

STA 138 Discussion 8

Fall 2020

For this discussion we will explore logistic regression models using `wine.csv`, containing data regarding the quality of wines. We have here three variables, “quality,” “SO2,” and “pH,” recorded for each of 1599 wine samples:

- quality (binary): 1 if high quality, 0 otherwise
- SO2 (binary): 1 if high sulfur dioxide levels, 0 o.w.
- pH (numeric): pH of the wine

Let’s let

$$x_1 = \begin{cases} 1 & \text{if SO2} = 1 \\ 0 & \text{if SO2} = 0 \end{cases},$$
$$x_2 = \text{pH} ,$$

and

$$x_3 = x_1 \cdot x_2 .$$

1. Consider the model

$$\log \left(\frac{\pi}{1 - \pi} \right) = \alpha + \beta_1 x_1 .$$

- (a) What are the estimated parameters for this model?
- (b) Interpret the parameters.

2. Consider the model

$$\log \left(\frac{\pi}{1 - \pi} \right) = \alpha + \beta_2 x_2 .$$

- (a) What are the estimated parameters for this model?
- (b) Interpret the parameters.
- (c) Plot both the fitted log-odds and fitted probability of high quality for wines as a function of pH.

3. Consider the model

$$\log \left(\frac{\pi}{1 - \pi} \right) = \alpha + \beta_1 x_1 + \beta_2 x_2 .$$

- (a) What are the estimated parameters for this model?
- (b) Interpret the parameters.
- (c) Plot both the fitted log-odds and fitted probability of high quality for wines as a function of pH and SO2.

4. Consider the model

$$\log \left(\frac{\pi}{1 - \pi} \right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 .$$

- (a) What are the estimated parameters for this model?
- (b) Interpret the parameters.
- (c) Plot both the fitted log-odds and fitted probability of high quality for wines as a function of pH and SO2.