Systems with Machine Learning

Task 1: Description

Topic: Wine Quality Analysis

1. Introduction

Wine is a beverage (alcoholic and non-alcoholic) typically made from fermented grapes and other fruit juices with a lower amount of alcohol content. Different varieties of grapes and strains of yeasts produce different styles and quality of wine. These variations result from the complex interactions between the biochemical development of the grape, the reactions involved in fermentation, the grape's growing environment terroir, and the production process. This process is time taking, costly and not efficient. A wine in itself includes different parameters like fixed acidity, pH, chlorides, citric acid, residual sugar, alcohol, etc.

2. Problem Statement

Understanding the demands of wine safety testing can be a complex task for many industrial laboratories with numerous analyses and residues to monitor. However, our program would provide prediction capabilities and ideal solutions for the analysis of wine, which will make this whole process efficient and cheaper with less human interaction.

3. Objective

Our main objective would be to create a system that will be able to predict the wine quality based on multiple wine parameters using machine learning through Python programming language. Our program will distinguish red and white wines and they will be treated separately so each wine could compete within its style.

4. Data Source

Our dataset is downloaded from the UCI Machine Learning Repository https://archive.ics.uci.edu/ml/index.php.

5. Input Data

Our input data will consist of a set of wine attributes, including: pH level, density alcohol etc. All data will be passed in a numeric form.

6. Output Data

Desired result of our system will be a wine rating on scale 1 - 10, where 1 is bad and 10 is good.

7. Proposed Methodology

For the purpose of prediction, all these parameters would be analyzed through machine learning regression algorithms ranging from a generalized linear model to cutting edge AI statistical techniques that would give us the best fit from our input variables. Our special requirement to classify wines is defined by quality >=7 as excellent wines, in this situation, we would build a classification model to identify excellent wines. Results obtained would further be checked for correctness and the model will be optimized accordingly.

8. Application

Consequently, this program can be adopted to support wine expert evaluations and ultimately improve their production. While wine manufacturers deploy this program to improve the quality of their future wines, certification bodies can also use the result for quality control. Results can also be published by magazine owners as guides to help consumers for wine selection.