Linear Regression

0.5706

0.5640

0.5771

X

0.5748

Linear Regression

Predicting Wine Quality

with

Linear Regression

20160802

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Main Idea

Bitter

Less Sugar

Dry

Fruity, Not Bitter

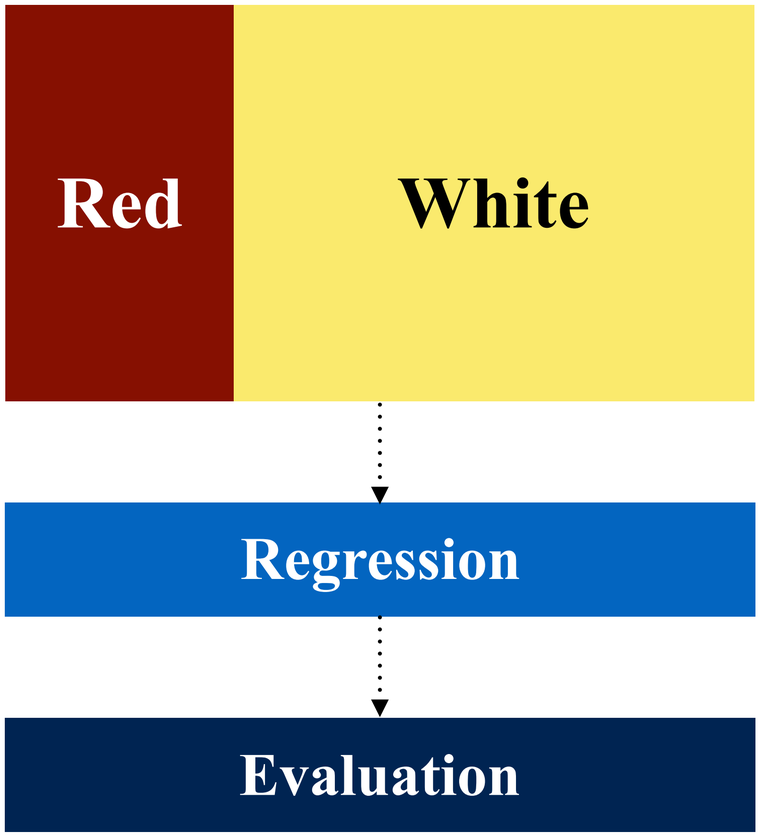
More Sugar

With Dessert

There are **different important factors** between two types of wines.

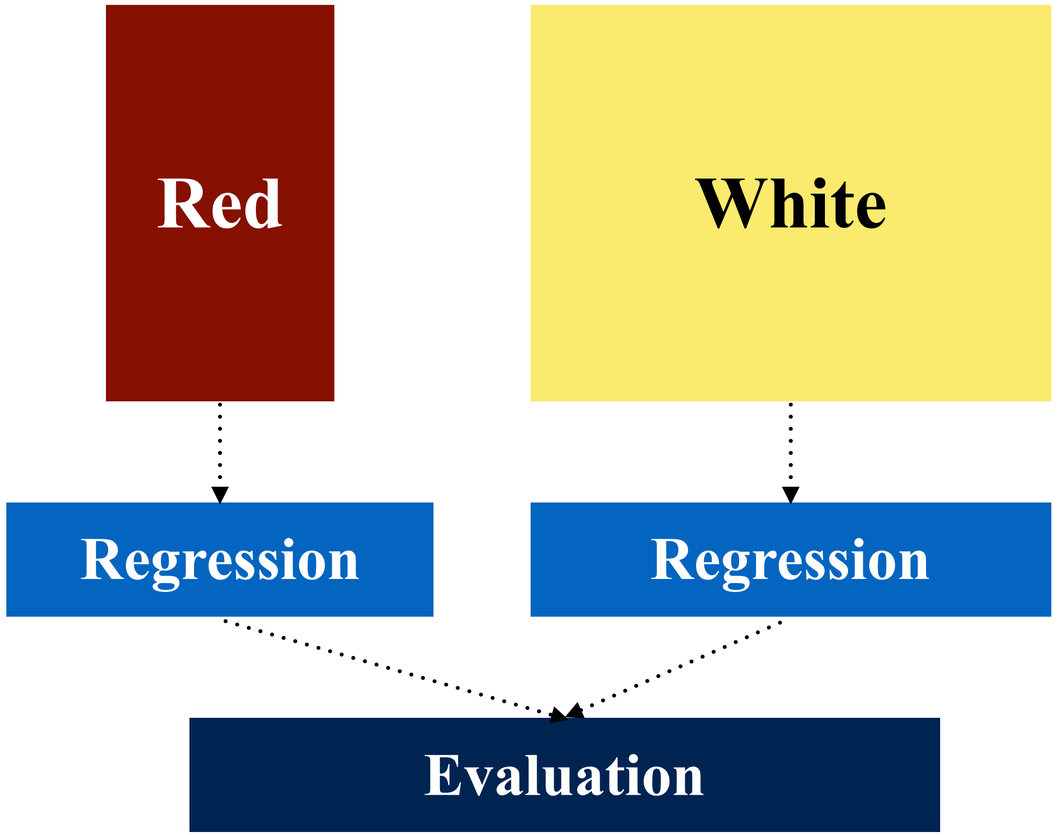
Main Idea

Traditional Method



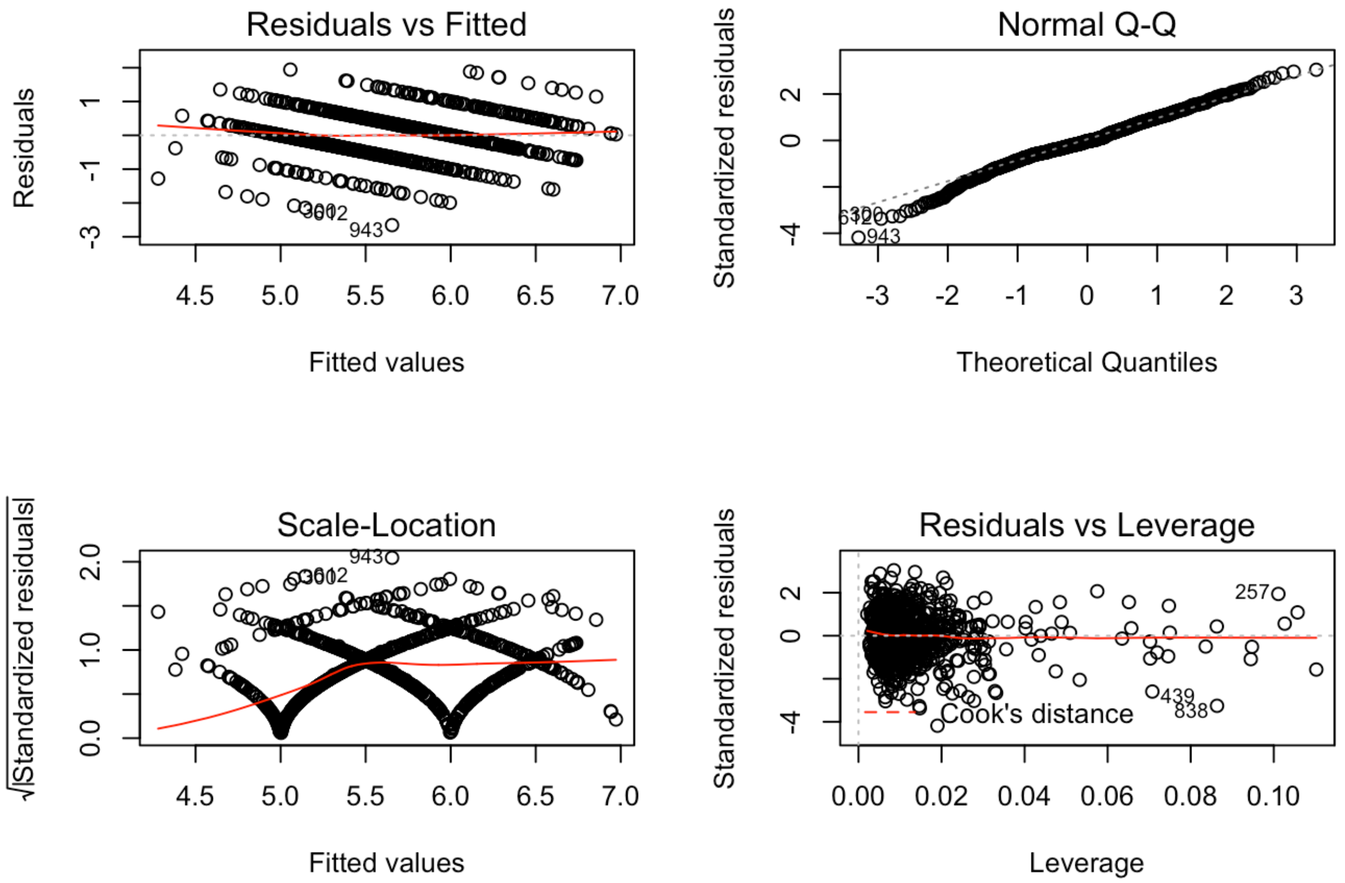
The Problem happens with Feature Selection

My Method



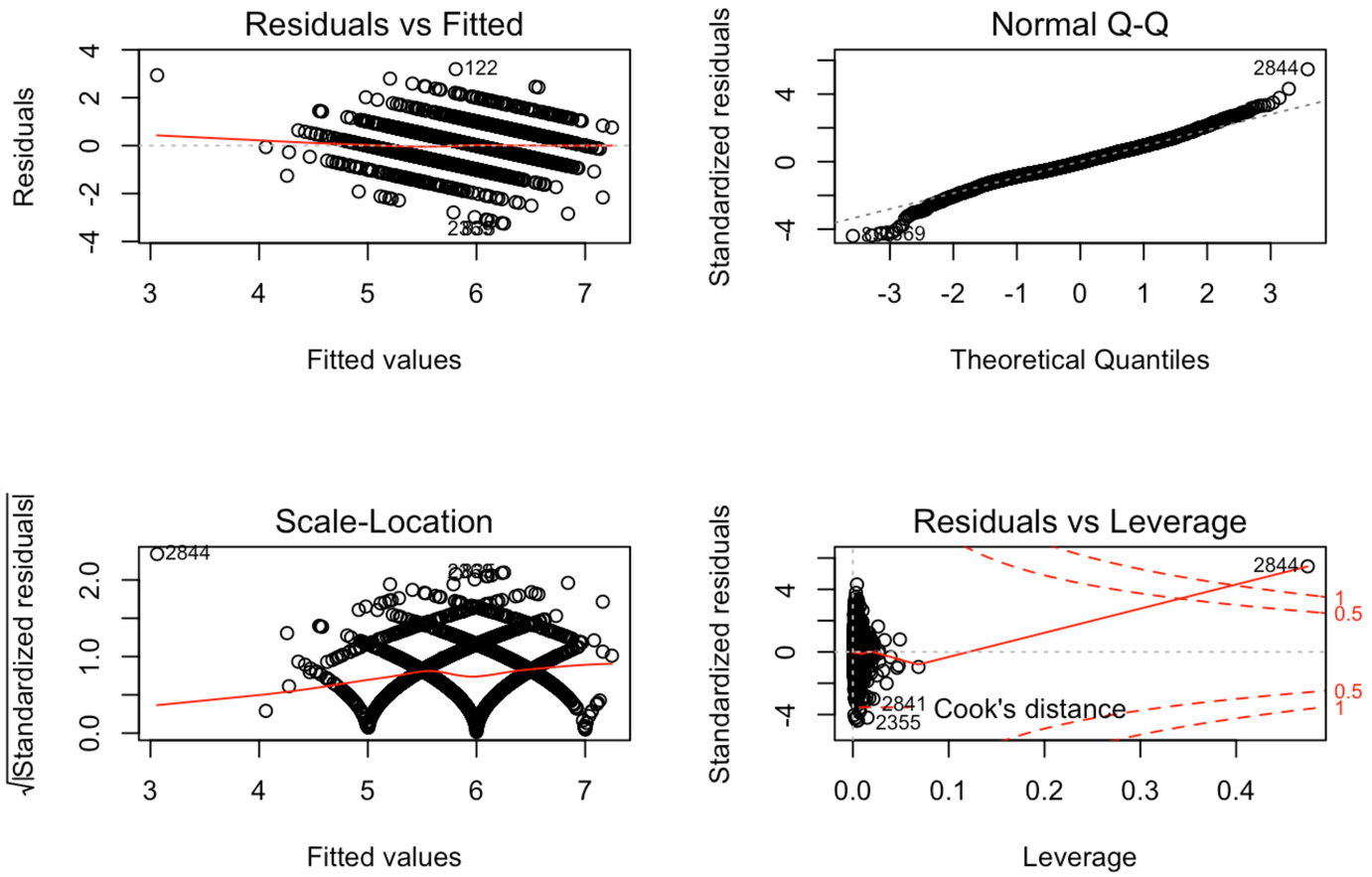
It can be considered as an ensemble model with two independent models

Outlier & Leverage Detection



Default : Red Wine

Outlier & Leverage Detection



Default : White Wine

Feature Selection & Interaction Term

Attributes Description

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, wich acts as an antimicrobial and antioxidant
11. alcohol: the percent alcohol content of the wine
12. type : the type of the wine

Feature Selection & Interaction Term

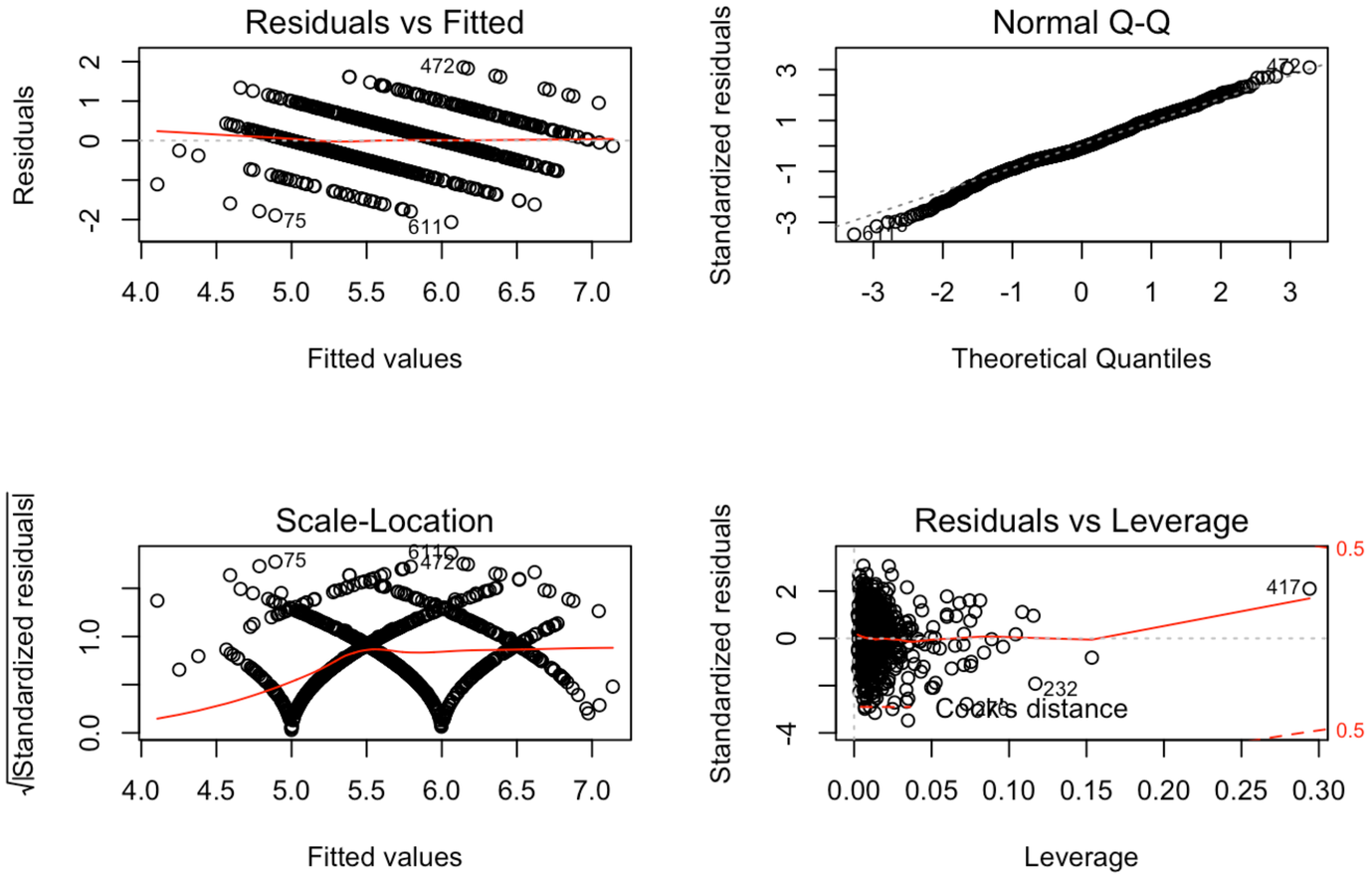
For Red Wine

```
step_red <- lm(formula = quality ~ volatile.acidity + citric.acid +
               residual.sugar + chlorides + free.sulfur.dioxide * density *
               total.sulfur.dioxide * sulphates + pH + density * alcohol,
               data = new_red)
```

For White Wine

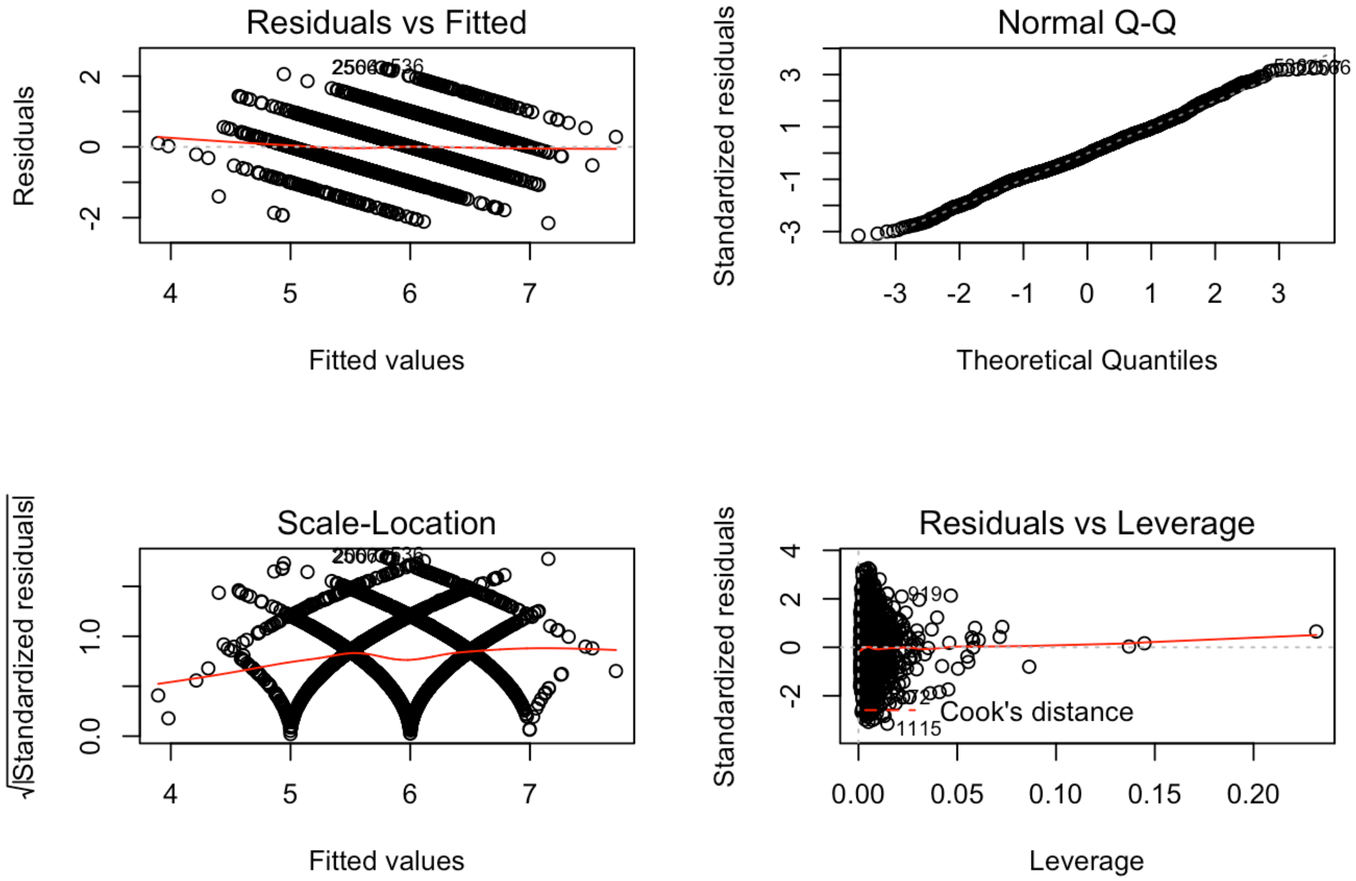
```
step_white <- lm(formula = quality ~ fixed.acidity * volatile.acidity +
                 residual.sugar * pH + free.sulfur.dioxide * total.sulfur.dioxide *
                 sulphates + density * alcohol, data = new_white)
```

Outlier & Leverage Detection



Featured Model : Red Wine

Outlier & Leverage Detection



Featured Model : White Wine

Result

Model	MAE
Traditional Model	0.5814709
Ensemble Model	0.5769779
Ensemble Model + Outlier & Leverage Detection (1)	0.5779364
Ensemble Model + Outlier & Leverage Detection (1) + Interaction Term	0.5657421
Ensemble Model + Outlier & Leverage Detection (1) Interaction Term + Outlier & Leverage Detection (2)	***0.5641923***

Question?