In [ ]:
```
# Shap Interpretation Model
```

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [3]:
```
df = pd.read_csv(r'C:\Users\Jaswanth Reddy\Downloads\winequality-red.csv')
df.head()
```

Out[3]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
0	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	5
1	7.8	0.88	0.00	2.6	0.098	25.0	67.0	0.9968	3.20	0.68	9.8	5
2	7.8	0.76	0.04	2.3	0.092	15.0	54.0	0.9970	3.26	0.65	9.8	5
3	11.2	0.28	0.56	1.9	0.075	17.0	60.0	0.9980	3.16	0.58	9.8	6
4	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	5

In [4]:
```
from sklearn.model_selection import train_test_split
from sklearn import preprocessing
from sklearn.ensemble import RandomForestRegressor
```

In [6]:
```
X=df.drop(columns='quality')
X
```

Out[6]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	3.26	0.65	9.8
3	11.2	0.280	0.56	1.9	0.075	17.0	60.0	0.99800	3.16	0.58	9.8
4	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4
...	...	...	...	...	...	...	...	...	...	...	...
1594	6.2	0.600	0.08	2.0	0.090	32.0	44.0	0.99490	3.45	0.58	10.5
1595	5.9	0.550	0.10	2.2	0.062	39.0	51.0	0.99512	3.52	0.76	11.2
1596	6.3	0.510	0.13	2.3	0.076	29.0	40.0	0.99574	3.42	0.75	11.0
1597	5.9	0.645	0.12	2.0	0.075	32.0	44.0	0.99547	3.57	0.71	10.2
1598	6.0	0.310	0.47	3.6	0.067	18.0	42.0	0.99549	3.39	0.66	11.0

1599 rows × 11 columns

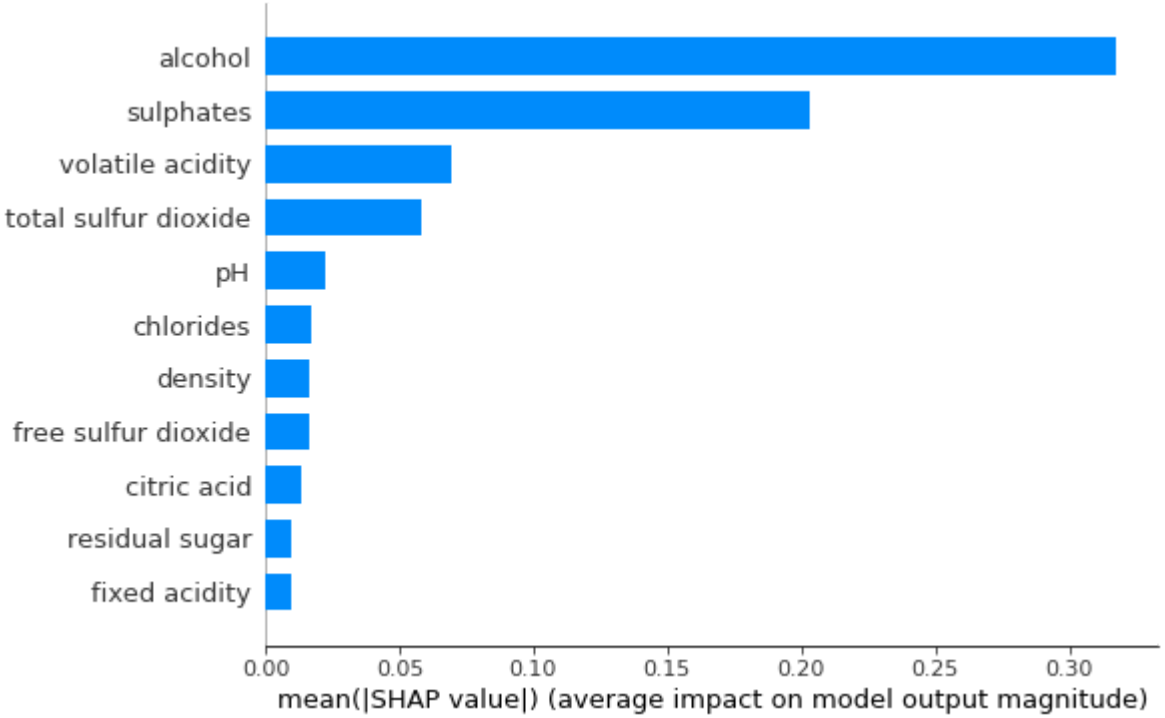
In [12]:
```
Y=df['quality']
Y
```

Out[12]:
```
0       5
1       5
2       5
3       6
4       5
       ..
1594    5
1595    6
1596    6
1597    5
1598    6
Name: quality, Length: 1599, dtype: int64
```

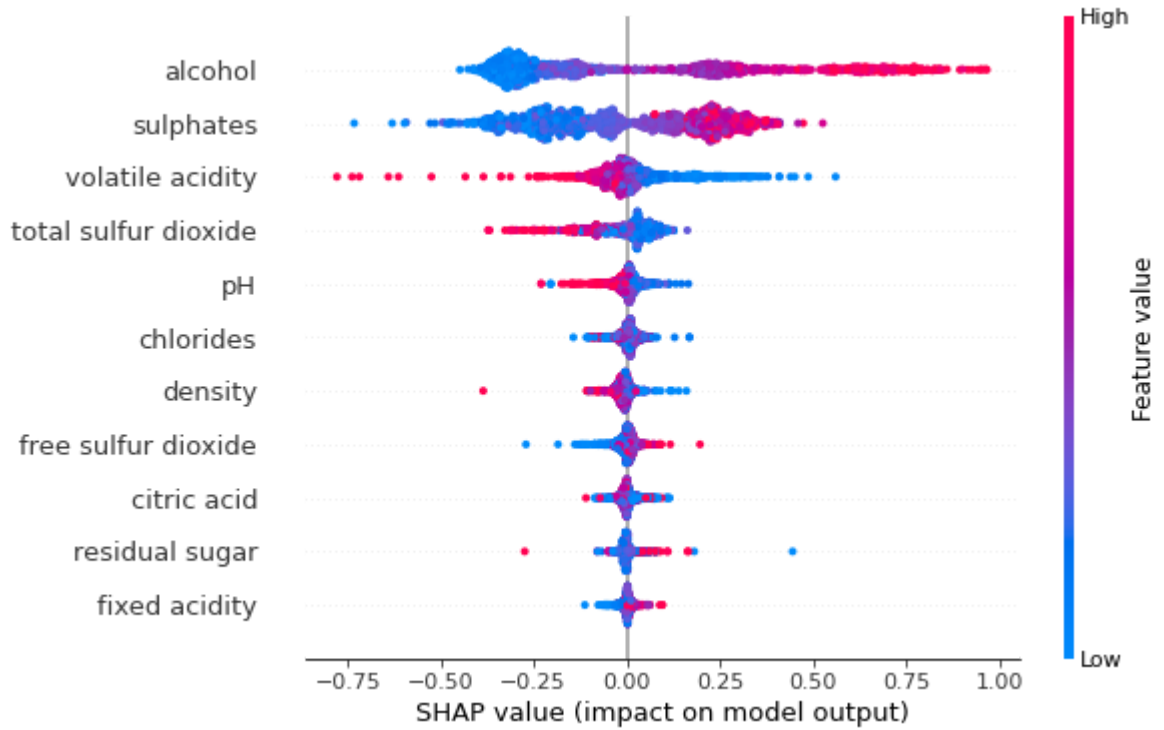
In [13]:
```
# Split the data into train and test data:
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.2)
# Build the model with the random forest regression algorithm:
model = RandomForestRegressor(max_depth=6, random_state=0, n_estimators=10)
model.fit(X_train, Y_train)
```

Out[13]:
```
RandomForestRegressor(max_depth=6, n_estimators=10, random_state=0)
```

In [15]:
```
import shap
shap_values = shap.TreeExplainer(model).shap_values(X_train)
shap.summary_plot(shap_values, X_train, plot_type="bar")
```



In [16]:
```
shap.summary_plot(shap_values, X_train)
```



In [ ]:
```
# In the plot color represents  A high level of the “alcohol” content has a high and positive impact on the qual
#The “high” comes from the red color, and the “positive” impact is shown on the X-axis.
#Similarly, the “volatile acidity” is negatively correlated with the target variable.
```