

**ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY**

**COLLEGE OF  ENGINEERING**

**DEPARTMENT OF SOFTWARE ENGINEERING**

**COURSE: Machine Learning**

**Title: wine quality prediction**

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Introduction

Wine quality prediction is a complex task that involves analyzing various chemical properties of wine to determine its quality. This code uses machine learning techniques to predict the quality of wine based on its chemical properties. The code uses a random forest classifier to train a model on a dataset of wine samples and then uses this model to predict the quality of new, unseen wine samples. The code also includes a graphical user interface (GUI) that allows users to input the chemical properties of a wine sample and receive a predicted quality score.

Objective

The objective of this code is to develop a machine learning model that can accurately predict the quality of wine based on its chemical properties. The model should be able to learn from a dataset of wine samples and make predictions on new, unseen samples. The code should also provide a user-friendly interface for users to input the chemical properties of a wine sample and receive a predicted quality score.

Method

The code uses the following method to achieve its objective:

Data Import and Preprocessing: The code imports a dataset of wine samples from a CSV file and preprocesses the data by encoding the quality labels using a label encoder.

Feature Selection: The code selects the chemical properties of the wine samples as features for the model.

Model Training: The code trains a random forest classifier on the preprocessed data using the selected features.

Model Evaluation: The code evaluates the performance of the model using accuracy score and confusion matrix.

GUI Development: The code develops a GUI using Tkinter that allows users to input the chemical properties of a wine sample and receive a predicted quality score.

Process 1: Importing Libraries

The code starts by importing necessary libraries:

numpy as np: A library for numerical computations.

matplotlib.pyplot as plt: A library for creating plots and visualizations.

pandas as pd: A library for data manipulation and analysis.

seaborn as sns: A library for data visualization.

sklearn.tree.plot\_tree: A library for plotting decision trees.

sklearn.ensemble.RandomForestClassifier: A library for random forest classification.

sklearn.metrics.confusion\_matrix, accuracy\_score: Libraries for evaluating model performance.

tkinter as tk: A library for creating graphical user interfaces (GUIs).

tkinter.ttk: A library for creating GUI components.

warnings.filterwarnings: A library for filtering warnings.

Process 2: Data Import and Preprocessing

The code imports a dataset of wine samples from a CSV file using pd.read\_csv. The dataset is stored in the data variable.

The code then preprocesses the data by encoding the quality labels using a LabelEncoder. This is done to convert the quality labels into numerical values that can be used by the machine learning model.

Process 3: Feature Selection

The code selects the chemical properties of the wine samples as features for the model. This is done by dropping the quality column from the dataset using data.drop.

Process 4: Model Training

The code trains a random forest classifier on the preprocessed data using RandomForestClassifier. The model is trained on the training data X\_train and y\_train using model.fit.

Process 5: Model Evaluation

The code evaluates the performance of the model using accuracy score and confusion matrix. The accuracy score is calculated using accuracy\_score, and the confusion matrix is calculated using confusion\_matrix.

Process 6: Defining the predict\_wine\_quality Function

The code defines a function predict\_wine\_quality that takes in the chemical properties of a wine sample as input and returns the predicted quality score. The function uses the trained model to make predictions on new, unseen data.

Process 7: Creating the GUI

The code creates a GUI using Tkinter that allows users to input the chemical properties of a wine sample and receive a predicted quality score. The GUI includes:

Input fields for each chemical property

A predict button that triggers the predict\_button\_click function

A result label that displays the predicted quality score

Process 8: Defining the predict\_button\_click Function

The code defines a function predict\_button\_click that is triggered when the predict button is clicked. The function:

Retrieves the input values from the input fields

Calls the predict\_wine\_quality function to make a prediction

Updates the result label with the predicted quality score

Checks if the predicted quality score is higher than 5 and prints the input values if true

Process 9: Running the GUI

The code runs the GUI using root.mainloop(), which starts the GUI event loop.

Conclusion

The code provides a comprehensive solution for wine quality prediction using machine learning techniques. The code trains a random forest classifier on a dataset of wine samples and uses this model to predict the quality of new, unseen wine samples. The code also provides a user-friendly GUI that allows users to input the chemical properties of a wine sample and receive a predicted quality score. The code can be used by wine producers and enthusiasts to predict the quality of wine and make informed decisions.