**Attribute information:**

Input variables (based on physicochemical tests):

1 - fixed acidity (tartaric acid – g / liter)

2 - volatile acidity (acetic acid - g / liter)

3 - citric acid (g / liter)

4 - residual sugar (g / dm^3)

5 - chlorides (sodium chloride (g / liter)

6 - free sulfur dioxide (mg / liter)

7 - total sulfur dioxide (mg / liter)

8 - density (g / liter)

9 - pH

10 - sulphates (potassium sulphate - g / liter)

11 - alcohol (% by volume)

Output variable (based on sensory data):

12 - quality (bad, average and good)

**Description of attributes:**

1 - fixed acidity: most acids involved with wine or fixed or nonvolatile (do not evaporate readily).

2 - volatile acidity: the amount of acetic acid in wine, which at too high of levels can lead to an unpleasant, vinegar taste.

3 - citric acid: found in small quantities, citric acid can add 'freshness' and flavor to wines.

4 - residual sugar: the amount of sugar remaining after fermentation stops, it's rare to find wines with less than 1 gram/liter and wines with greater than 45 grams/liter are considered sweet.

5 - chlorides: the amount of salt in the wine.

6 - free sulfur dioxide: the free form of SO2 exists in equilibrium between molecular SO2 (as a dissolved gas) and bisulfite ion; it prevents microbial growth and the oxidation of wine.

7 - total sulfur dioxide: amount of free and bound forms of S02; in low concentrations, SO2 is mostly undetectable in wine, but at free SO2 concentrations over 50 ppm, SO2 becomes evident in the nose and taste of wine.

8 - density: the density of water is close to that of water depending on the percent alcohol and sugar content.

9 - pH: describes how acidic or basic a wine is on a scale from 0 (very acidic) to 14 (very basic); most wines are between 3-4 on the pH scale.

10 - sulphates: a wine additive which can contribute to sulfur dioxide gas (S02) levels, which acts as an antimicrobial and antioxidant.

11 - alcohol: the percent alcohol content of the wine.

12 – quality: output variable (based on sensory data, score between 0 and 10).