Wine Quality Data Set

This project is a part of Coursera and UCSD's Python Data Products Specialization course. The objective is to extract and visualize basic statistics from a dataset. I chose a Wine Quality Data Set from the UCI Machine Learning.

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Data Set Information:

The two datasets are related to red and white variants of the Portuguese "Vinho Verde" wine. For more details, consult: [Web Link] or the reference [Cortez et al., 2009]. Due to privacy and logistic issues, only physicochemical (inputs) and sensory (the output) variables are available (e.g. there is no data about grape types, wine brand, wine selling price, etc.).

These datasets can be viewed as classification or regression tasks. The classes are ordered and not balanced (e.g. there are many more normal wines than excellent or poor ones). Outlier detection algorithms could be used to detect the few excellent or poor wines. Also, we are not sure if all input variables are relevant. So it could be interesting to test feature selection methods.

Attribute Information:

```
For more information, read [Cortez et al., 2009].
Input variables (based on physicochemical tests):
    1 - fixed acidity
    2 - volatile acidity
    3 - citric acid
    4 - residual sugar
    5 - chlorides
    6 - free sulfur dioxide
    7 - total sulfur dioxide
    8 - density
    9 - pH
    10 - sulphates
    11 - alcohol
    Output variable (based on sensory data):
    12 - quality (score between 0 and 10)
```

In [8]:

```
# importing libraries and reading the dataset
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

labels = ('fixed_activity', 'volatile_acidity', 'citric_acid', 'residual
_sugar', 'chlorides', 'free_sulfur_dioxide', 'total_sulfur_dioxide', 'de
nsity', 'pH', 'sulphates', 'alcohol', 'quality')
df_white = pd.read_csv('winequality-white.csv', header = 0, names = labe
ls, sep = ';')
df_red = pd.read_csv('winequality-red.csv', header = 0, names = labels,
sep = ';')
```

The two dataframes above store all the relevant data and attributes regarding white and red vine samples. I created my own labels based on attribute names and created my own pandas dataframe. Both these datasets can be compared to find out how wine qualities are affected with physiochemical test values.

In [6]:

```
df_white.head()
```

Out[6]:

	fixed_activity	volatile_acidity	citric_acid	residual_sugar	chlorides	free_sulfur_dioxide	total_su
0	7.0	0.27	0.36	20.7	0.045	45.0	
1	6.3	0.30	0.34	1.6	0.049	14.0	
2	8.1	0.28	0.40	6.9	0.050	30.0	
3	7.2	0.23	0.32	8.5	0.058	47.0	
4	7.2	0.23	0.32	8.5	0.058	47.0	

In [9]:

```
df_red.head()
```

Out[9]:

	fixed_activity	volatile_acidity	citric_acid	residual_sugar	chlorides	free_sulfur_dioxide	total_su
0	7.4	0.70	0.00	1.9	0.076	11.0	
1	7.8	0.88	0.00	2.6	0.098	25.0	
2	7.8	0.76	0.04	2.3	0.092	15.0	
3	11.2	0.28	0.56	1.9	0.075	17.0	
4	7.4	0.70	0.00	1.9	0.076	11.0	

In [10]:
```
df_white.describe()
```

Out[10]:

	fixed_activity	volatile_acidity	citric_acid	residual_sugar	chlorides	free_sulfur_dioxide
count	4898.000000	4898.000000	4898.000000	4898.000000	4898.000000	4898.000000
mean	6.854788	0.278241	0.334192	6.391415	0.045772	35.308085
std	0.843868	0.100795	0.121020	5.072058	0.021848	17.007137
min	3.800000	0.080000	0.000000	0.600000	0.009000	2.000000
25%	6.300000	0.210000	0.270000	1.700000	0.036000	23.000000
50%	6.800000	0.260000	0.320000	5.200000	0.043000	34.000000
75%	7.300000	0.320000	0.390000	9.900000	0.050000	46.000000
max	14.200000	1.100000	1.660000	65.800000	0.346000	289.000000

In [11]:
```
df_red.describe()
```

Out[11]:

	fixed_activity	volatile_acidity	citric_acid	residual_sugar	chlorides	free_sulfur_dioxide
count	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
std	1.741096	0.179060	0.194801	1.409928	0.047065	10.460157
min	4.600000	0.120000	0.000000	0.900000	0.012000	1.000000
25%	7.100000	0.390000	0.090000	1.900000	0.070000	7.000000
50%	7.900000	0.520000	0.260000	2.200000	0.079000	14.000000
75%	9.200000	0.640000	0.420000	2.600000	0.090000	21.000000
max	15.900000	1.580000	1.000000	15.500000	0.611000	72.000000

We can append both datasets into a single dataframe that will allow us to compare statistics. First, we need to append color attributes for both dataframes, after which we can merge them both.

In [12]:
```
df_red['color'] = 'red'
df_white['color'] = 'white'

# appending dataframes
df_wine = df_red.append(df_white)
df_wine.head()
```

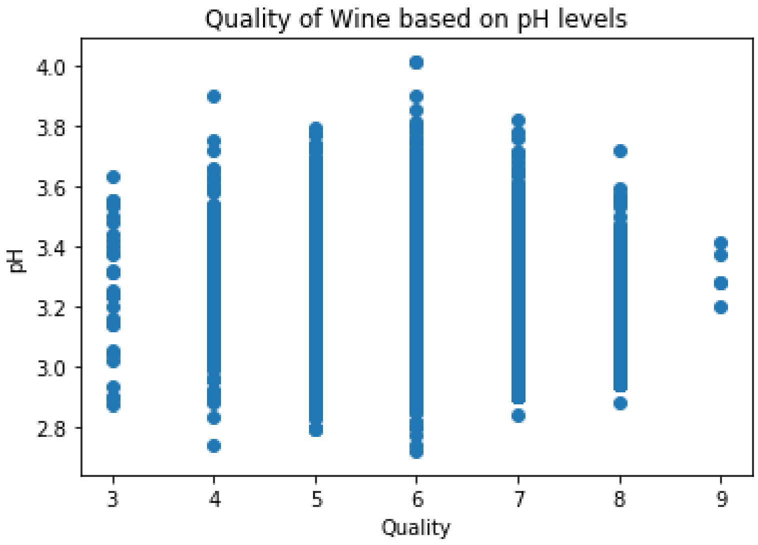
Out[12]:

	fixed_activity	volatile_acidity	citric_acid	residual_sugar	chlorides	free_sulfur_dioxide	total_su
0	7.4	0.70	0.00	1.9	0.076	11.0	
1	7.8	0.88	0.00	2.6	0.098	25.0	
2	7.8	0.76	0.04	2.3	0.092	15.0	
3	11.2	0.28	0.56	1.9	0.075	17.0	
4	7.4	0.70	0.00	1.9	0.076	11.0	

We can now identify how the wine quality is affected by different attributes such as pH, residual sugar, volatile acidity, alcohol content, total sulfur dioxide or citric acid. We can assess more feature attributes and how it can impact the quality of wine.

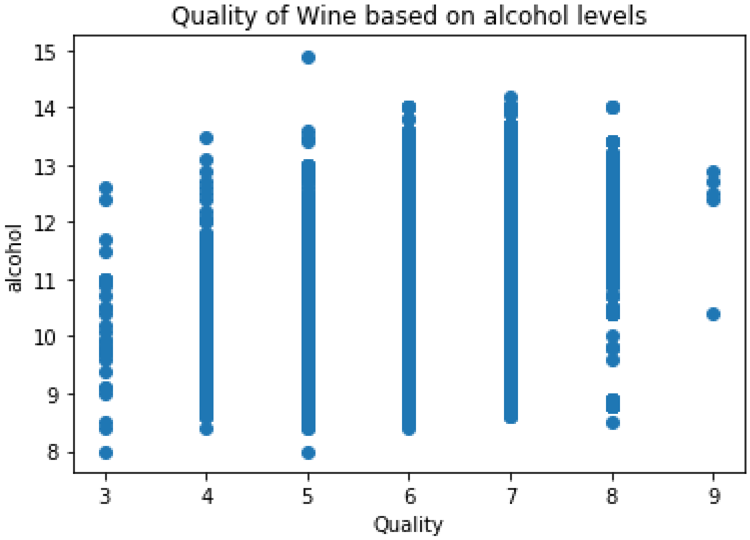
In [21]:
```
x = df_wine.quality
y = df_wine.pH
plt.xlabel("Quality")
plt.ylabel("pH")
plt.title("Quality of Wine based on pH levels")
plt.scatter(x,y)
```

Out[21]:
```
<matplotlib.collections.PathCollection at 0x7fbf97db3e10>
```



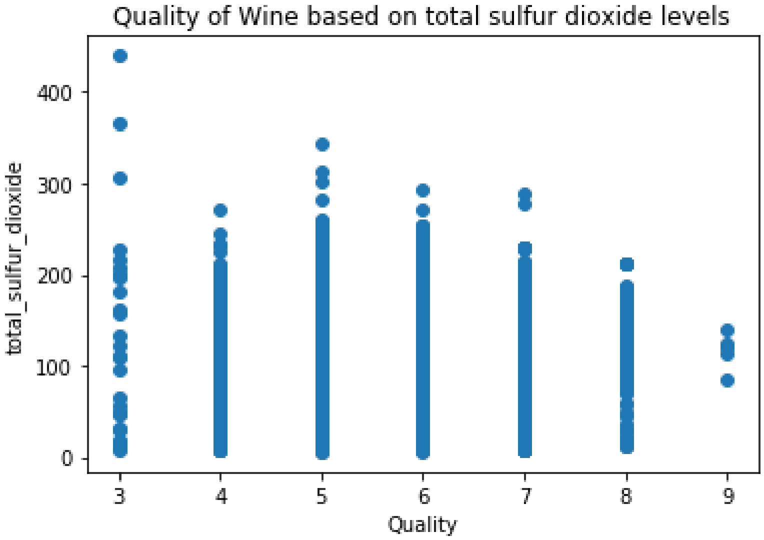
In [24]:
```
x = df_wine.quality
y = df_wine.alcohol
plt.xlabel("Quality")
plt.ylabel("alcohol")
plt.title("Quality of Wine based on alcohol levels")
plt.scatter(x,y)
```

Out[24]:
```
<matplotlib.collections.PathCollection at 0x7fbf984f0d50>
```



In [25]:
```
x = df_wine.quality
y = df_wine.total_sulfur_dioxide
plt.xlabel("Quality")
plt.ylabel("total_sulfur_dioxide")
plt.title("Quality of Wine based on total sulfur dioxide levels")
plt.scatter(x,y)
```

Out[25]:
```
<matplotlib.collections.PathCollection at 0x7fbf986f6f50>
```

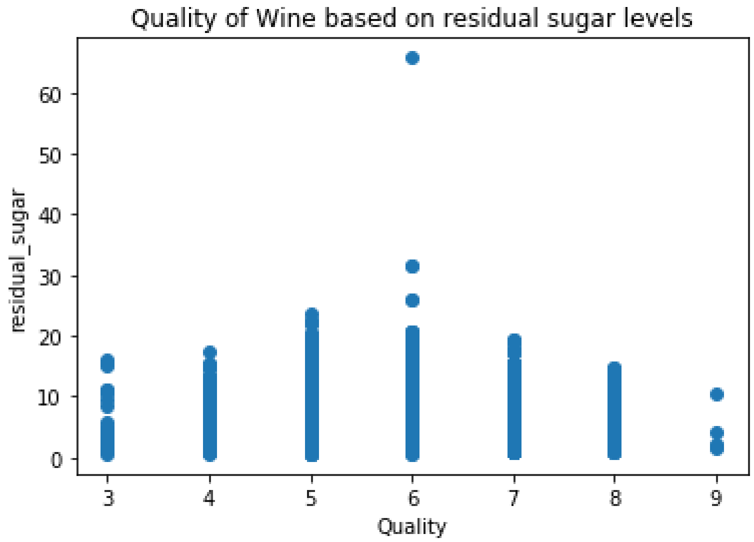


In [27]:

```
x = df_wine.quality
y = df_wine.residual_sugar
plt.xlabel("Quality")
plt.ylabel("residual_sugar")
plt.title("Quality of Wine based on residual sugar levels")
plt.scatter(x,y)
```

Out[27]:

```
<matplotlib.collections.PathCollection at 0x7fbf98981490>
```



We can see that alcohol clearly has a higher effect on the quality of wine than other feature attributes

In [ ]:

```
```