y_pred = Admit_SVR_model.predict(AdmitScaler.transform(Admit_X_test))
```

In [64]:
```
print(f"Mean Absolute Error: {metrics.mean_absolute_error(Admit_y_test, Admit_y_pred)}")
print(f"Mean squared error: , {metrics.mean_squared_error(Admit_y_test, Admit_y_pred)}")
print(f"Median absolute error: {metrics.median_absolute_error(Admit_y_test, Admit_y_pred)}")
print(f"Explain variance score: , {metrics.explained_variance_score(Admit_y_test, Admit_y_pred)}")
print(f"R2 score: , {metrics.r2_score(Admit_y_test, Admit_y_pred)}")
```

```
Mean Absolute Error: 0.054483683833666634
Mean squared error: , 0.004598432360858017
Median absolute error: 0.04913018222582349
Explain variance score: , 0.8078910066096596
R2 score: , 0.779367688675496
```

Hyperparameter Tunning

GridSearchCV For Wine Data

In [65]:
```
WineParameters = {'C': [0.1, 1, 10, 100, 1000],
                  'gamma': [1, 0.1, 0.01, 0.001, 0.0001],
                  'kernel': ['rbf']}
```

In [66]:
```
WineHyperparameter = GridSearchCV(svm.SVC(), WineParameters, refit=True, verbose=3)
WineHyperparameter.fit(Wine_X_train_tf, Wine_y_train)
```

```
Fitting 5 folds for each of 25 candidates, totalling 125 fits
[CV 1/5] END ........C=0.1, gamma=1, kernel=rbf;, score=0.433 total time=   0.0s
[CV 2/5] END ........C=0.1, gamma=1, kernel=rbf;, score=0.433 total time=   0.0s
[CV 3/5] END ........C=0.1, gamma=1, kernel=rbf;, score=0.433 total time=   0.0s
[CV 4/5] END ........C=0.1, gamma=1, kernel=rbf;, score=0.438 total time=   0.1s
[CV 5/5] END ........C=0.1, gamma=1, kernel=rbf;, score=0.435 total time=   0.1s
[CV 1/5] END ......C=0.1, gamma=0.1, kernel=rbf;, score=0.558 total time=   0.0s
[CV 2/5] END ......C=0.1, gamma=0.1, kernel=rbf;, score=0.540 total time=   0.0s
[CV 3/5] END ......C=0.1, gamma=0.1, kernel=rbf;, score=0.589 total time=   0.0s
[CV 4/5] END ......C=0.1, gamma=0.1, kernel=rbf;, score=0.607 total time=   0.0s
```

```
[CV 5/5] END ......C=0.1, gamma=0.1, kernel=rbf;, score=0.659 total time=   0.0s
[CV 1/5] END .....C=0.1, gamma=0.01, kernel=rbf;, score=0.527 total time=   0.0s
[CV 2/5] END .....C=0.1, gamma=0.01, kernel=rbf;, score=0.531 total time=   0.0s
[CV 3/5] END .....C=0.1, gamma=0.01, kernel=rbf;, score=0.589 total time=   0.0s
[CV 4/5] END .....C=0.1, gamma=0.01, kernel=rbf;, score=0.589 total time=   0.0s
[CV 5/5] END .....C=0.1, gamma=0.01, kernel=rbf;, score=0.619 total time=   0.0s
[CV 1/5] END ....C=0.1, gamma=0.001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 2/5] END ....C=0.1, gamma=0.001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 3/5] END ....C=0.1, gamma=0.001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 4/5] END ....C=0.1, gamma=0.001, kernel=rbf;, score=0.438 total time=   0.0s
[CV 5/5] END ....C=0.1, gamma=0.001, kernel=rbf;, score=0.435 total time=   0.0s
[CV 1/5] END ...C=0.1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 2/5] END ...C=0.1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 3/5] END ...C=0.1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 4/5] END ...C=0.1, gamma=0.0001, kernel=rbf;, score=0.438 total time=   0.0s
[CV 5/5] END ...C=0.1, gamma=0.0001, kernel=rbf;, score=0.435 total time=   0.0s
[CV 1/5] END .........C=1, gamma=1, kernel=rbf;, score=0.634 total time=   0.1s
[CV 2/5] END .........C=1, gamma=1, kernel=rbf;, score=0.607 total time=   0.1s
[CV 3/5] END .........C=1, gamma=1, kernel=rbf;, score=0.607 total time=   0.1s
[CV 4/5] END .........C=1, gamma=1, kernel=rbf;, score=0.701 total time=   0.1s
[CV 5/5] END .........C=1, gamma=1, kernel=rbf;, score=0.704 total time=   0.1s
[CV 1/5] END ........C=1, gamma=0.1, kernel=rbf;, score=0.576 total time=   0.0s
[CV 2/5] END ........C=1, gamma=0.1, kernel=rbf;, score=0.576 total time=   0.0s
[CV 3/5] END ........C=1, gamma=0.1, kernel=rbf;, score=0.616 total time=   0.0s
[CV 4/5] END ........C=1, gamma=0.1, kernel=rbf;, score=0.647 total time=   0.0s
[CV 5/5] END ........C=1, gamma=0.1, kernel=rbf;, score=0.686 total time=   0.0s
[CV 1/5] END .......C=1, gamma=0.01, kernel=rbf;, score=0.562 total time=   0.0s
[CV 2/5] END .......C=1, gamma=0.01, kernel=rbf;, score=0.558 total time=   0.0s
[CV 3/5] END .......C=1, gamma=0.01, kernel=rbf;, score=0.580 total time=   0.0s
[CV 4/5] END .......C=1, gamma=0.01, kernel=rbf;, score=0.603 total time=   0.0s
[CV 5/5] END .......C=1, gamma=0.01, kernel=rbf;, score=0.650 total time=   0.0s
[CV 1/5] END ......C=1, gamma=0.001, kernel=rbf;, score=0.531 total time=   0.0s
[CV 2/5] END ......C=1, gamma=0.001, kernel=rbf;, score=0.531 total time=   0.0s
[CV 3/5] END ......C=1, gamma=0.001, kernel=rbf;, score=0.589 total time=   0.0s
[CV 4/5] END ......C=1, gamma=0.001, kernel=rbf;, score=0.603 total time=   0.0s
[CV 5/5] END ......C=1, gamma=0.001, kernel=rbf;, score=0.632 total time=   0.0s
[CV 1/5] END .....C=1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 2/5] END .....C=1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 3/5] END .....C=1, gamma=0.0001, kernel=rbf;, score=0.433 total time=   0.0s
[CV 4/5] END .....C=1, gamma=0.0001, kernel=rbf;, score=0.438 total time=   0.0s
[CV 5/5] END .....C=1, gamma=0.0001, kernel=rbf;, score=0.435 total time=   0.0s
[CV 1/5] END ........C=10, gamma=1, kernel=rbf;, score=0.643 total time=   0.1s
[CV 2/5] END ........C=10, gamma=1, kernel=rbf;, score=0.634 total time=   0.1s
[CV 3/5] END ........C=10, gamma=1, kernel=rbf;, score=0.607 total time=   0.1s
[CV 4/5] END ........C=10, gamma=1, kernel=rbf;, score=0.661 total time=   0.1s
[CV 5/5] END ........C=10, gamma=1, kernel=rbf;, score=0.686 total time=   0.1s
[CV 1/5] END .......C=10, gamma=0.1, kernel=rbf;, score=0.585 total time=   0.0s
[CV 2/5] END .......C=10, gamma=0.1, kernel=rbf;, score=0.616 total time=   0.0s
[CV 3/5] END .......C=10, gamma=0.1, kernel=rbf;, score=0.603 total time=   0.0s
[CV 4/5] END .......C=10, gamma=0.1, kernel=rbf;, score=0.643 total time=   0.0s
[CV 5/5] END .......C=10, gamma=0.1, kernel=rbf;, score=0.695 total time=   0.0s
[CV 1/5] END ......C=10, gamma=0.01, kernel=rbf;, score=0.576 total time=   0.0s
[CV 2/5] END ......C=10, gamma=0.01, kernel=rbf;, score=0.571 total time=   0.0s
[CV 3/5] END ......C=10, gamma=0.01, kernel=rbf;, score=0.585 total time=   0.0s
[CV 4/5] END ......C=10, gamma=0.01, kernel=rbf;, score=0.616 total time=   0.0s
[CV 5/5] END ......C=10, gamma=0.01, kernel=rbf;, score=0.691 total time=   0.0s
[CV 1/5] END .....C=10, gamma=0.001, kernel=rbf;, score=0.545 total time=   0.0s
[CV 2/5] END .....C=10, gamma=0.001, kernel=rbf;, score=0.545 total time=   0.0s
[CV 3/5] END .....C=10, gamma=0.001, kernel=rbf;, score=0.571 total time=   0.0s
[CV 4/5] END .....C=10, gamma=0.001, kernel=rbf;, score=0.598 total time=   0.0s
[CV 5/5] END .....C=10, gamma=0.001, kernel=rbf;, score=0.664 total time=   0.0s
[CV 1/5] END ....C=10, gamma=0.0001, kernel=rbf;, score=0.527 total time=   0.0s
[CV 2/5] END ....C=10, gamma=0.0001, kernel=rbf;, score=0.531 total time=   0.0s
[CV 3/5] END ....C=10, gamma=0.0001, kernel=rbf;, score=0.589 total time=   0.0s
[CV 4/5] END ....C=10, gamma=0.0001, kernel=rbf;, score=0.607 total time=   0.0s
[CV 5/5] END ....C=10, gamma=0.0001, kernel=rbf;, score=0.632 total time=   0.0s
[CV 1/5] END ........C=100, gamma=1, kernel=rbf;, score=0.643 total time=   0.1s
[CV 2/5] END ........C=100, gamma=1, kernel=rbf;, score=0.634 total time=   0.1s
[CV 3/5] END ........C=100, gamma=1, kernel=rbf;, score=0.612 total time=   0.1s
[CV 4/5] END ........C=100, gamma=1, kernel=rbf;, score=0.656 total time=   0.1s
[CV 5/5] END ........C=100, gamma=1, kernel=rbf;, score=0.682 total time=   0.1s
[CV 1/5] END ......C=100, gamma=0.1, kernel=rbf;, score=0.638 total time=   0.0s
[CV 2/5] END ......C=100, gamma=0.1, kernel=rbf;, score=0.616 total time=   0.0s
[CV 3/5] END ......C=100, gamma=0.1, kernel=rbf;, score=0.554 total time=   0.0s
[CV 4/5] END ......C=100, gamma=0.1, kernel=rbf;, score=0.661 total time=   0.0s
[CV 5/5] END ......C=100, gamma=0.1, kernel=rbf;, score=0.664 total time=   0.1s
[CV 1/5] END .....C=100, gamma=0.01, kernel=rbf;, score=0.571 total time=   0.0s
[CV 2/5] END .....C=100, gamma=0.01, kernel=rbf;, score=0.545 total time=   0.0s
[CV 3/5] END .....C=100, gamma=0.01, kernel=rbf;, score=0.607 total time=   0.0s
[CV 4/5] END .....C=100, gamma=0.01, kernel=rbf;, score=0.638 total time=   0.0s
[CV 5/5] END .....C=100, gamma=0.01, kernel=rbf;, score=0.686 total time=   0.0s
[CV 1/5] END ....C=100, gamma=0.001, kernel=rbf;, score=0.571 total time=   0.0s
[CV 2/5] END ....C=100, gamma=0.001, kernel=rbf;, score=0.549 total time=   0.0s
[CV 3/5] END ....C=100, gamma=0.001, kernel=rbf;, score=0.562 total time=   0.0s
[CV 4/5] END ....C=100, gamma=0.001, kernel=rbf;, score=0.612 total time=   0.0s
[CV 5/5] END ....C=100, gamma=0.001, kernel=rbf;, score=0.664 total time=   0.0s
[CV 1/5] END ...C=100, gamma=0.0001, kernel=rbf;, score=0.545 total time=   0.0s
[CV 2/5] END ...C=100, gamma=0.0001, kernel=rbf;, score=0.545 total time=   0.0s
[CV 3/5] END ...C=100, gamma=0.0001, kernel=rbf;, score=0.571 total time=   0.0s
```

```
[CV 4/5] END ...C=100, gamma=0.0001, kernel=rbf;, score=0.603 total time=   0.0s
[CV 5/5] END ...C=100, gamma=0.0001, kernel=rbf;, score=0.659 total time=   0.0s
[CV 1/5] END .......C=1000, gamma=1, kernel=rbf;, score=0.643 total time=   0.0s
[CV 2/5] END .......C=1000, gamma=1, kernel=rbf;, score=0.634 total time=   0.1s
[CV 3/5] END .......C=1000, gamma=1, kernel=rbf;, score=0.612 total time=   0.1s
[CV 4/5] END .......C=1000, gamma=1, kernel=rbf;, score=0.656 total time=   0.1s
[CV 5/5] END .......C=1000, gamma=1, kernel=rbf;, score=0.682 total time=   0.1s
[CV 1/5] END .....C=1000, gamma=0.1, kernel=rbf;, score=0.589 total time=   0.2s
[CV 2/5] END .....C=1000, gamma=0.1, kernel=rbf;, score=0.594 total time=   0.2s
[CV 3/5] END .....C=1000, gamma=0.1, kernel=rbf;, score=0.589 total time=   0.2s
[CV 4/5] END .....C=1000, gamma=0.1, kernel=rbf;, score=0.625 total time=   0.2s
[CV 5/5] END .....C=1000, gamma=0.1, kernel=rbf;, score=0.646 total time=   0.2s
[CV 1/5] END ....C=1000, gamma=0.01, kernel=rbf;, score=0.554 total time=   0.2s
[CV 2/5] END ....C=1000, gamma=0.01, kernel=rbf;, score=0.580 total time=   0.3s
[CV 3/5] END ....C=1000, gamma=0.01, kernel=rbf;, score=0.612 total time=   0.2s
[CV 4/5] END ....C=1000, gamma=0.01, kernel=rbf;, score=0.656 total time=   0.2s
[CV 5/5] END ....C=1000, gamma=0.01, kernel=rbf;, score=0.673 total time=   0.2s
[CV 1/5] END ...C=1000, gamma=0.001, kernel=rbf;, score=0.580 total time=   0.1s
[CV 2/5] END ...C=1000, gamma=0.001, kernel=rbf;, score=0.576 total time=   0.0s
[CV 3/5] END ...C=1000, gamma=0.001, kernel=rbf;, score=0.612 total time=   0.1s
[CV 4/5] END ...C=1000, gamma=0.001, kernel=rbf;, score=0.629 total time=   0.0s
[CV 5/5] END ...C=1000, gamma=0.001, kernel=rbf;, score=0.668 total time=   0.1s
[CV 1/5] END ..C=1000, gamma=0.0001, kernel=rbf;, score=0.567 total time=   0.0s
[CV 2/5] END ..C=1000, gamma=0.0001, kernel=rbf;, score=0.545 total time=   0.0s
[CV 3/5] END ..C=1000, gamma=0.0001, kernel=rbf;, score=0.567 total time=   0.0s
[CV 4/5] END ..C=1000, gamma=0.0001, kernel=rbf;, score=0.612 total time=   0.0s
[CV 5/5] END ..C=1000, gamma=0.0001, kernel=rbf;, score=0.668 total time=   0.0s
```

Out[66]:

```
GridSearchCV(estimator=SVC(),
             param_grid={'C': [0.1, 1, 10, 100, 1000],
                         'gamma': [1, 0.1, 0.01, 0.001, 0.0001],
                         'kernel': ['rbf']},
             verbose=3)
```

In [69]:

```
print(f"Best Parameters: {WineHyperparameter.best_params_}")
print(f"Best Estimators: {WineHyperparameter.best_estimator_}")
```

```
Best Parameters: {'C': 1, 'gamma': 1, 'kernel': 'rbf'}
Best Estimators: SVC(C=1, gamma=1)
```

In [72]:

```
WineHyperPred = WineHyperparameter.predict(WineScaler.transform(Wine_X_test))
print("Classification Report of Wine Hyperparameter Model\n")
print(metrics.classification_report(Wine_y_test, WineHyperPred))
```

```
Classification Report of Wine Hyperparameter Model

              precision    recall  f1-score   support

           3       0.00      0.00      0.00         1
           4       0.00      0.00      0.00        17
           5       0.69      0.76      0.72       195
           6       0.60      0.69      0.65       200
           7       0.60      0.34      0.44        61
           8       0.00      0.00      0.00         6

    accuracy                           0.64       480
   macro avg       0.32      0.30      0.30       480
weighted avg       0.61      0.64      0.62       480
```

Accuracy has been Increased by 2% after Hyperparameter in Wine Data

GridSearchCV for Admition Data

In [74]:

```
AdmitParameters = {'kernel': ('linear', 'rbf', 'poly'),
                   'C': [1.5, 10],
                   'gamma': [1e-7, 1e-4],
                   'epsilon': [0,1,0,2,0,5,0.3]}
```

In [75]:

```
AdmitHyperparameter = GridSearchCV(svm.SVR(), AdmitParameters, refit=True, verbose=3)
AdmitHyperparameter.fit(Admit_X_train_tf, Admit_y_train)
```

```
Fitting 5 folds for each of 84 candidates, totalling 420 fits
```

```
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.066 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.004 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.011 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.004 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.001 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.744 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.729 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.760 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.747 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.758 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.827 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.066 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.004 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.011 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.004 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.001 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.744 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.729 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.760 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.747 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.758 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.827 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
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[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.1s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.066 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.004 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.011 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.004 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.001 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.758 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.826 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.744 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=linear;, score=0.884 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.729 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.760 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.747 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.758 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.827 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
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[CV 4/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.052 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.141 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.329 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.181 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.202 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.081 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.147 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.369 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.237 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.234 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.082 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.147 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.369 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.237 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.234 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.052 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.141 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.329 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.181 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.202 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.051 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.141 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.330 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.185 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.208 total time=   0.0s
[CV 1/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.082 total time=   0.0s
[CV 2/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.147 total time=   0.0s
[CV 3/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.369 total time=   0.0s
[CV 4/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.237 total time=   0.0s
[CV 5/5] END C=1.5, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.234 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.7s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.825 total time=   0.3s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.5s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.4s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.883 total time=   0.4s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.044 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.016 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.013 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.024 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.022 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
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[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.3s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.883 total time=   0.4s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.757 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.808 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.746 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.797 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.872 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
```

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[CV 3/5] END C=10, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=1, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.5s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.825 total time=   0.4s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.6s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.3s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.883 total time=   0.3s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.044 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.016 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.013 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.024 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.022 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.758 total time=   0.5s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.825 total time=   0.4s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.744 total time=   0.6s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.4s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.883 total time=   0.4s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.757 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.808 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.746 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.797 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.872 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=2, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.758 total time=   0.5s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.825 total time=   0.5s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.744 total time=   0.6s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.809 total time=   0.4s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=linear;, score=0.883 total time=   0.4s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=-0.044 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.016 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.013 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.024 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=rbf;, score=0.022 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.069 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=1e-07, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.758 total time=   0.6s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.825 total time=   0.5s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.744 total time=   0.7s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.809 total time=   0.3s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=linear;, score=0.883 total time=   0.4s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.757 total time=   0.0s
[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.808 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.746 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.797 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=rbf;, score=0.872 total time=   0.0s
[CV 1/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.069 total time=   0.0s
```

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[CV 2/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.008 total time=   0.0s
[CV 3/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.016 total time=   0.0s
[CV 4/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.000 total time=   0.0s
[CV 5/5] END C=10, epsilon=0, gamma=0.0001, kernel=poly;, score=-0.003 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=1e-07, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=1e-07, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=1e-07, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=0.0001, kernel=linear;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=0.0001, kernel=rbf;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.133 total time=   0.0s
[CV 2/5] END C=10, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.203 total time=   0.0s
[CV 3/5] END C=10, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.419 total time=   0.0s
[CV 4/5] END C=10, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.273 total time=   0.0s
[CV 5/5] END C=10, epsilon=5, gamma=0.0001, kernel=poly;, score=-0.303 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.052 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.141 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.329 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.181 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=linear;, score=-0.202 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.081 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.147 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.368 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.237 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=rbf;, score=-0.234 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.082 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.147 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.369 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.237 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=1e-07, kernel=poly;, score=-0.234 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.052 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.141 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.329 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.181 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=linear;, score=-0.202 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.052 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.141 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.329 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.181 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=rbf;, score=-0.202 total time=   0.0s
[CV 1/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.082 total time=   0.0s
[CV 2/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.147 total time=   0.0s
[CV 3/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.369 total time=   0.0s
[CV 4/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.237 total time=   0.0s
[CV 5/5] END C=10, epsilon=0.3, gamma=0.0001, kernel=poly;, score=-0.234 total time=   0.0s
```

Out[75]:
```
GridSearchCV(estimator=SVR(),
             param_grid={'C': [1.5, 10], 'epsilon': [0, 1, 0, 2, 0, 5, 0.3],
                         'gamma': [1e-07, 0.0001],
                         'kernel': ('linear', 'rbf', 'poly')},
             verbose=3)
```

In [76]:
```
print(f"Best Parameters: {AdmitHyperparameter.best_params_}")
print(f"Best Estimators: {AdmitHyperparameter.best_estimator_}")
```

```
Best Parameters: {'C': 1.5, 'epsilon': 0, 'gamma': 1e-07, 'kernel': 'linear'}
Best Estimators: SVR(C=1.5, epsilon=0, gamma=1e-07, kernel='linear')
```

In [77]:
```
AdmitHyperPred = AdmitHyperparameter.predict(AdmitScaler.transform(Admit_X_test))

print(f"Mean Absolute Error: {metrics.mean_absolute_error(Admit_y_test, AdmitHyperPred)}")
print(f"Mean squared error: , {metrics.mean_squared_error(Admit_y_test, AdmitHyperPred)}")
```

```python
print(f"Median absolute error: {metrics.median_absolute_error(Admit_y_test, AdmitHyperPred)}")
print(f"Explain variance score: , {metrics.explained_variance_score(Admit_y_test, AdmitHyperPred)}")
print(f"R2 score: , {metrics.r2_score(Admit_y_test, AdmitHyperPred)}")
```

```
Mean Absolute Error: 0.042691468821372
Mean squared error: , 0.003684961104911344
Median absolute error: 0.03014154661587254
Explain variance score: , 0.8308028744214442
R2 score: , 0.8231959455057012
```

In [ ]: