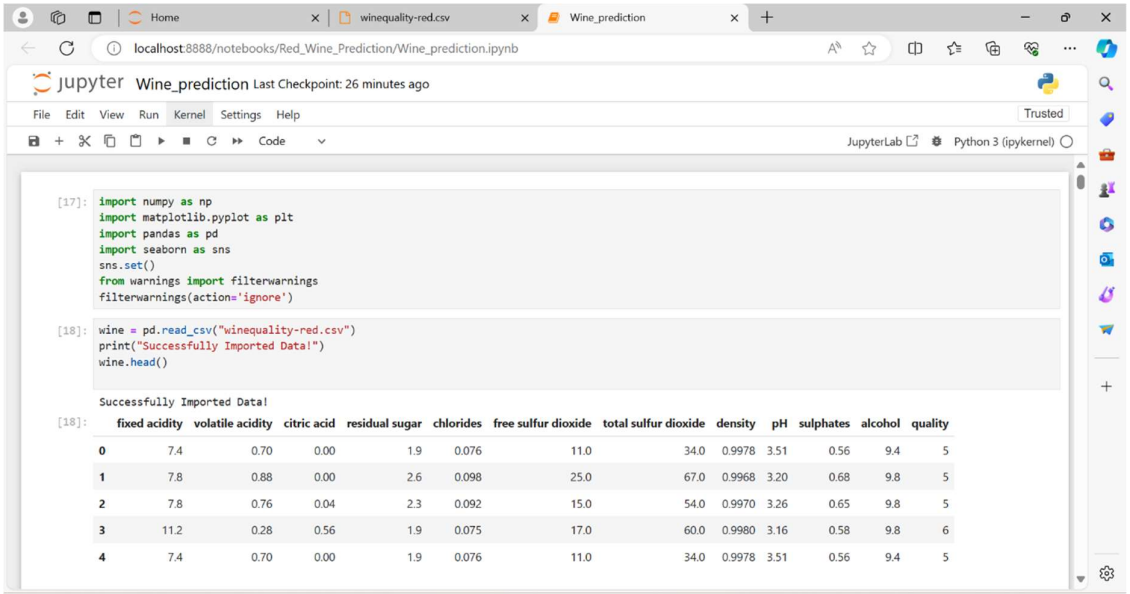
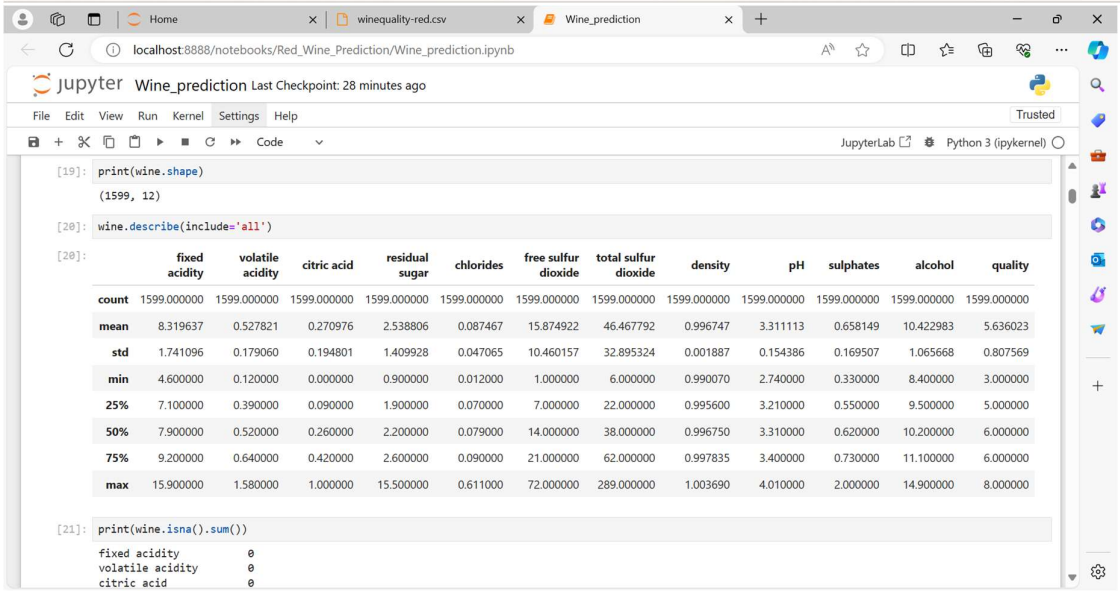
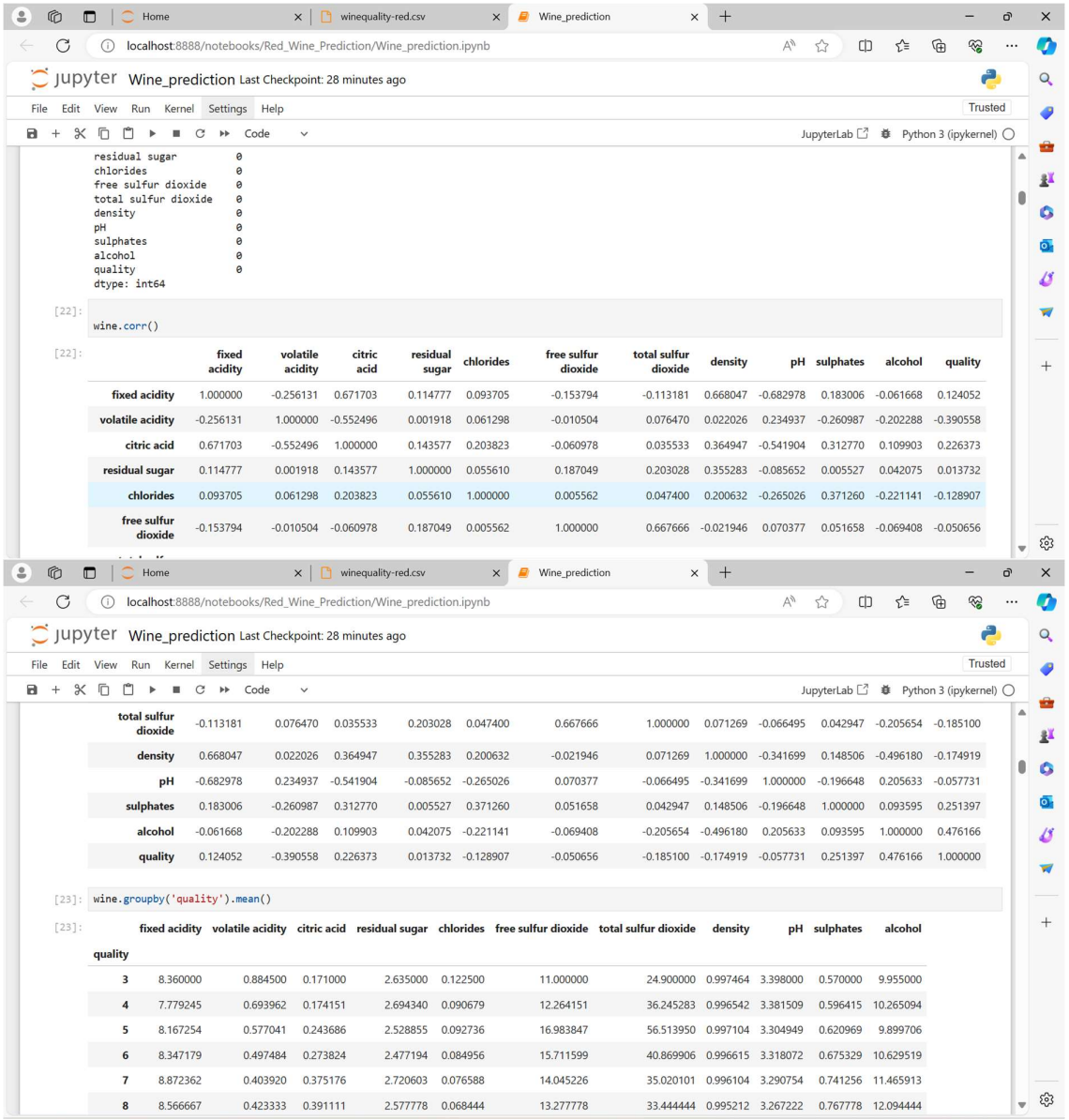


	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
0	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	5
1	7.8	0.88	0.00	2.6	0.098	25.0	67.0	0.9968	3.20	0.68	9.8	5
2	7.8	0.76	0.04	2.3	0.092	15.0	54.0	0.9970	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



	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
count	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000	1599.000000
mean	8.319637	0.527821	0.270976	2.538806	0.087467	15.874922	46.467792	0.996747	3.311113	0.658149	10.422983	5.636023
std	1.741096	0.179060	0.194801	1.409928	0.047065	10.460157	32.895324	0.001887	0.154386	0.169507	1.065668	0.807569
min	4.600000	0.120000	0.000000	0.900000	0.012000	1.000000	6.000000	0.990070	2.740000	0.330000	8.400000	3.000000
25%	7.100000	0.390000	0.090000	1.900000	0.070000	7.000000	22.000000	0.995600	3.210000	0.550000	9.500000	5.000000
50%	7.900000	0.520000	0.260000	2.200000	0.079000	14.000000	38.000000	0.996750	3.310000	0.620000	10.200000	6.000000
75%	9.200000	0.640000	0.420000	2.600000	0.090000	21.000000	62.000000	0.997835	3.400000	0.730000	11.100000	6.000000
max	15.900000	1.580000	1.000000	15.500000	0.611000	72.000000	289.000000	1.003690	4.010000	2.000000	14.900000	8.000000




```
residual sugar          0
chlorides               0
free sulfur dioxide     0
total sulfur dioxide    0
density                 0
pH                      0
sulphates               0
alcohol                 0
quality                 0
dtype: int64
```

[22]:
```
wine.corr()
```

[22]:

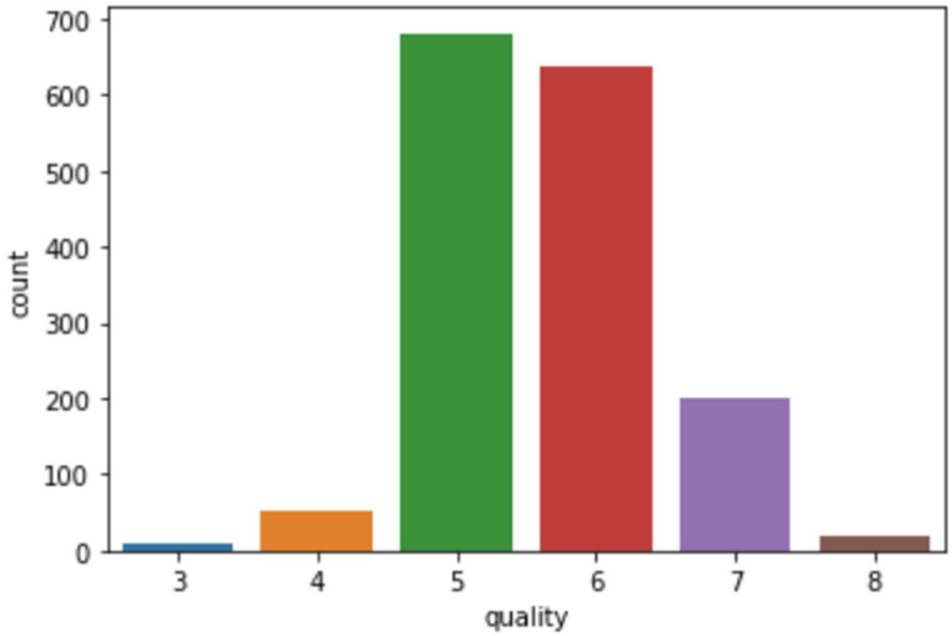
	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
fixed acidity	1.000000	-0.256131	0.671703	0.114777	0.093705	-0.153794	-0.113181	0.668047	-0.682978	0.183006	-0.061668	0.124052
volatile acidity	-0.256131	1.000000	-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

[23]:
```
wine.groupby('quality').mean()
```

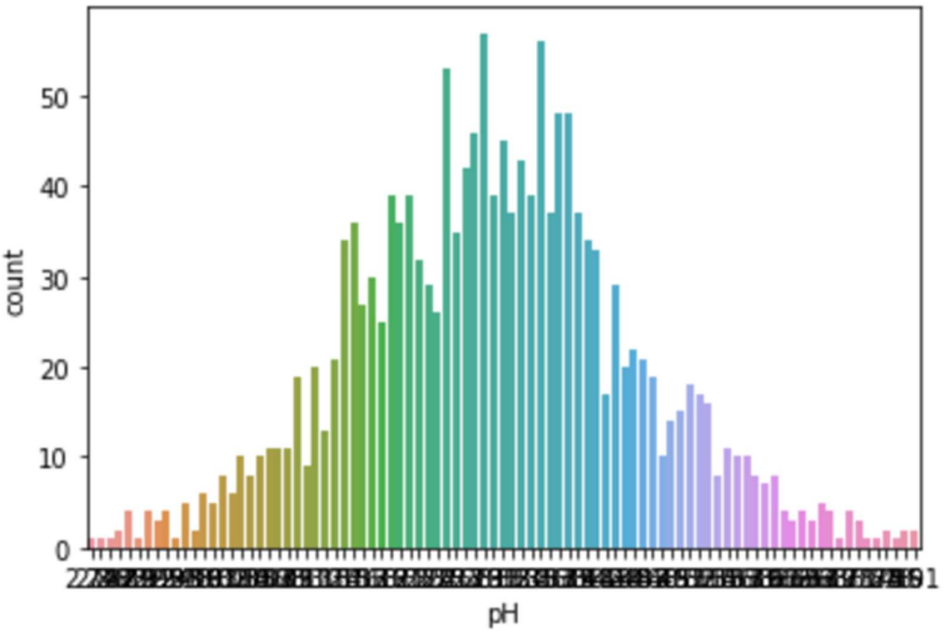
[23]:

quality	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol
3	8.360000	0.884500	0.171000	2.635000	0.122500	11.000000	24.900000	0.997464	3.398000	0.570000	9.955000
4	7.779245	0.693962	0.174151	2.694340	0.090679	12.264151	36.245283	0.996542	3.381509	0.596415	10.265094
5	8.167254	0.577041	0.243686	2.528855	0.092736	16.983847	56.513950	0.997104	3.304949	0.620969	9.899706
6	8.347179	0.497484	0.273824	2.477194	0.084956	15.711599	40.869906	0.996615	3.318072	0.675329	10.629519
7	8.872362	0.403920	0.375176	2.720603	0.076588	14.045226	35.020101	0.996104	3.290754	0.741256	11.465913
8	8.566667	0.423333	0.391111	2.577778	0.068444	13.277778	33.444444	0.995212	3.267222	0.767778	12.094444

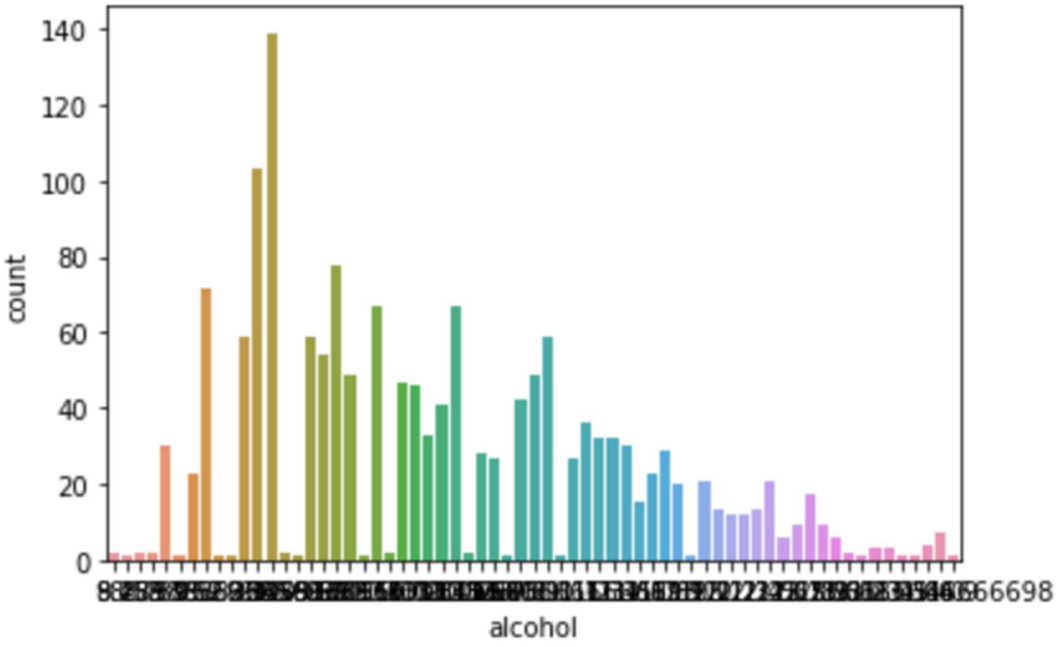
```
sns.countplot(wine['quality'])
plt.show()
```



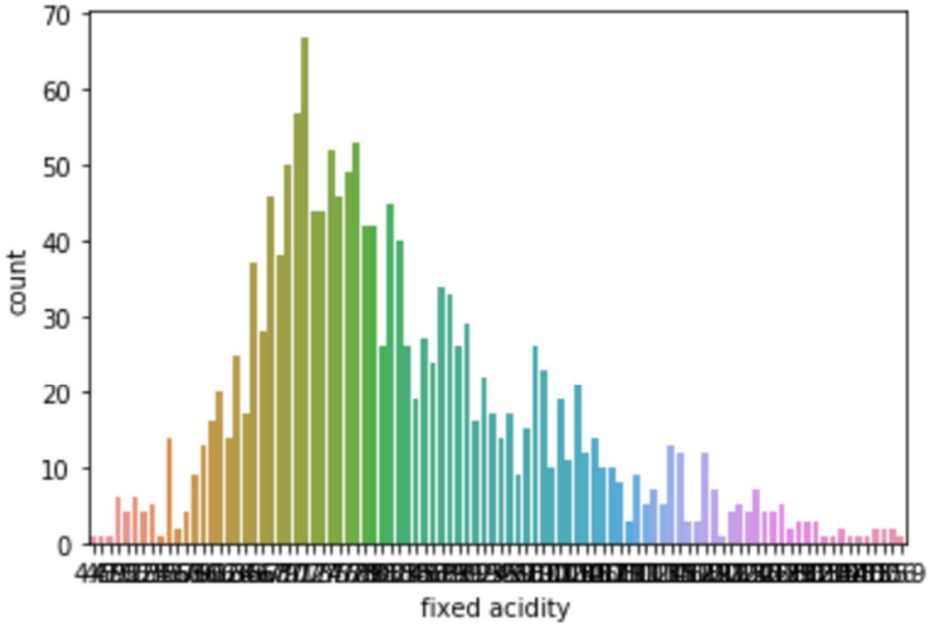

```
sns.countplot(wine['pH'])
plt.show()
```



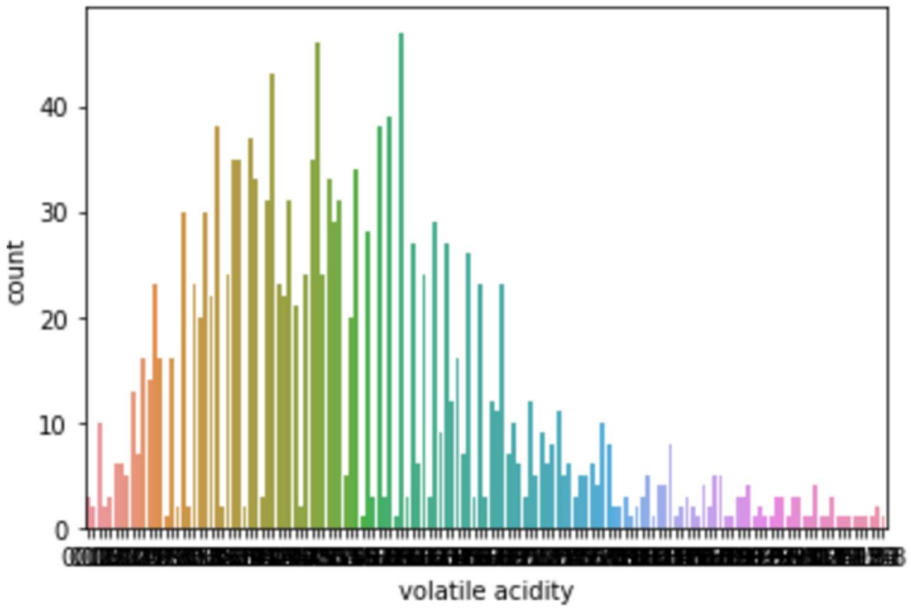
```
sns.countplot(wine['alcohol'])
plt.show()
```



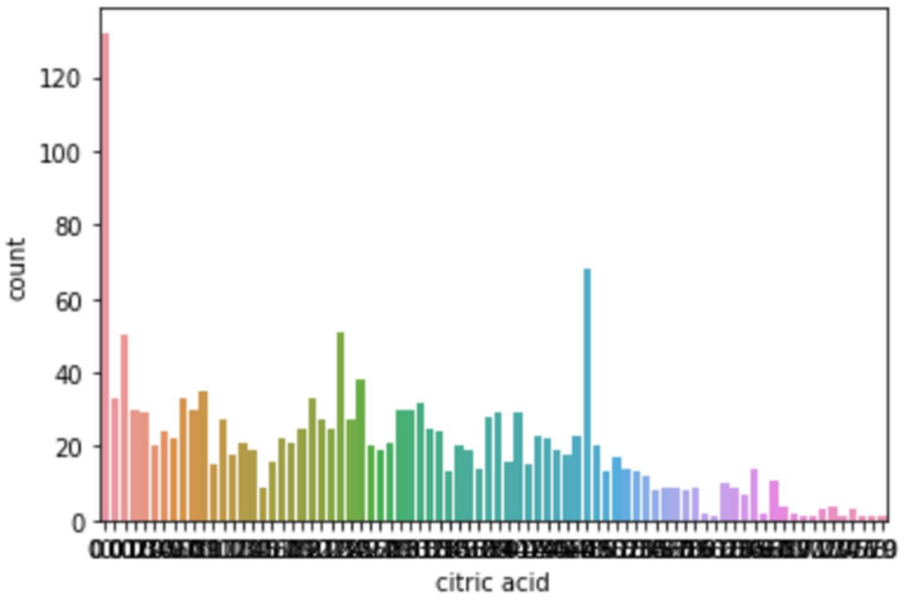

```
sns.countplot(wine['fixed acidity'])
plt.show()
```



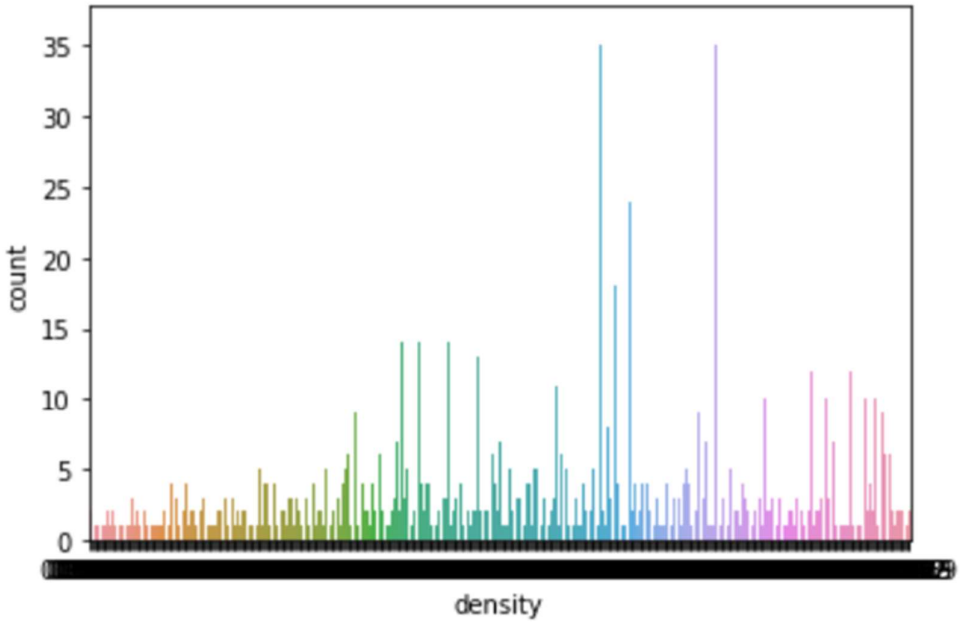
```
sns.countplot(wine['volatile acidity'])
plt.show()
```

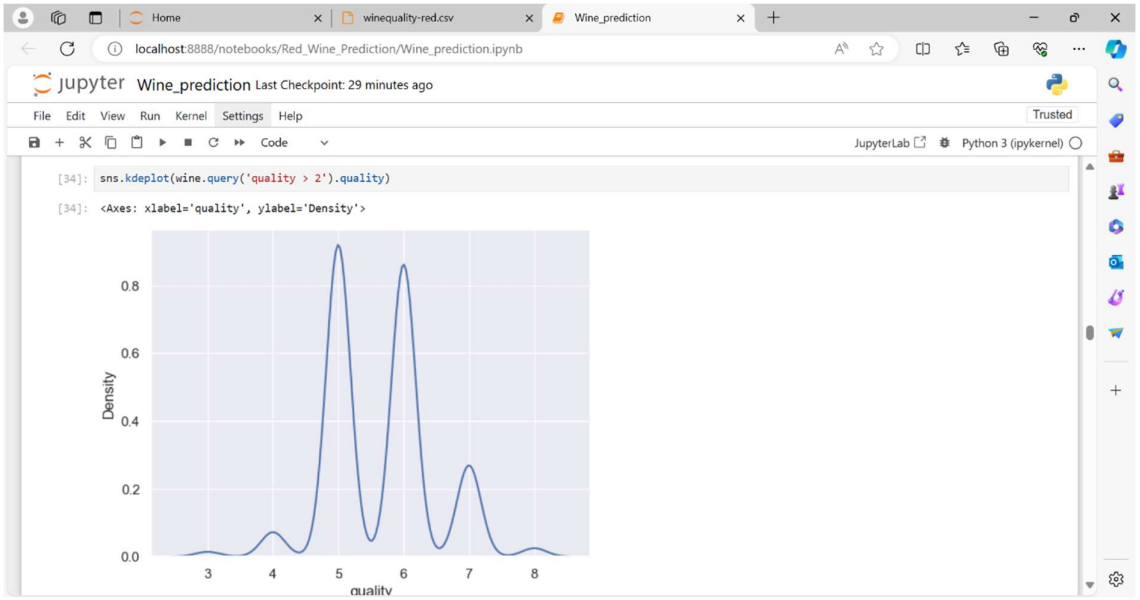



```
sns.countplot(wine['citric acid'])
plt.show()
```



```
sns.countplot(wine['density'])
plt.show()
```





Home | winequality-red.csv | Wine_prediction

localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb

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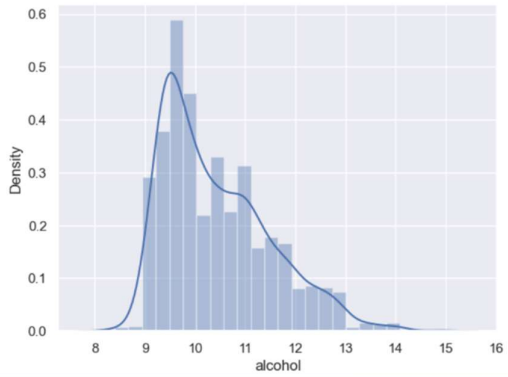
Code — JupyterLab — Python 3 (ipykernel)

```
[32]: sns.distplot(wine['alcohol'])
```

```
[32]: <Axes: xlabel='alcohol', ylabel='Density'>
```



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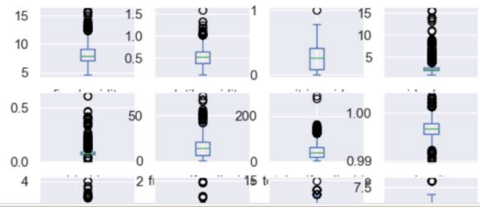
Code — JupyterLab — Python 3 (ipykernel)

```
[36]: wine.plot(kind ='box',subplots = True, layout =(4,4),sharex = False)
```

```
[36]: fixed acidity             Axes(0.125,0.712609;0.168478x0.167391)
      volatile acidity       Axes(0.327174,0.712609;0.168478x0.167391)
      citric acid            Axes(0.529348,0.712609;0.168478x0.167391)
      residual sugar         Axes(0.731522,0.712609;0.168478x0.167391)
      chlorides                 Axes(0.125,0.511739;0.168478x0.167391)
      free sulfur dioxide    Axes(0.327174,0.511739;0.168478x0.167391)
      total sulfur dioxide   Axes(0.529348,0.511739;0.168478x0.167391)
      density                Axes(0.731522,0.511739;0.168478x0.167391)
      pH                        Axes(0.125,0.31087;0.168478x0.167391)
      sulphates              Axes(0.327174,0.31087;0.168478x0.167391)
      alcohol                Axes(0.529348,0.31087;0.168478x0.167391)
      quality                Axes(0.731522,0.31087;0.168478x0.167391)
      dtype: object
```



Home | winequality-red.csv | Wine_prediction

localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb

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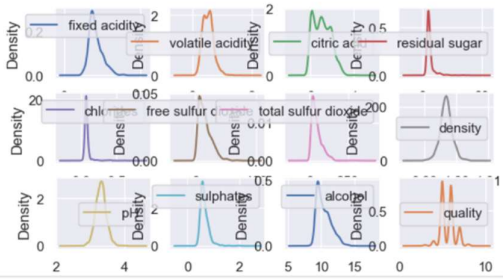
Code

JupyterLab | Python 3 (ipykernel)

```
[38]: wine.plot(kind ='density',subplots = True, layout =(4,4),sharex = False)
```

```
[38]: array([[<Axes: ylabel='Density'>, <Axes: ylabel='Density'>,
              <Axes: ylabel='Density'>, <Axes: ylabel='Density'>],
             [<Axes: ylabel='Density'>, <Axes: ylabel='Density'>,
              <Axes: ylabel='Density'>, <Axes: ylabel='Density'>],
             [<Axes: ylabel='Density'>, <Axes: ylabel='Density'>,
              <Axes: ylabel='Density'>, <Axes: ylabel='Density'>],
             [<Axes: ylabel='Density'>, <Axes: ylabel='Density'>,
              <Axes: ylabel='Density'>, <Axes: ylabel='Density'>]], dtype=object)
```



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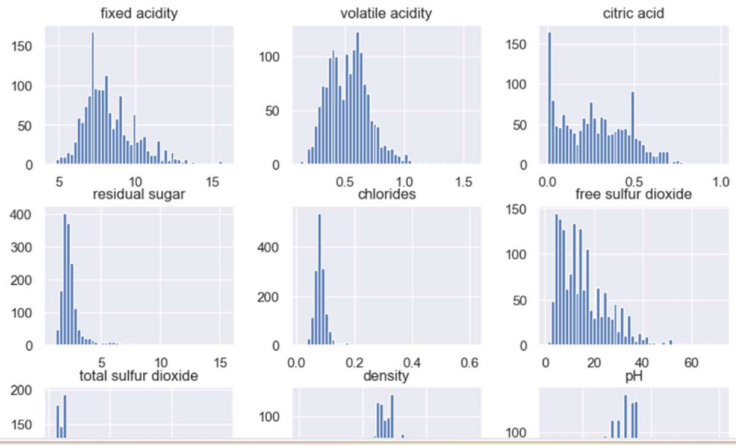
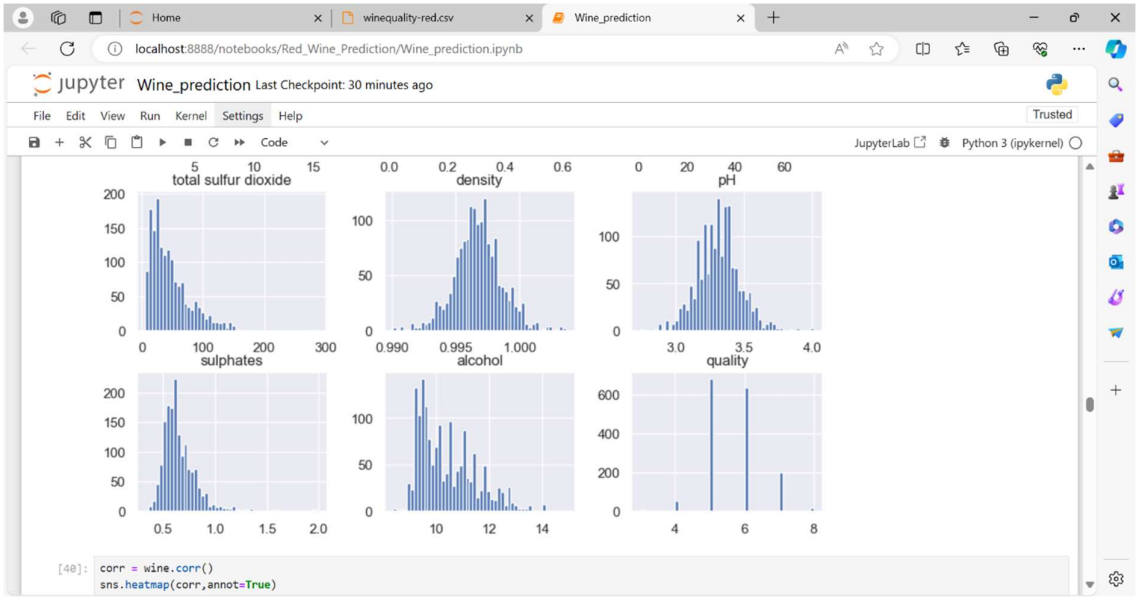
Code

JupyterLab | Python 3 (ipykernel)




Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
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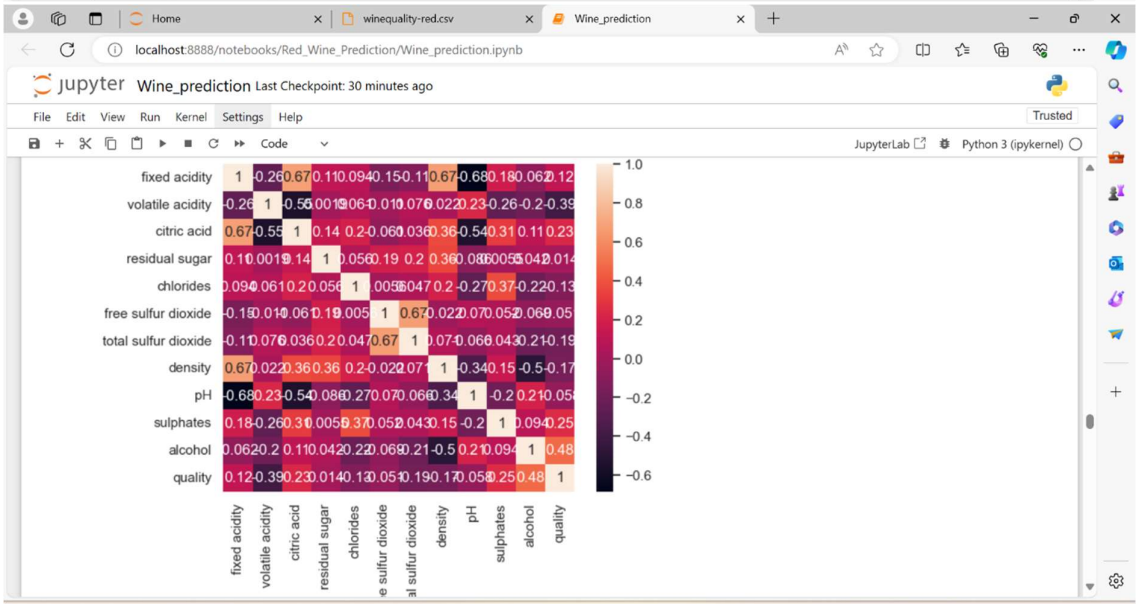
Code
JupyterLab
Python 3 (ipykernel)
total sulfur dioxide
density
pH
sulphates
alcohol
quality
[40]:
corr = wine.corr()
sns.heatmap(corr,annot=True)


Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
jupyter Wine_prediction Last Checkpoint: 30 minutes ago
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Code
JupyterLab
Python 3 (ipykernel)
fixed acidity
volatile acidity
citric acid
residual sugar
chlorides
free sulfur dioxide
total sulfur dioxide
density
pH
sulphates
alcohol
quality
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6

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localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb

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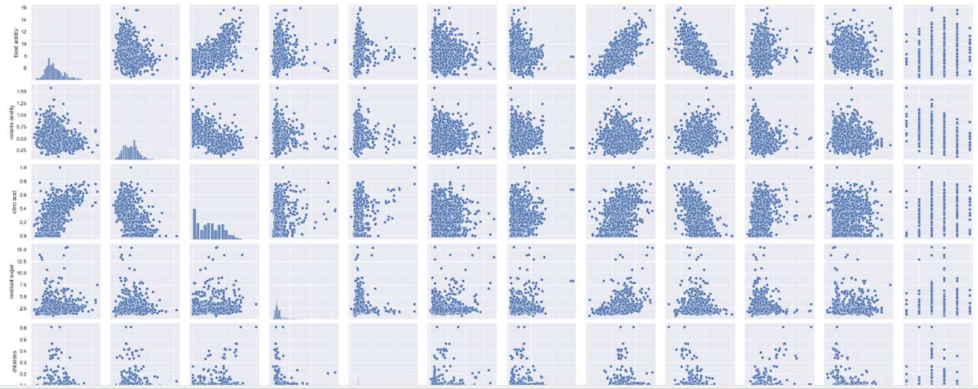
Code

JupyterLab Python 3 (ipykernel)

```
[41]: sns.pairplot(wine)
```

```
[41]: <seaborn.axisgrid.PairGrid at 0x220d1554230>
```



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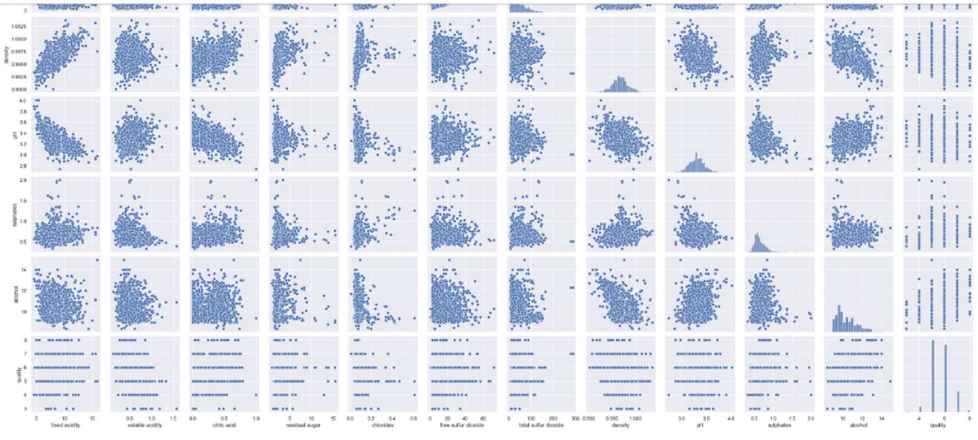
Code

JupyterLab Python 3 (ipykernel)



Home | winequality-red.csv | Wine_prediction

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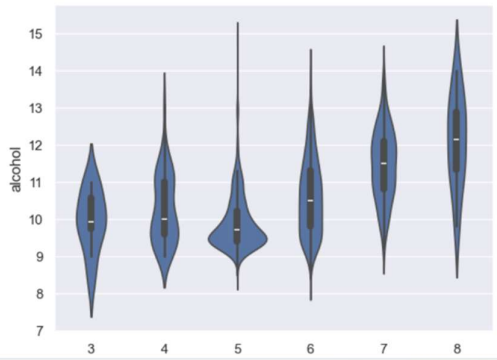
Code

JupyterLab Python 3 (ipykernel)

[42]:
```
sns.violinplot(x='quality', y='alcohol', data=wine)
```

[42]:
```
<Axes: xlabel='quality', ylabel='alcohol'>
```



Home | winequality-red.csv | Wine_prediction

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Code

JupyterLab Python 3 (ipykernel)

[43]:
```
wine['goodquality'] = [1 if x >= 7 else 0 for x in wine['quality']]# Separate feature variables and target variable
X = wine.drop(['quality','goodquality'], axis = 1)
Y = wine['goodquality']
```

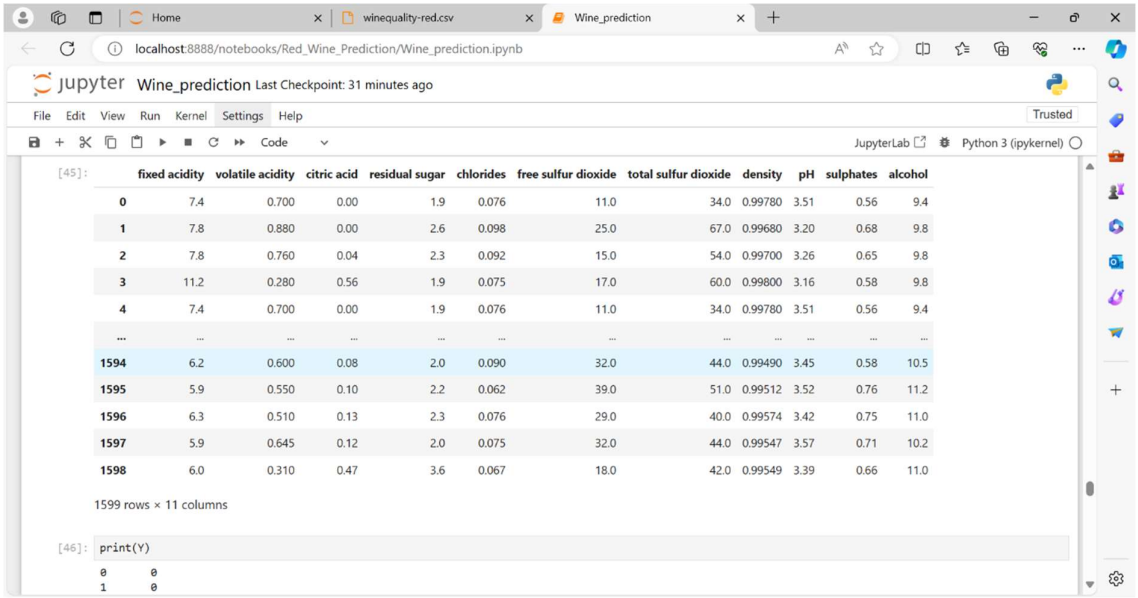
[44]:
```
wine['goodquality'].value_counts()
```

[44]:
```
goodquality
0    1382
1     217
Name: count, dtype: int64
```

[45]:
```
X
```

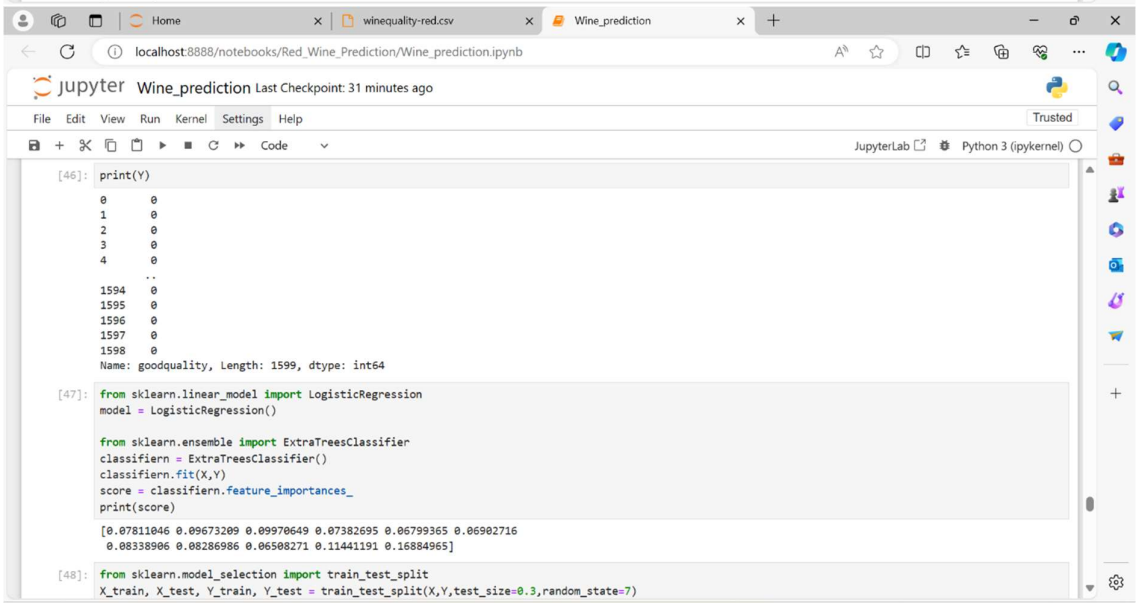
[45]:

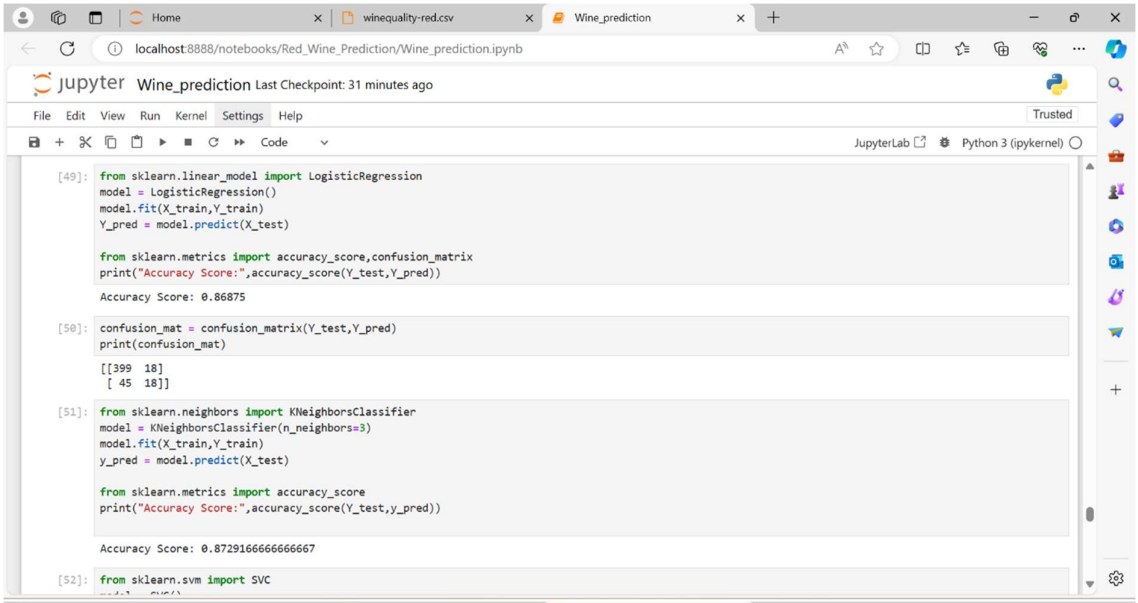
	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	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

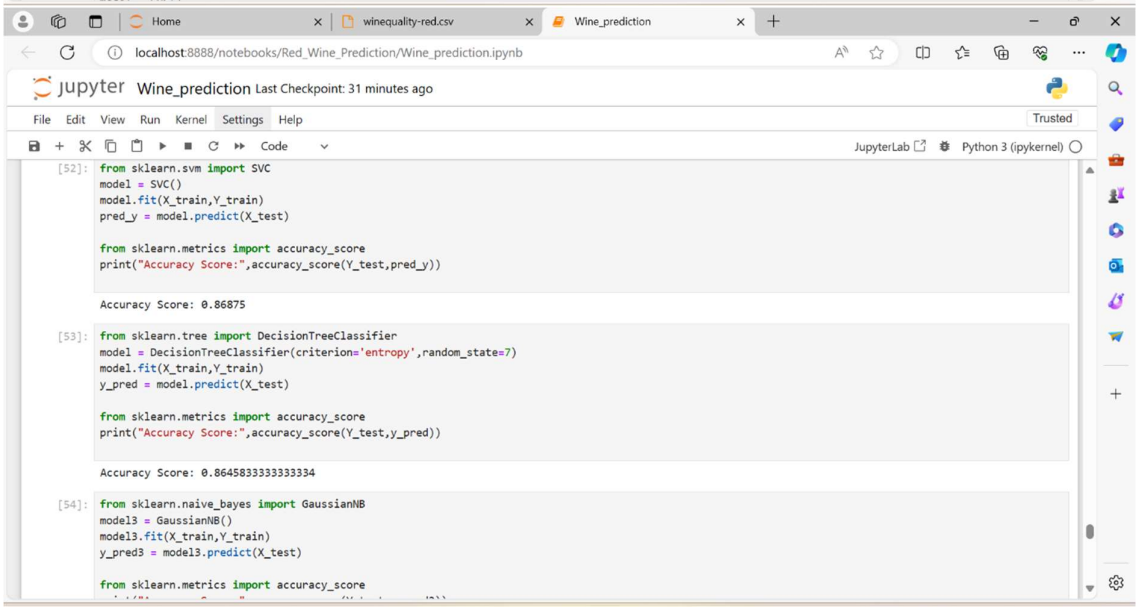


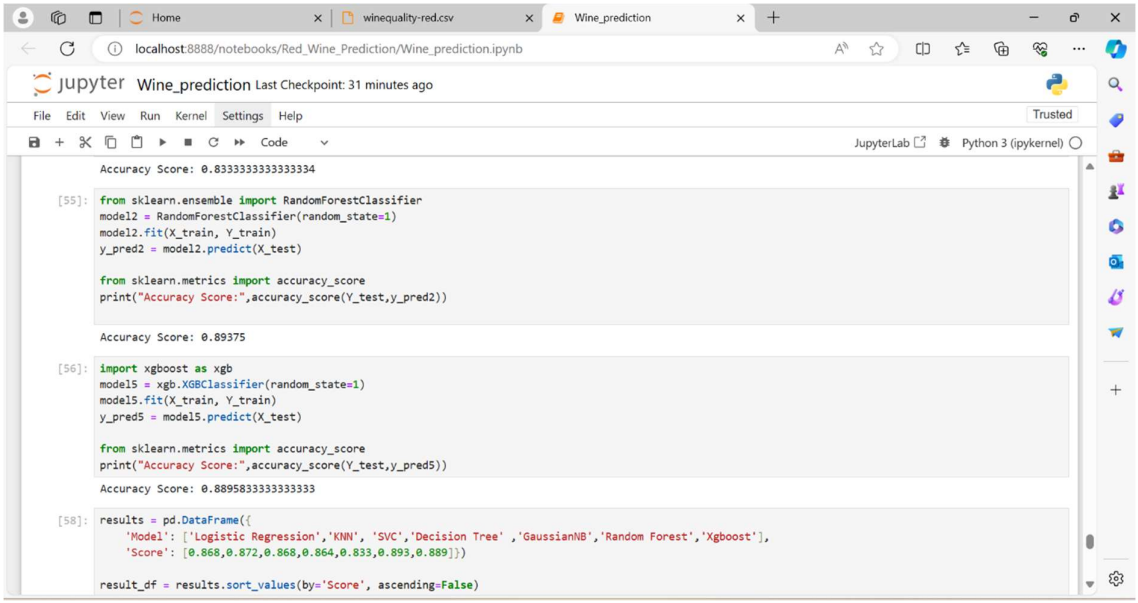
	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	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

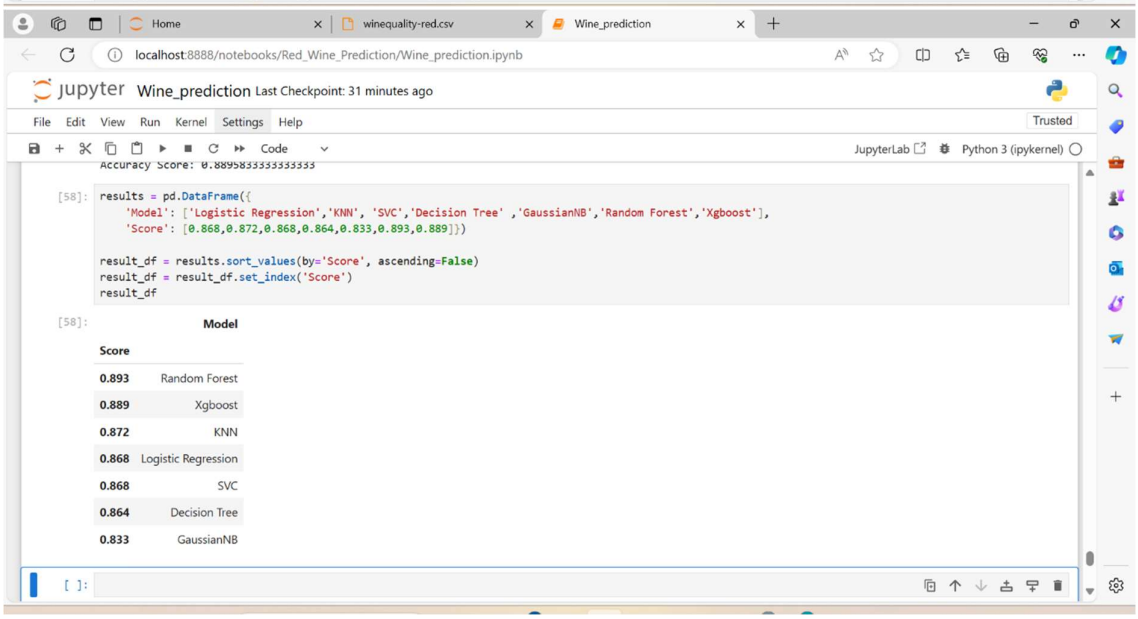
1599 rows × 11 columns




Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
jupyter Wine_prediction Last Checkpoint: 31 minutes ago
File Edit View Run Kernel Settings Help
Trusted
Code
JupyterLab
Python 3 (ipykernel)
[49]:
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(X_train,Y_train)
Y_pred = model.predict(X_test)
from sklearn.metrics import accuracy_score,confusion_matrix
print("Accuracy Score:",accuracy_score(Y_test,Y_pred))
Accuracy Score: 0.86875
[50]:
confusion_mat = confusion_matrix(Y_test,Y_pred)
print(confusion_mat)
[[399 18]
[45 18]]
[51]:
from sklearn.neighbors import KNeighborsClassifier
model = KNeighborsClassifier(n_neighbors=3)
model.fit(X_train,Y_train)
y_pred = model.predict(X_test)
from sklearn.metrics import accuracy_score
print("Accuracy Score:",accuracy_score(Y_test,y_pred))
Accuracy Score: 0.8729166666666667
[52]:
from sklearn.svm import SVC


Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
jupyter Wine_prediction Last Checkpoint: 31 minutes ago
File Edit View Run Kernel Settings Help
Trusted
Code
JupyterLab
Python 3 (ipykernel)
[52]:
from sklearn.svm import SVC
model = SVC()
model.fit(X_train,Y_train)
pred_y = model.predict(X_test)
from sklearn.metrics import accuracy_score
print("Accuracy Score:",accuracy_score(Y_test,pred_y))
Accuracy Score: 0.86875
[53]:
from sklearn.tree import DecisionTreeClassifier
model = DecisionTreeClassifier(criterion='entropy',random_state=7)
model.fit(X_train,Y_train)
y_pred = model.predict(X_test)
from sklearn.metrics import accuracy_score
print("Accuracy Score:",accuracy_score(Y_test,y_pred))
Accuracy Score: 0.8645833333333334
[54]:
from sklearn.naive_bayes import GaussianNB
model3 = GaussianNB()
model3.fit(X_train,Y_train)
y_pred3 = model3.predict(X_test)
from sklearn.metrics import accuracy_score


Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
jupyter Wine_prediction Last Checkpoint: 31 minutes ago
File Edit View Run Kernel Settings Help
Trusted
Code
JupyterLab
Python 3 (ipykernel)
Accuracy Score: 0.8333333333333334
[55]:
from sklearn.ensemble import RandomForestClassifier
model2 = RandomForestClassifier(random_state=1)
model2.fit(X_train, Y_train)
y_pred2 = model2.predict(X_test)
from sklearn.metrics import accuracy_score
print("Accuracy Score:",accuracy_score(Y_test,y_pred2))
Accuracy Score: 0.89375
[56]:
import xgboost as xgb
model5 = xgb.XGBClassifier(random_state=1)
model5.fit(X_train, Y_train)
y_pred5 = model5.predict(X_test)
from sklearn.metrics import accuracy_score
print("Accuracy Score:",accuracy_score(Y_test,y_pred5))
Accuracy Score: 0.8895833333333333
[58]:
results = pd.DataFrame({
'Model': ['Logistic Regression','KNN', 'SVC','Decision Tree' ,'GaussianNB','Random Forest','Xgboost'],
'Score': [0.868,0.872,0.868,0.864,0.833,0.893,0.889]})
result_df = results.sort_values(by='Score', ascending=False)


Home
winequality-red.csv
Wine_prediction
localhost:8888/notebooks/Red_Wine_Prediction/Wine_prediction.ipynb
jupyter Wine_prediction Last Checkpoint: 31 minutes ago
File Edit View Run Kernel Settings Help
Trusted
Code
JupyterLab
Python 3 (ipykernel)
[58]:
results = pd.DataFrame({
'Model': ['Logistic Regression','KNN', 'SVC','Decision Tree' ,'GaussianNB','Random Forest','Xgboost'],
'Score': [0.868,0.872,0.868,0.864,0.833,0.893,0.889]})
result_df = results.sort_values(by='Score', ascending=False)
result_df = result_df.set_index('Score')
result_df
[58]:
Model
Score
0.893 Random Forest
0.889 Xgboost
0.872 KNN
0.868 Logistic Regression
0.868 SVC
0.864 Decision Tree
0.833 GaussianNB
[ ]: