# Red Wine Quality Prediction Using Machine Learning Techniques

Mini Project Report

Submitted by

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*Submitted in partial fulfillment of the requirements for the award of the degree of*

***Master of Computer Applications***
***Of***
***A P J Abdul Kalam Technological University***

**FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)®**
**ANGAMALY-683577, ERNAKULAM(DIST)**
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# DECLARATION

I, **Manjima Varghese** hereby declare that the report of this project work, submitted to the Department of Computer Applications, Federal Institute of Science and Technology (**FISAT**), Angamaly in partial fulfillment of the award of the degree of Master of Computer Application is an authentic record of my original work.

The report has not been submitted for the award of any degree of this university or any other university.

**Date :**

**Place: Angamaly**

# FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)®

**ANGAMALY, ERNAKULAM-683577**

**DEPARTMENT OF COMPUTER APPLICATIONS**

## CERTIFICATE

This is to certify that the project report titled **”Red Wine Quality Prediction Using Machine Learning Techniques”** submitted by **Manjima Varghese** towards partial fulfillment of the requirements for the award of the degree of Master of Computer Applications is a record of bonafide work carried out by her during the year 2022.

| | |
|---|---|
| **Project Guide** | **Head of the Department** |

# ACKNOWLEDGEMENT

With pleasure, I am submitting the mini project which I did as a part of my curriculum. I am very grateful to almighty God who let me in the right way and showered upon me his blessings throughout the successful completion of this project.

I am very much indebted to Dr. George Manoj George, Principal, FISAT, Angamaly and Dr. C. Sheela, Vice Principal, FISAT, Angamaly, for encouragement and co-operation. Our sincere thanks to Dr.Deepa Mary Mathews, Head of the department of Computer Applications, FISAT, who gave the source of inspiration for achieving greater height in the pursed of excellence.

The project report titled "Red Wine Quality Prediction using Machine Learning" has been done under the guidance of scrum master Dr.Sujesh.P.Lal and internal guide Ms.Anju. With great respect I express my sincere and heartfelt thanks for her guidance for preparing this project.

Last but not the least, I express our heartfelt word of thanks to my parents and friends who have given me inspiration, mental support and lot of help and encouragement for doing this project successfully. My heart flows out to all those who helped me directly or indirectly in the completion of this work.

# ABSTRACT

Nowadays people try to lead a luxurious life. They tend to use the things either for show off or for their daily basis. These days the consumption of red wine is very common to all. So it became important to analyze the quality of red wine before its consumption to preserve human health. Hence this research is a step towards the quality prediction of the red wine using its various attributes.

The use of machiene learning techniques such as Random Forest, Support Vector Machine and naïve Bayes help us achieve this goal.Dataset is taken from the sources. Various measures are calculated and the results are compared among training set and testing set and accordingly the best out of the three techniques depending on the training set results predicted. Better results can be observed if the best features out from other techniques are extracted and merged with one another to improve the accuracy and efficiency.

# Contents

# Chapter 1

# Introduction

Wine is an alcoholic beverage made with the fermented juice of grapes. Quality of wine is graded based on the taste of wine and vintage.this process is time consuming,costly and not efficient.A wine itself include different parameters like fixed acidity,volatile acidity,citric acid,residual sugar,chlorides ,free sulphur dioxide,total sulphur dioxide,density, ph,sulphates,alcohol and quality.In industries, understanding the demand of wine safety testing can be complex task for thelaboratory with numerous analytes and resideus to monitor But, our machiene learning prediction provide ideal solutions for the analysis of wine,which will make this whole process efficient and cheaper with less human interaction

Data mining is the path toward discovering new examples to separate the quality information from immense storehouse. It incorporates various kinds of measurements, machine learning and arrangement of databases. The fundamental target is to isolate significant information from tremendous database and after those changes over the important substance into a meaningful substance for future research. Knowledge Discovery in Databases (KDD) generally incorporates data mining as its critical investigation step. Aside from the analysis,

# Chapter 2

# PROOF OF CONCEPT

- In recent years, most of the industries promoting their products supported the standard certification they received the products. The normal manner of assessing product quality is time overwhelming, but with the invention of machine learning techniques, the processes has become a lot of economical and consumed less time than before..

In a proposed system, is a step towards the quality prediction of the red wine using its various attributes. dataset is taken from the sources and the techniques such as random forest, support vector machine and naïve bayes are applied. Various measures are calculated and the results are compared among training set and testing set and accordingly the best out of the three techniques depending on the training set results is predicted.Better results can be observed if the best features out from other techniques are extracted and merged with one another to improve the accuracy and efficiency.

The red wine industry shows a recent exponential growth as social drinking is on the rise. Nowadays, industry players are using product quality certifications to promote their products.The red wine market would be of interest if the human quality of tasting can be related to wine's chemical properties so that certification and quality assessment and assurance processes are more controlled.

## 2.1 Objectives

- To apply different machine learning techniques over the large existing dataset, which is based on the risk factors.
- To predict whether the patient is likely to have stroke or not.
- To provide a personalized warning based on stroke risk.
- To provide lifestyle correction message about the stroke risk factors.

# Chapter 3

# IMPLEMENTATION

Wine Quality Prediction using Machine Learning is a web based application.The basic concept of this work is to use machine learning techniques to effectively prediction of wine quality . Here we use HTML and CSS to describe the structure of application and the presentation of Web pages, including colors, layout, and fonts respectively.The model is trained using dataset taken from kaggle which represents the quality of wine from 3 to 8. The project uses Visual Studio Code to develop the front end of application. The backend is python and server used is python flask and is developed in Jupyter Notebook.Flask is a micro web framework written in python. Flask depends on the Jinja template engine and the Werkzeug WSGI toolkit.

## 3.1 Architecture

The architecture diagram for the whole application is given in figure 3.1

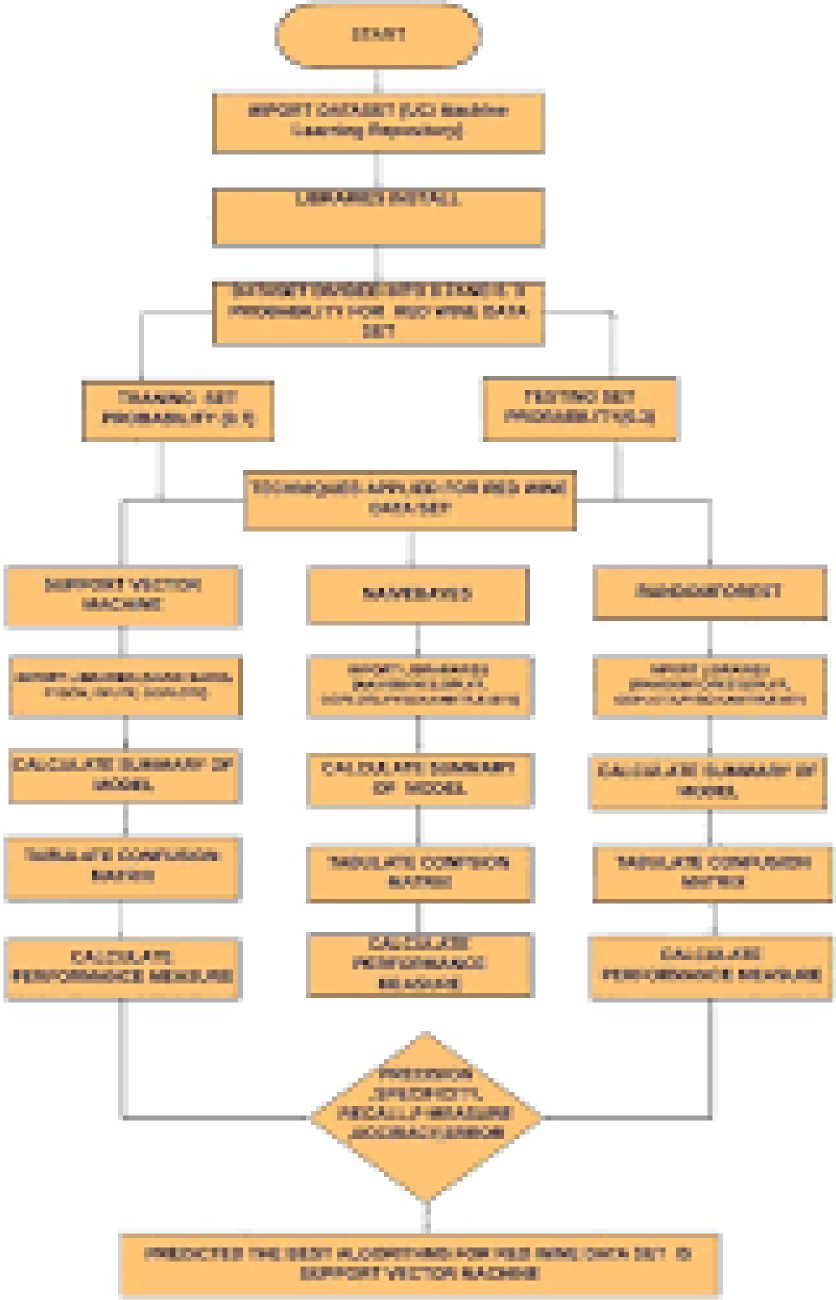

START
IMPORT DATASET (UCI Machine Learning Repository)
LIBRARIES INSTALL
DATASET DIVIDED INTO 2 PARTS PROBABILITY FOR RED WINE DATA SET
TRAINING SET PROBABILITY (0.8)
TESTING SET PROBABILITY(0.2)
TECHNIQUES APPLIED FOR RED WINE DATA SET
SUPPORT VECTOR MACHINE
NAIVEBAYES
RANDOMFOREST
IMPORT LIBRARIES
IMPORT LIBRARIES
IMPORT LIBRARIES
CALCULATE SUMMARY OF MODEL
CALCULATE SUMMARY OF MODEL
CALCULATE SUMMARY OF MODEL
TABULATE CONFUSION MATRIX
TABULATE CONFUSION MATRIX
TABULATE CONFUSION MATRIX
CALCULATE PERFORMANCE MEASURE
CALCULATE PERFORMANCE MEASURE
CALCULATE PERFORMANCE MEASURE
PRECISION ,SPECIFICITY, RECALL,F-MEASURE ,ACCURACY,ERROR
PREDICTED THE BEST ALGORITHMS FOR RED WINE DATA SET IS SUPPORT VECTOR MACHINE

Figure 3.1 : Architecture Diagram

## 3.2 Dataset

Here we used the Red Wine Quality dataset that is available in the kaggle website for our analysis. This dataset consists of total 12 attributes. The complete description of the attributes used in the proposed work is given below:

- fixed acidity : Non-volatile acids that don't evaporate easily.
- volatile acidity : acetic acid content which leading to an unpleasant vinegar taste
- citric acid : acts as a preservative to increase acidity
- residual sugar : amount of sugar remains after fermentation stops
- chlorides : Amount of salt
- free sulfur dioxide : It prevent microbial growth and the oxidation of wine
- total sulfur dioxide : Amount of SO2(Sulphur Dioxide)
- density : Sweeter wines have a higher density
- pH : Level of acidity

- sulphates : A wine addictive that contributes to SO2 levels and acts as an antimicrobial and antioxident

- alcohol : Amount of alocohol in wine

Output variable (based on sensory data)

- quality (score between 3 and 8)

## 3.3 Algorithms

### 3.3.1 Naive Bayes Algorithm

Naïve Bayes algorithm is a supervised learning algorithm, which is based on Bayes theorem and used for solving classification problems.Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions.It is a probabilistic classifier, which means it predicts on the basis of the probability of an object.

### 3.3.2 Support Vector Machine

This technique was taken from factual learning theory by Vapnik and Chervonenkis.This technique is utilized for the characterization of both nonlinear and linear information. It utilizes a nonlinear mapping to change the primary preparing information into a higher estimation. It scans for the linear optimal isolating hyperplane in this new estimation.A hyperplane can isolate information from two classes, with a reasonable nonlinear mapping to adequately high estimation.The SVM uses support vectors and edges to find this hyperplane. SVM can play out a nonlinear type of classification.

### 3.3.3 Random Forest

Random Forest algorithms are used for classification as well as regression. It creates a tree for the data and makes prediction based on that. Random Forest algorithm can be used on large datasets and can produce the same result even when large sets record values are missing. In random forest there are two stages, firstly create a random forest then make a prediction using a random forest classifier created in the first stage.

## 3.4 Modules

There are four modules in the prediction model of the application Stroke Prediction. They are User Module, Data preparation module, model creation module and Stroke Prediction module

### 3.4.1 User Module

A form is provided in the website which need to be filled in by the user. It consists of 11 attributes whose answers goes in as inputs like fixed acidity,volatile acidity,citric acid,residual sugar,chlorides,free sulfur dioxide ,total sulfur dioxide ,density , pH,sulphates and alcohol . Users enter the information into the application through User interface

### 3.4.2 Data Preparation Module

The data preparation model actually takes place during the training phase of the model where the data needs to be cleaned and preprocessed before using it for training the model.

### 3.4.3 Model creation module

In this module, the data is split into training and test data, where the training data consists of 70 percentage of data in dataset and the testing data gets the remaining. The training dataset is used to train the model i.e. it is fed into various algorithms to create 3 individual models. These are tested using the test dataset and the accuracy is calculated for each model. The techniques such as Random Forest, Support Vector Machine and Naïve Bayes are applied. Various measures are calculated and the results are compared among training set and testing set and accordingly the best out of the three techniques depending on the training set results is predicted

### 3.4.4 Quality Prediction Module

A python file is created to store the model i.e. the 3 models Naive Bayes,Support Vector Machiene and Random Forest. After the prediction of output from the three models i.e.Naive Bayes, Support Vector Machiene and Random Forest which have highest accuracy . The output is printed at the prediction page of web application.

# Chapter 4

# RESULT ANALYSIS

The application was successfully completed in time. This handy web app can easily predict with the help of data entered by the user, whether its a good quality or bad quality wine . The proposed work predicts quality of wine by exploring classification algorithms and does performance analysis. The user enters the input values. The data is fed into model which predicts the quality of wine.The output is printed at the prediction page of web application.

# Chapter 5

# CONCLUSION AND FUTURE SCOPE

## 5.1 Conclusion

Data mining nowadays is most important technique which is utilized for investigation of the archives. It looks at the information and produces the required yield. With the headway in the innovation it helps in playing the sound test in the market thus benefits the client. As a result of its property of investigating the information it is utilized in the examination to process diverse execution appraisals utilizing different calculations. .

## 5.2 Future Scope

In the future, to improve the accuracy of the classifier, it is clear that the algorithm or the data must be adjusted. We recommend feature engineering, using potential relationships between wine quality, or applying the boosting algorithm on the more accurate method

In addition, by applying the other performance measurement and other machine learning algorithms for the better comparison on results. This study will help the manufacturing industries to predict the quality of the different types of wines based on certain features, and also it will be helpful for them to make a good product.

# Chapter 6

# CODING

## 6.1 Training.ipynb

import pandas as pd

df = pd.read$_csv('Redwinedata.csv')$

$df.head(10)$

$df.shape$

$df.info()df.isnull().sum()$

$df.describe()$

$importmatplotlib.pyplotaspltimportseabornassnsimportseabornassimportnumpyasnp$

$sns.countplot(x =' quality', data = df)$

$fromsklearn.preprocessing$

$importStandardScaler, LabelEncoder$

$fromsklearn.model_selectionimporttrain_test_split$

$y = df.qualityx = df.drop('quality', axis = 1)$

$x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, random_state = 42)$

$frompandas.core.commonimportrandom_state$

$defmodels(x_train, y_train) :$

$supportvectormachienealgorithm(linearclassifier)$

$fromsklearn.svmimportSVC,LinearSVC$

$svc_lin = SVC(kernel =' linear', random_state = 0)$

$svc_lin.fit(x_train, y_train)$

$supportvectormachienealgorithm(RBFclasiifier)$

$fromsklearn.svmimportSVC$

$svc_rbf = SVC(kernel =' rbf', random_state = 0)$

$svc_rbf.fit(x_train, y_train)$

$naivebayesalgorithm$

$fromsklearn.naive_bayesimportGaussianNB$

$guass = GaussianNB()$

$guass.fit(x_train, y_train)$

$Randomforestalgorithm$

$fromsklearn.ensembleimportRandomForestClassifier$

$forest = RandomForestClassifier(n_estimators = 10, criterion ='$
$entropy', random_state = 0)$

$forest.fit(x_train, y_train)$

$print('[1]SupportvectormachienelinearclasifierTraining$
$accuracy', svc_lin.score(x_train, y_train))$

$print('[2]SupportvectormachieneRBFclasifierTraining$
$accuracy', svc_rbf.score(x_train, y_train))$

$print('[3]NaiveBayesGuassianclasifierTraining$
$accuracy', guass.score(x_train, y_train))$

$print('[4]RandomForestclasifierTraining$
$accuracy', forest.score(x_train, y_train))$

## 6.2 project.py

from flask import Flask, render$_{t}emplate,request$
$importpandasaspd$
$fromsklearn.metricsimportaccuracy_{s}core,confusion_{m}atrix$
$fromsklearn.model_{s}electionimporttrain_{t}est_{s}plit$
$fromsklearn.preprocessingimportStandardScaler$

app = Flask(name)

@app.route('/')
def la():
return render$_{t}emplate(”admin/home.html”)$

@app.route('/loaddataset')
def loaddataset():
import pandas as pd
df = pd.read$_{c}sv(”C: projectWinequality-red.csv”)$
$x = df.values[:]$
$returnrender_{t}emplate(”admin/loaddataset.html”,x = x)$
$@app.route('/machinelearningalgoaccuracy')$
$defmachinelearningalgoaccuracy():$
$importpandasaspd$
$df = pd.read_{c}sv(”C: -project-winequality-red.csv”)$
$y = df.quality$
$x = df.drop('quality',axis = 1)$
$x_{t}rain,x_{t}est,y_{t}rain,y_{t}est = train_{t}est_{s}plit(x,y,test_{s}ize = 0.2,random_{s}tate = 42)$
$sc = StandardScaler()$
$x_{t}rain = sc.fit_{t}ransform(x_{t}rain)$
$x_{t}est = sc.transform(x_{t}est)$
$frompandas.core.commonimportrandom_{s}tate$

$fromsklearn.svmimportSVC,LinearSVC$

$svc_lin=SVC(kernel='linear',random_state=0)$

$svc_lin.fit(x_train,y_train)$

$pred1=svc_lin.predict(x_test)$

$acc1=accuracy_score(pred1,y_test)$

$c1=confusion_matrix(pred1,y_test)$

support vector machiene algorithm(RBF clasiifier)

from sklearn.svm import SVC

svc$_rbf=SVC(kernel='rbf',random_state=0)$

$svc_rbf.fit(x_train,y_train)$

$pred2=svc_rbf.predict(x_test)$

$acc2=accuracy_score(pred2,y_test)$

$c2=confusion_matrix(pred2,y_test)$

$naivebayesalgorithm$

$fromsklearn.naive_bayesimportGaussianNB$

$guass=GaussianNB()$

$guass.fit(x_train,y_train)$

$pred3=guass.predict(x_test)$

$acc3=accuracy_score(pred3,y_test)$

$c3=confusion_matrix(pred3,y_test)$

$Randomforestalgorithm$

$fromsklearn.ensembleimportRandomForestClassifier$

$forest=RandomForestClassifier(n_estimators=10,criterion='$

$entropy',random_state=0)$

$forest.fit(x_train,y_train)$

$pred4=forest.predict(x_test)$

$acc4=accuracy_score(pred4,y_test)$

$c4=confusion_matrix(pred4,y_test)$

$returnrender_template(”admin/algorithmaccuracies.html”,svcscore=$

$acc1,svcrpf=acc2,gauss=acc3,rf=acc4,c1=c1,c2=c2,c3=c3,c4=c4)$

```
@app.route('/user-datamining')
def user-datamining():
import pandas
spath="C:project" str = "C:project-winequality-red.csv"
pd = pandas.read-csv(str)
import numpy
import numpy
import seaborn
col = ["volatile acidity","citric acid","residual sugar","chlorides","free sulfur
dioxide","total sulfur dioxide","density","pH","sulphates","alcohol", "quality"]
correlation = numpy.corrcoef(pd[col].values.T)
seaborn.set(font-scale=0.5)
heatmap = seaborn.heatmap(correlation, cbar=True, annot=True, square=True,
yticklabels=col, xticklabels=col)
heatmap.get-figure().savefig(spath+"correlation.jpg", dpi=200)

c = pd.plot(x='volatile acidity', y='quality', style='o')

return render-template("admin/datamining.html",col=col)
@app.route('/predictionload')
def predictionload():
return render$_t emplate('admin/Form.html', pred4 = -1)$

@app.route('/predictionloadpost',methods=['post'])
def predictionloadpost():
f0=float(request.form["0"])
f1=float(request.form["1"])
f2=float(request.form["2"])
f3=float(request.form["3"])
```

f4=float(request.form[”4”])
f5=float(request.form[”5”])
f6=float(request.form[”6”])
f7=float(request.form[”7”])
f8=float(request.form[”8”])
f9=float(request.form[”9”])
f10=float(request.form[”10”])

test=[[f0,f1,f2,f3,f4,f5,f6,f7,f8,f9,f10]]

import pandas as pd
df = pd.read$_{c}sv(”C : project - -red.csv”)$
$y = df.quality$
$x = df.drop(^{\prime}quality^{\prime}, axis = 1)$

x$_{t}rain, x_{t}est, y_{t}rain, y_{t}est = train_{t}est_{s}plit(x, y, test_{s}ize = 0.2, random_{s}tate = 42)$
$sc = StandardScaler()$
$x_{t}rain = sc.fit_{t}ransform(x_{t}rain)$
$fromsklearn.svmimportSVC, LinearSVCsvclin = SVC(kernel =^{\prime}$
$linear^{\prime}, random_{s}tate = 0)$
$svclin.fit(xtrain, ytrain)$
$pred1 = svc_{l}in.predict(test)$

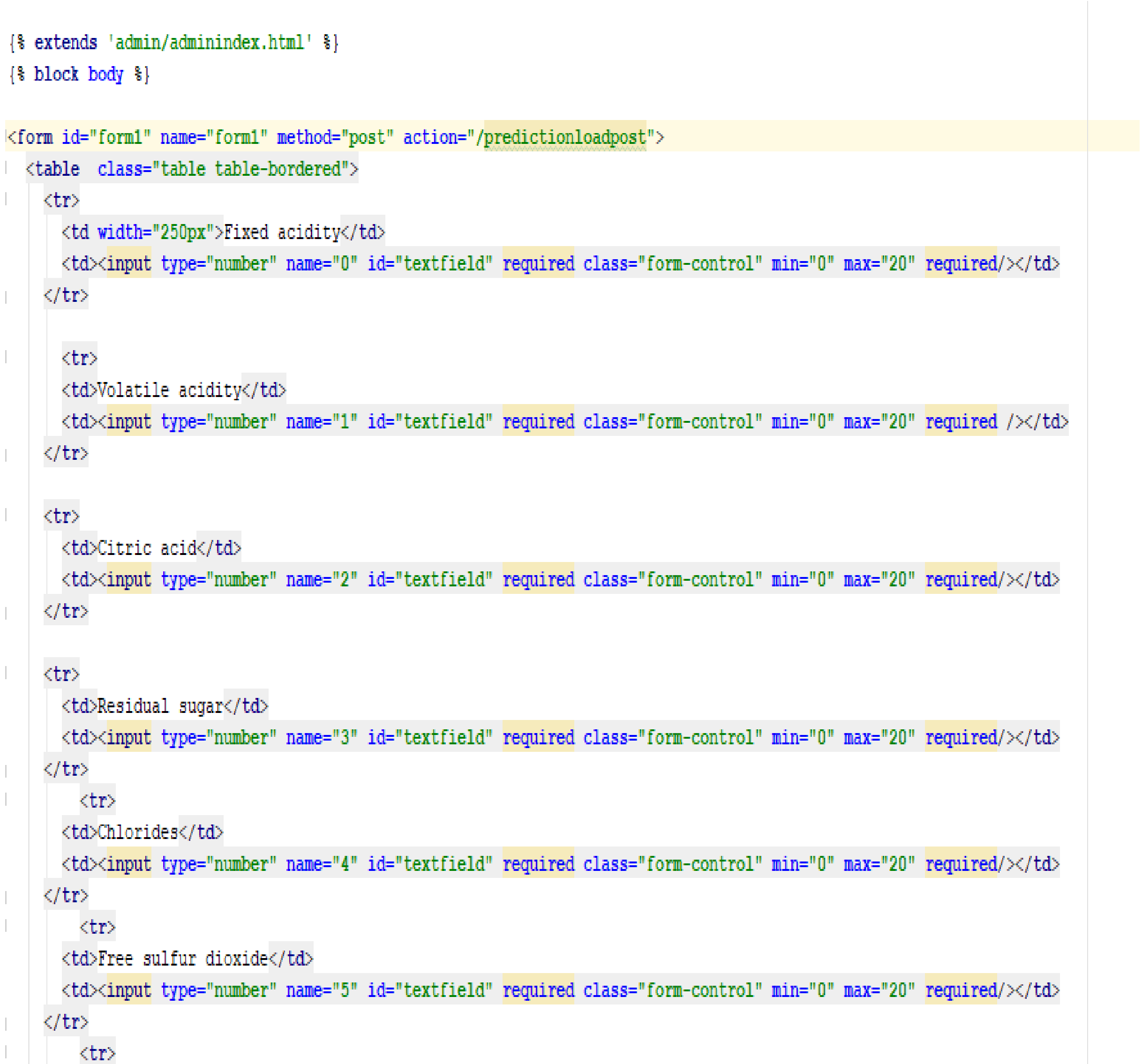
support vector machiene algorithm(RBF clasiifier)
from sklearn.svm import SVC
svcrbf = SVC(kernel=’rbf’, random$_{s}tate = 0)$
$svcrbf.fit(x_{t}rain, y_{t}rain)$
$pred2 = svcrbf.predict(test)$

naive bayes algorithm

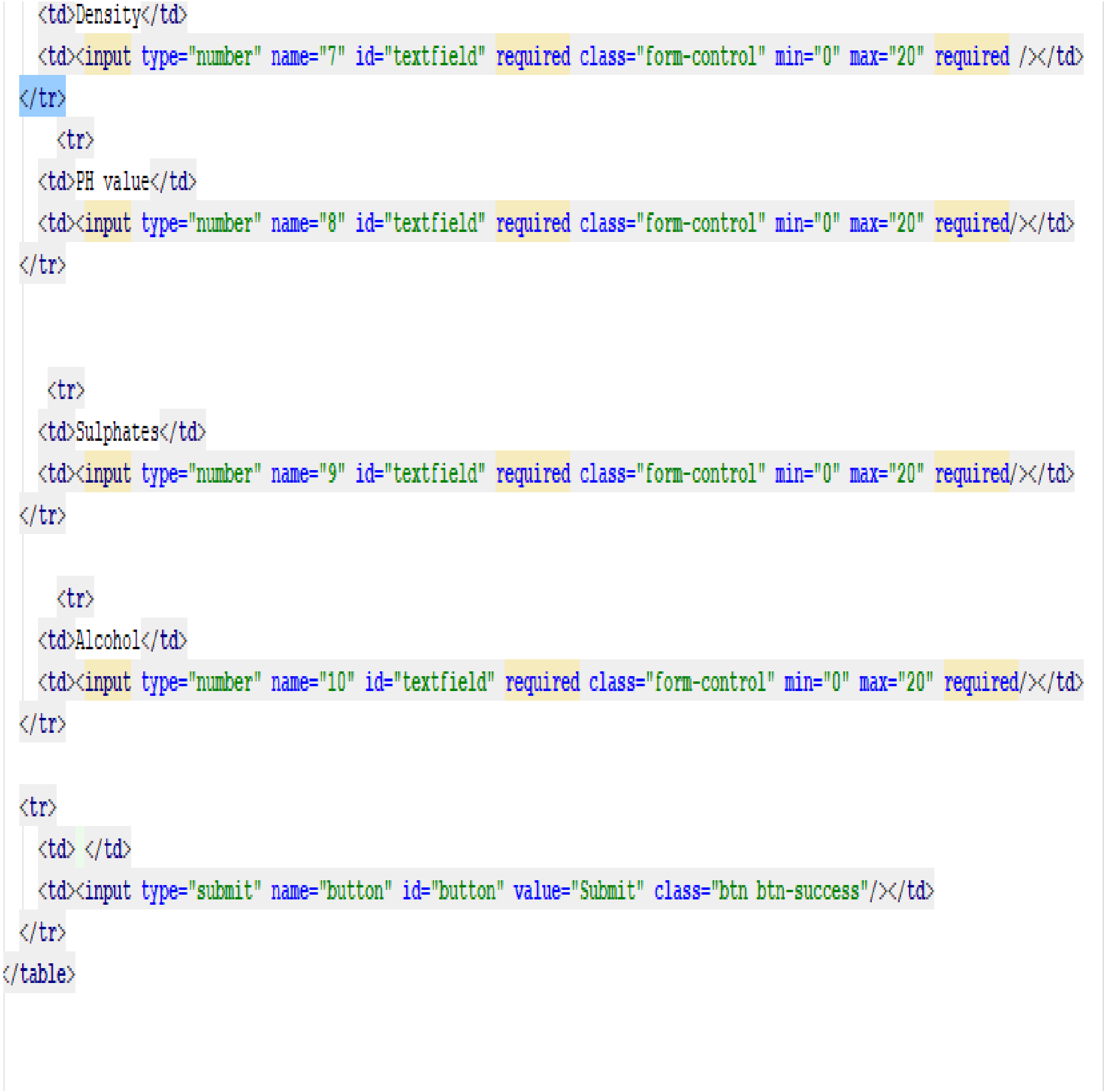
from sklearn.naivebayes import GaussianNB  
guass = GaussianNB()  
guass.fit(xtrain, ytrain)  
pred3 = guass.predict(test)  
Random forest algorithm  
from sklearn.ensemble import RandomForestClassifier forest =  
RandomForestClassifier(nestimators=10, criterion=’entropy’, randomstate=0)  
forest.fit(xtrain, ytrain)  
pred4 = forest.predict(test)  
return render$_template('admin/Form.html', pred1 = pred1[0], pred2 =$  
$pred2[0], pred3 = pred3[0], pred4 = pred4[0])$

if name == main  
app.run(threaded=False)

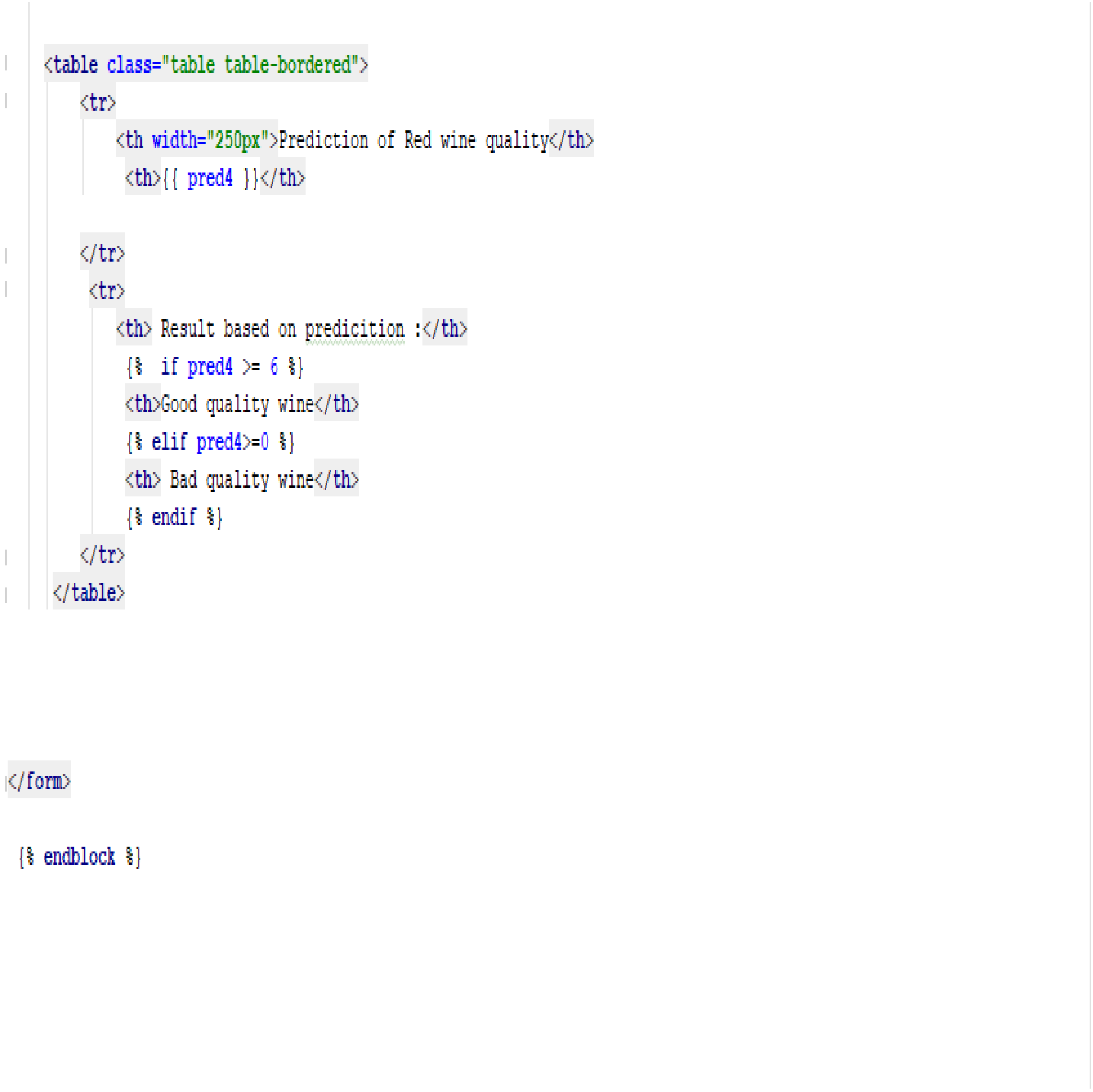
## 6.3 form.html



```
{% extends 'admin/adminindex.html' %}
{% block body %}

<form id="form1" name="form1" method="post" action="/predictionloadpost">
  <table  class="table table-bordered">
    <tr>
      <td width="250px">Fixed acidity</td>
      <td><input type="number" name="0" id="textfield" required class="form-control" min="0" max="20" required/></td>
    </tr>

      <tr>
      <td>Volatile acidity</td>
      <td><input type="number" name="1" id="textfield" required class="form-control" min="0" max="20" required /></td>
    </tr>

    <tr>
      <td>Citric acid</td>
      <td><input type="number" name="2" id="textfield" required class="form-control" min="0" max="20" required/></td>
    </tr>

    <tr>
      <td>Residual sugar</td>
      <td><input type="number" name="3" id="textfield" required class="form-control" min="0" max="20" required/></td>
    </tr>
        <tr>
      <td>Chlorides</td>
      <td><input type="number" name="4" id="textfield" required class="form-control" min="0" max="20" required/></td>
    </tr>
        <tr>
      <td>Free sulfur dioxide</td>
      <td><input type="number" name="5" id="textfield" required class="form-control" min="0" max="20" required/></td>
    </tr>
        <tr>
```

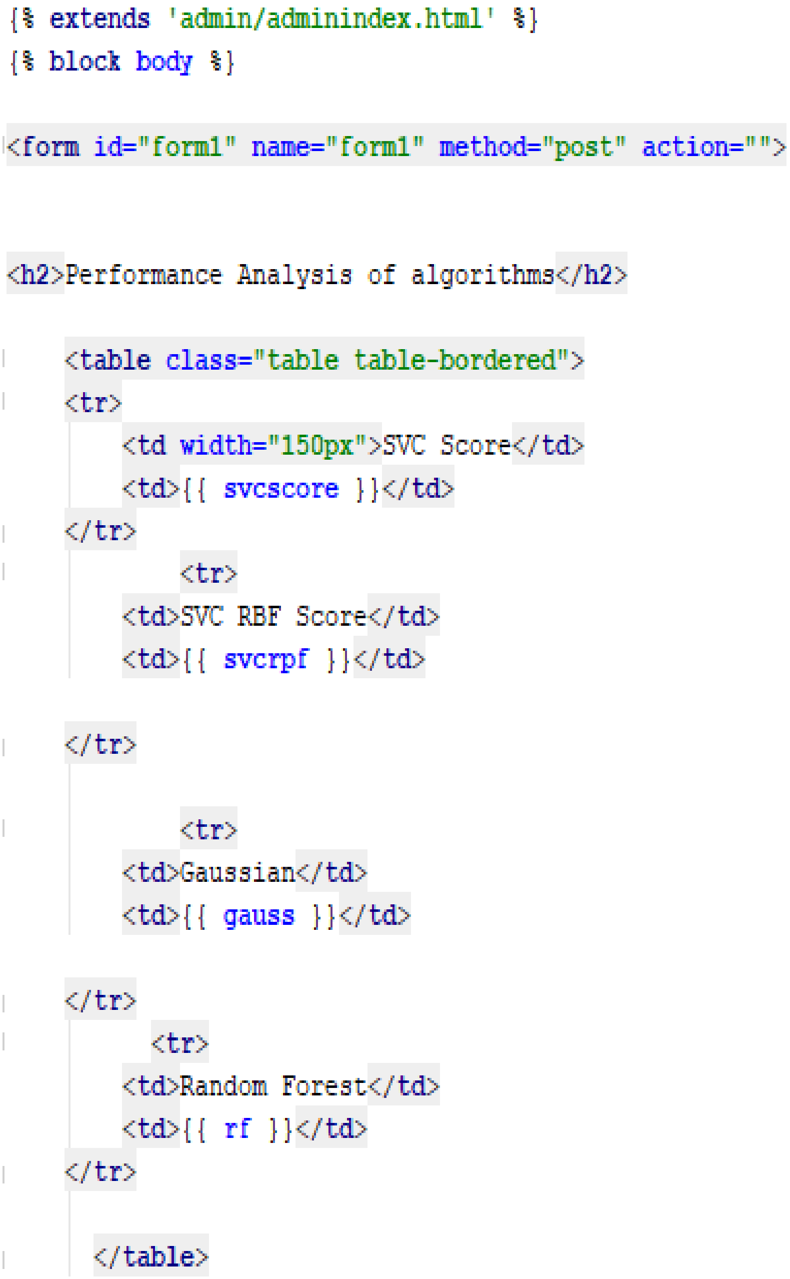


```
  <td>Density</td>
  <td><input type="number" name="7" id="textfield" required class="form-control" min="0" max="20" required /></td>
</tr>
    <tr>
  <td>PH value</td>
  <td><input type="number" name="8" id="textfield" required class="form-control" min="0" max="20" required/></td>
</tr>



   <tr>
  <td>Sulphates</td>
  <td><input type="number" name="9" id="textfield" required class="form-control" min="0" max="20" required/></td>
</tr>

    <tr>
  <td>Alcohol</td>
  <td><input type="number" name="10" id="textfield" required class="form-control" min="0" max="20" required/></td>
</tr>

<tr>
  <td> </td>
  <td><input type="submit" name="button" id="button" value="Submit" class="btn btn-success"/></td>
</tr>
</table>
```

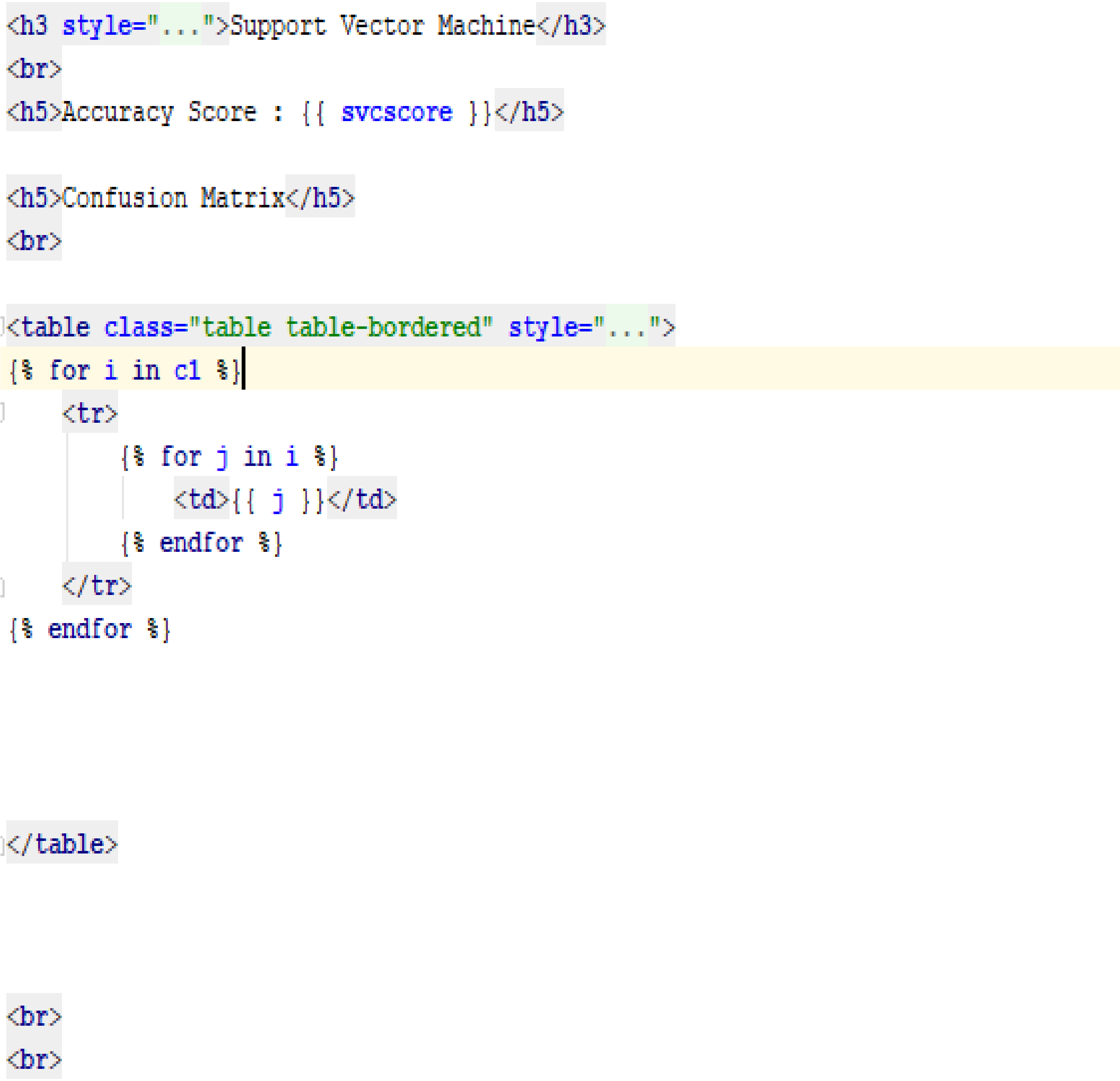


```
<table class="table table-bordered">
    <tr>
        <th width="250px">Prediction of Red wine quality</th>
         <th>{{ pred4 }}</th>

    </tr>
     <tr>
        <th> Result based on predicition :</th>
         {%  if pred4 >= 6 %}
         <th>Good quality wine</th>
         {% elif pred4>=0 %}
         <th> Bad quality wine</th>
         {% endif %}
    </tr>
  </table>



</form>

 {% endblock %}
```

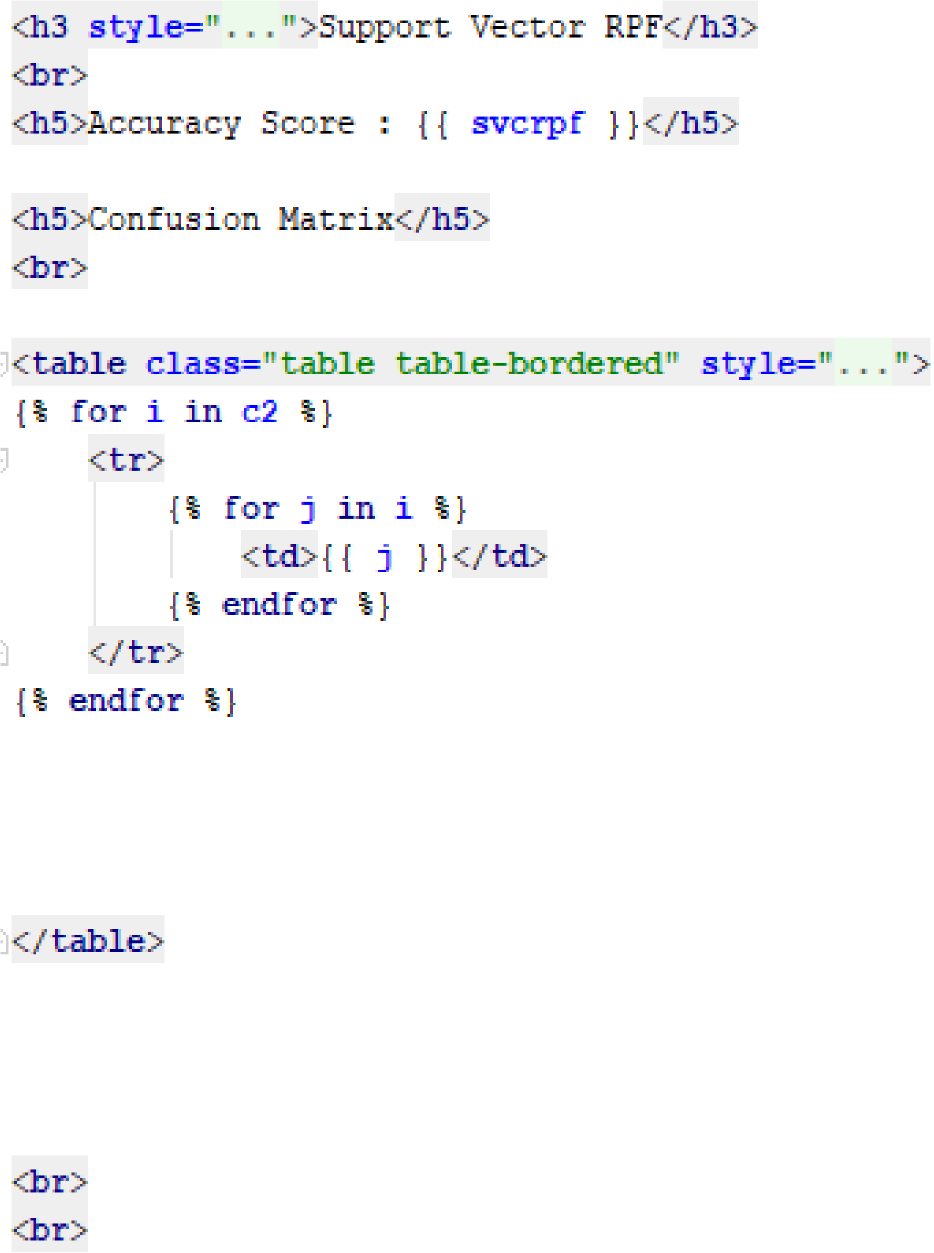
## 6.4 algorithmaccuracies.html



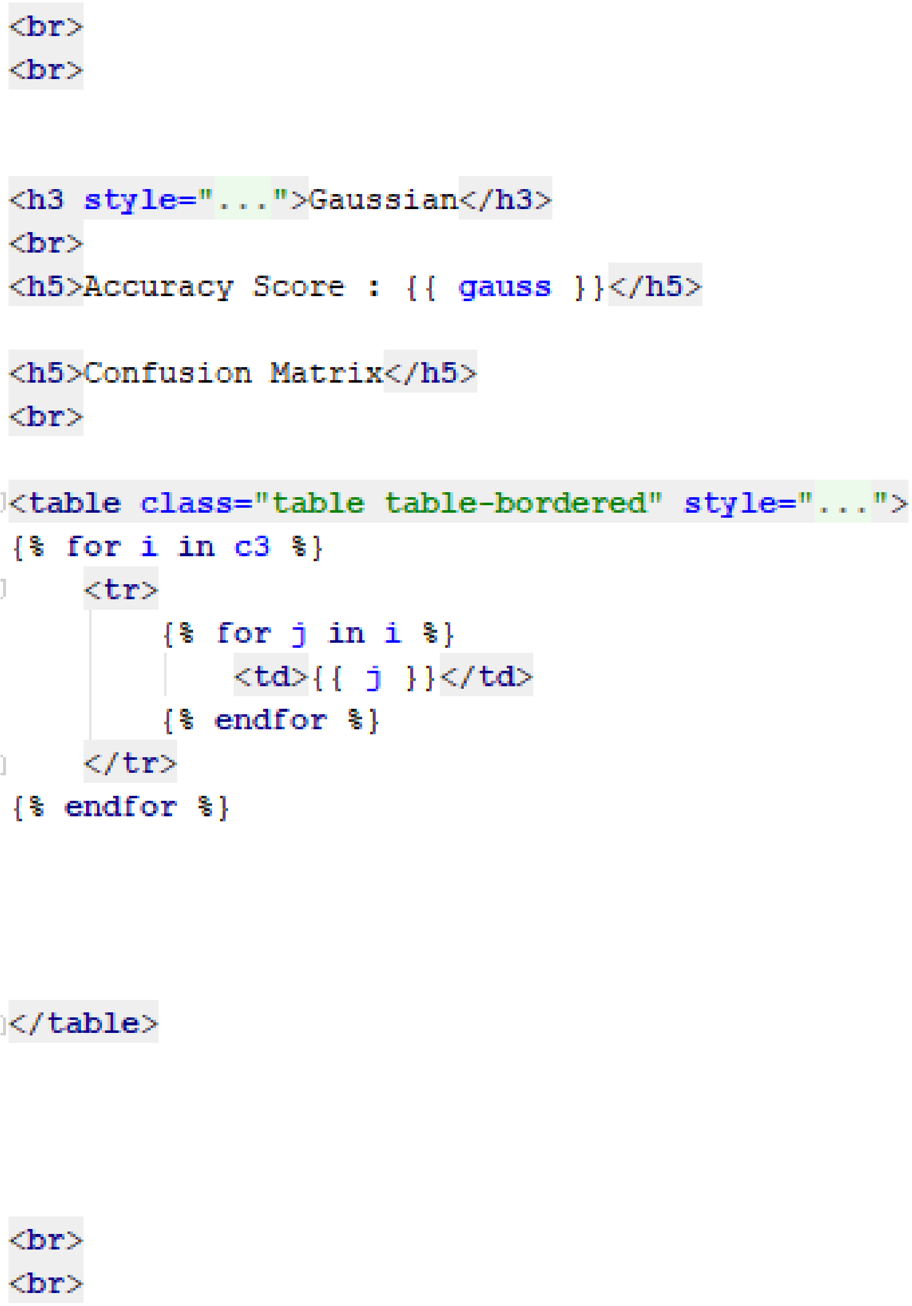
```
{% extends 'admin/adminindex.html' %}
{% block body %}

<form id="form1" name="form1" method="post" action="">


<h2>Performance Analysis of algorithms</h2>

    <table class="table table-bordered">
    <tr>
        <td width="150px">SVC Score</td>
        <td>{{ svcscore }}</td>
    </tr>
            <tr>
        <td>SVC RBF Score</td>
        <td>{{ svcrpf }}</td>

    </tr>

            <tr>
        <td>Gaussian</td>
        <td>{{ gauss }}</td>

    </tr>
          <tr>
        <td>Random Forest</td>
        <td>{{ rf }}</td>
    </tr>

      </table>
```



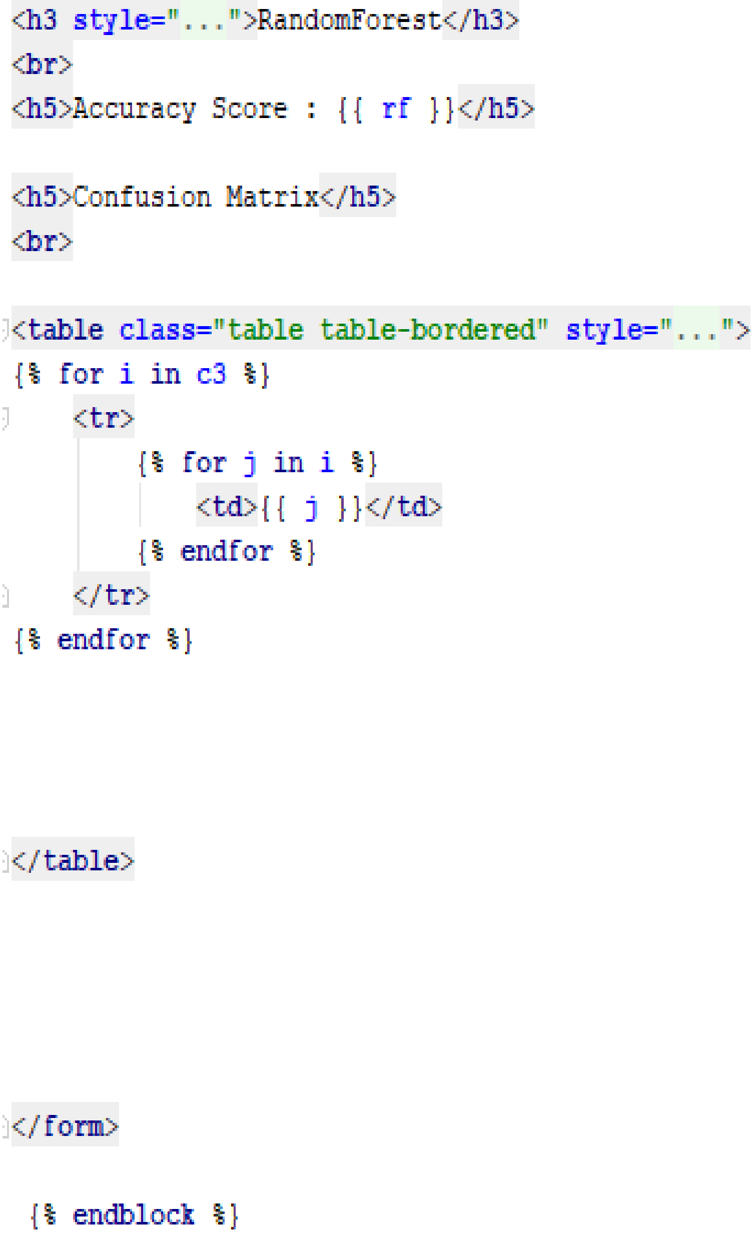
```
<h3 style="...">Support Vector Machine</h3>
<br>
<h5>Accuracy Score : {{ svcscore }}</h5>

<h5>Confusion Matrix</h5>
<br>

<table class="table table-bordered" style="...">
{% for i in c1 %}
    <tr>
        {% for j in i %}
            <td>{{ j }}</td>
        {% endfor %}
    </tr>
{% endfor %}





</table>




<br>
<br>
```



```
<h3 style="...">Support Vector RPF</h3>
<br>
<h5>Accuracy Score : {{ svcrpf }}</h5>

<h5>Confusion Matrix</h5>
<br>

<table class="table table-bordered" style="...">
{% for i in c2 %}
    <tr>
        {% for j in i %}
            <td>{{ j }}</td>
        {% endfor %}
    </tr>
{% endfor %}





</table>





<br>
<br>
```



```
<br>
<br>


<h3 style="...">Gaussian</h3>
<br>
<h5>Accuracy Score : {{ gauss }}</h5>

<h5>Confusion Matrix</h5>
<br>

<table class="table table-bordered" style="...">
{% for i in c3 %}
    <tr>
        {% for j in i %}
            <td>{{ j }}</td>
        {% endfor %}
    </tr>
{% endfor %}




</table>




<br>
<br>
```



```
<h3 style="...">RandomForest</h3>
<br>
<h5>Accuracy Score : {{ rf }}</h5>

<h5>Confusion Matrix</h5>
<br>

<table class="table table-bordered" style="...">
{% for i in c3 %}
    <tr>
        {% for j in i %}
            <td>{{ j }}</td>
        {% endfor %}
    </tr>
{% endfor %}




</table>





</form>

 {% endblock %}
```

# Chapter 7

# SCREEN SHOTS

Here I add some sample screenshots of the proposed system which includes,

- Home Screen
- User Input Screen
- Generate Quality Screen

Figure 7.1: Home Screen

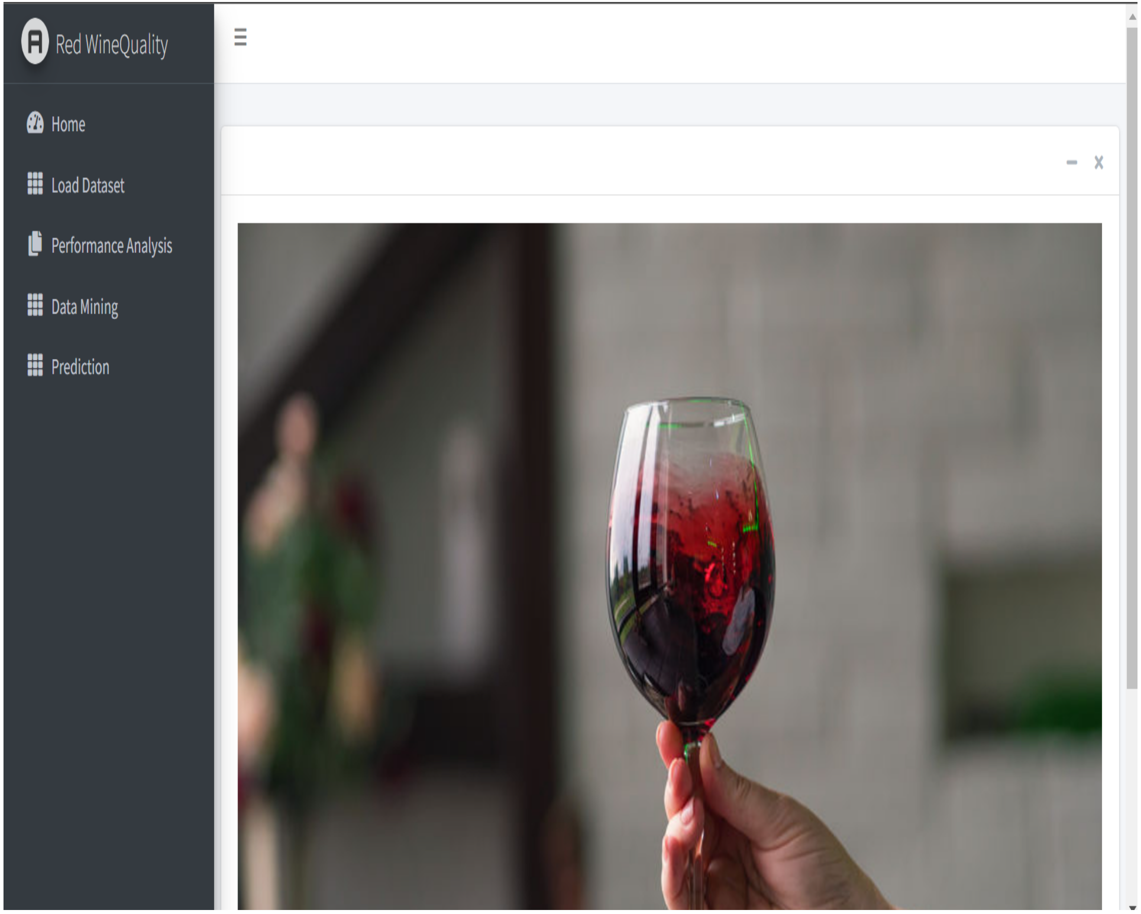
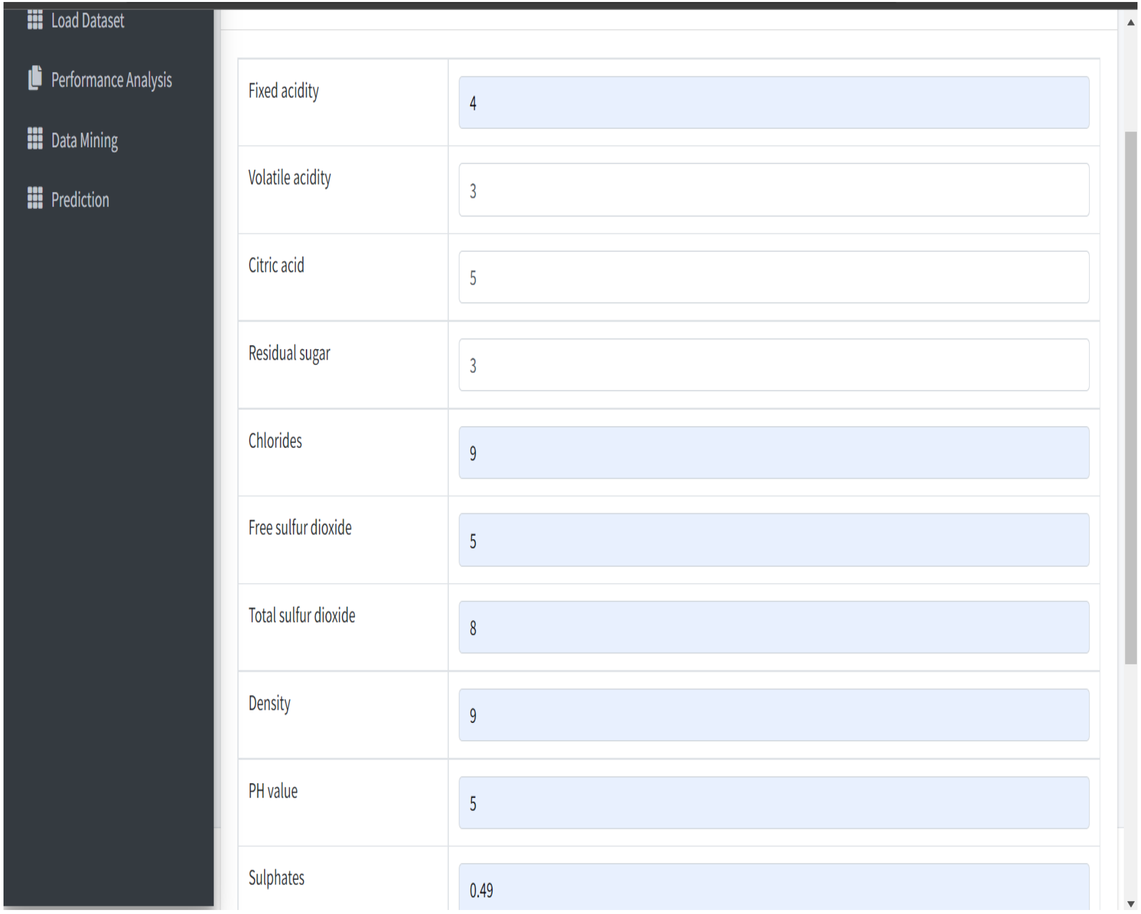
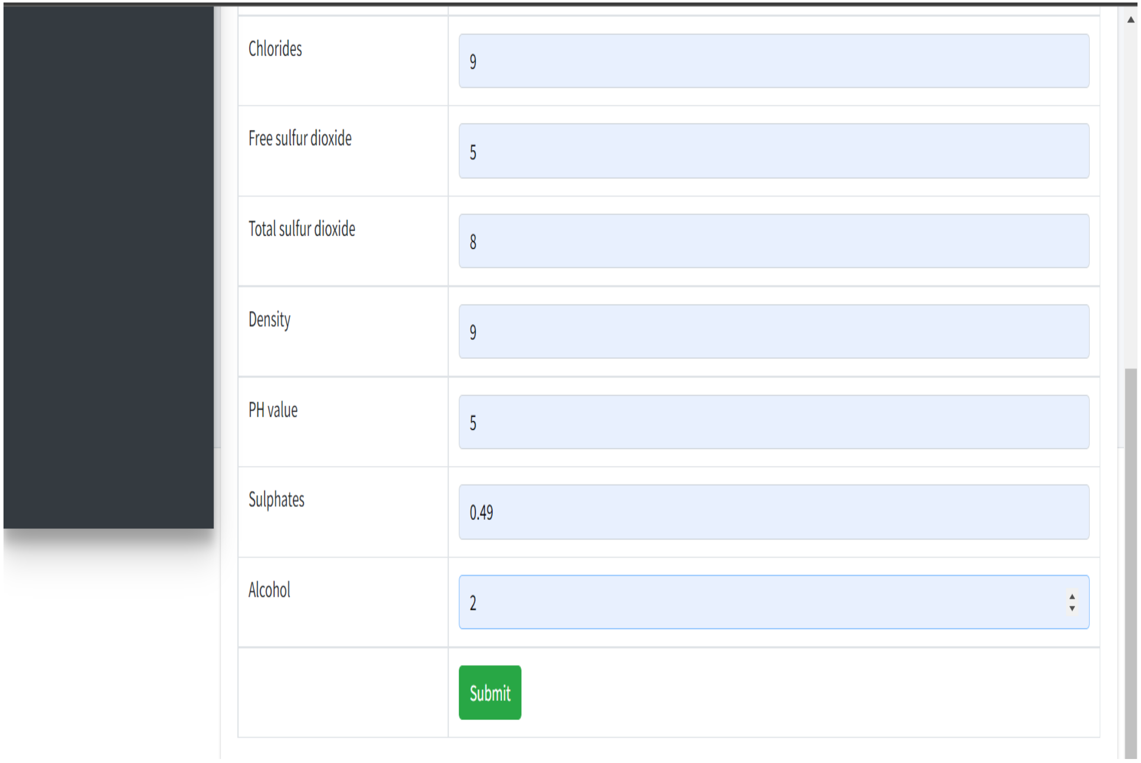


Figure 7.2: User Input Form



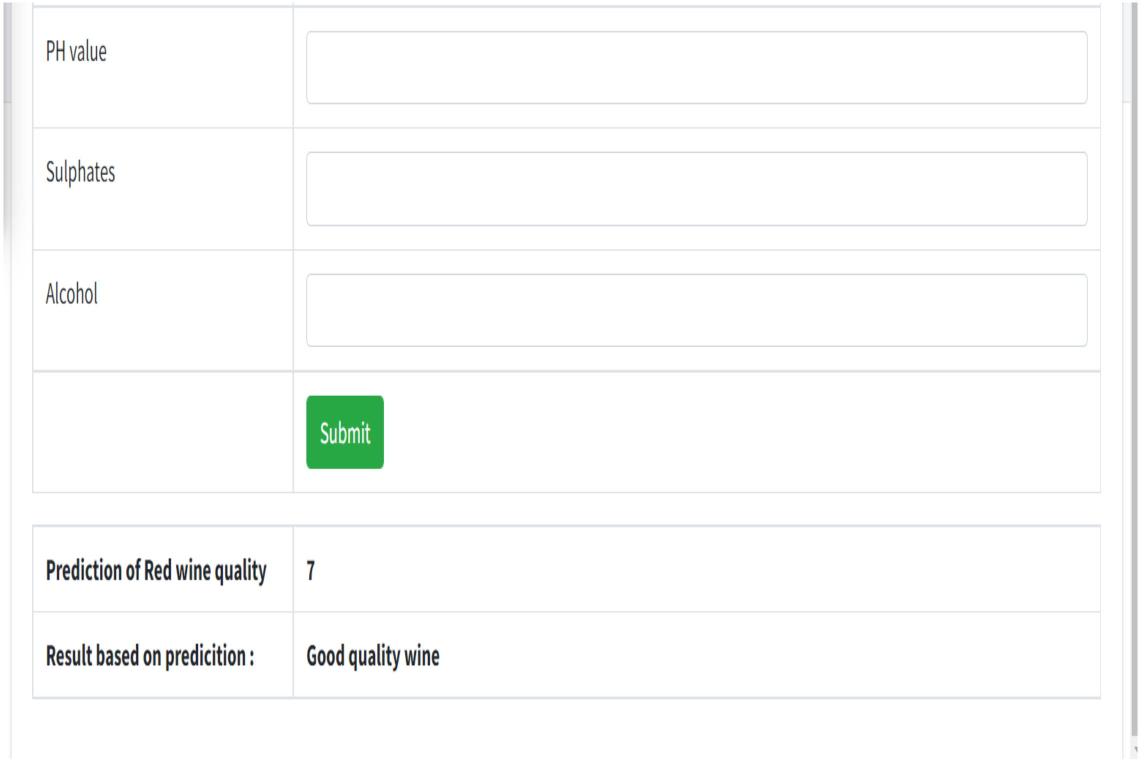
| | |
|---|---|
| Fixed acidity | 4 |
| Volatile acidity | 3 |
| Citric acid | 5 |
| Residual sugar | 3 |
| Chlorides | 9 |
| Free sulfur dioxide | 5 |
| Total sulfur dioxide | 8 |
| Density | 9 |
| PH value | 5 |
| Sulphates | 0.49 |

Figure 7.3: User Input Form



| | |
|---|---|
| Chlorides | 9 |
| Free sulfur dioxide | 5 |
| Total sulfur dioxide | 8 |
| Density | 9 |
| PH value | 5 |
| Sulphates | 0.49 |
| Alcohol | 2 |
| | Submit |

Figure 7.4: Final Report



| | |
|---|---|
| PH value | |
| Sulphates | |
| Alcohol | |
| | Submit |

| | |
|---|---|
| **Prediction of Red wine quality** | **7** |
| **Result based on predicition :** | **Good quality wine** |

# Chapter 8

# REFERENCES

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5. UCI Machine Learning Repository, Wine quality data set, [Online]. Available: https://archive.ics.uci.edu/ml/datasets/Wine+Quality
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