Data Glacier

Your Deep Learning Partner

VIRTUAL DATA INTERNSHIP

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DATE: 5Th of May 2024

SUBMITTED TO: DATA GLACIER

Introduction

This project aims at the deployment of a machine learning model for data that expresses the quality of wine using a Flask framework. The proposed workflow is shown in diagram 1.1 while the data information is showcased in table 1.1

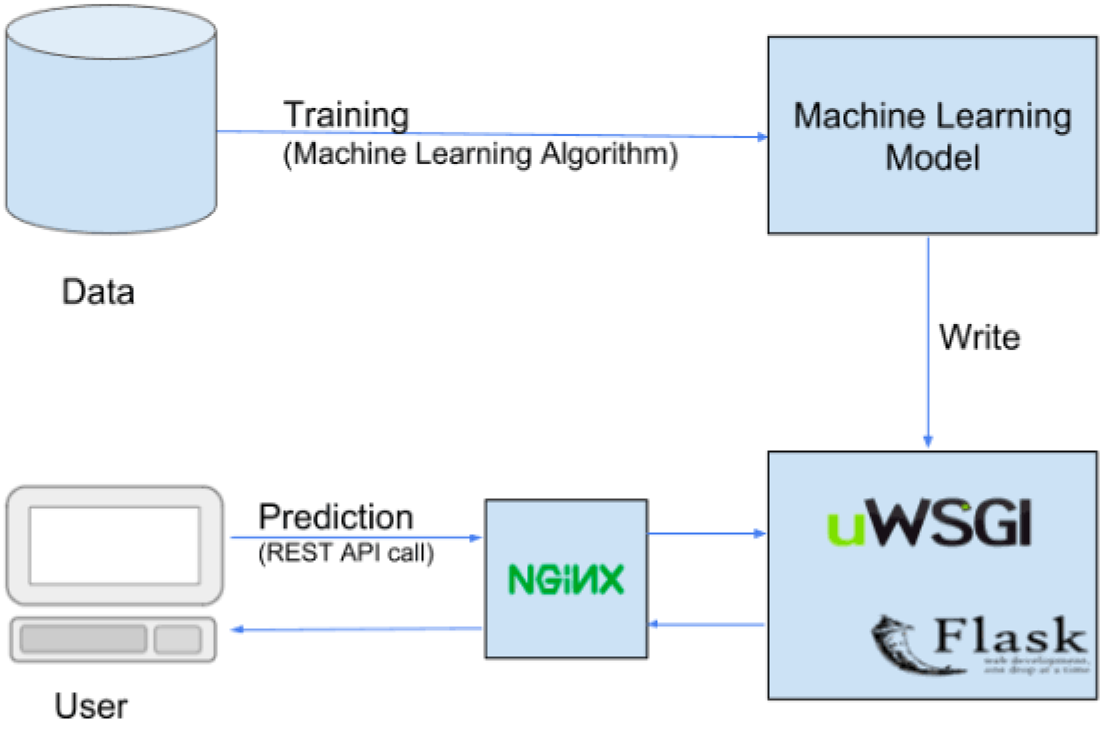


Diagram 1.1 Application Workflow

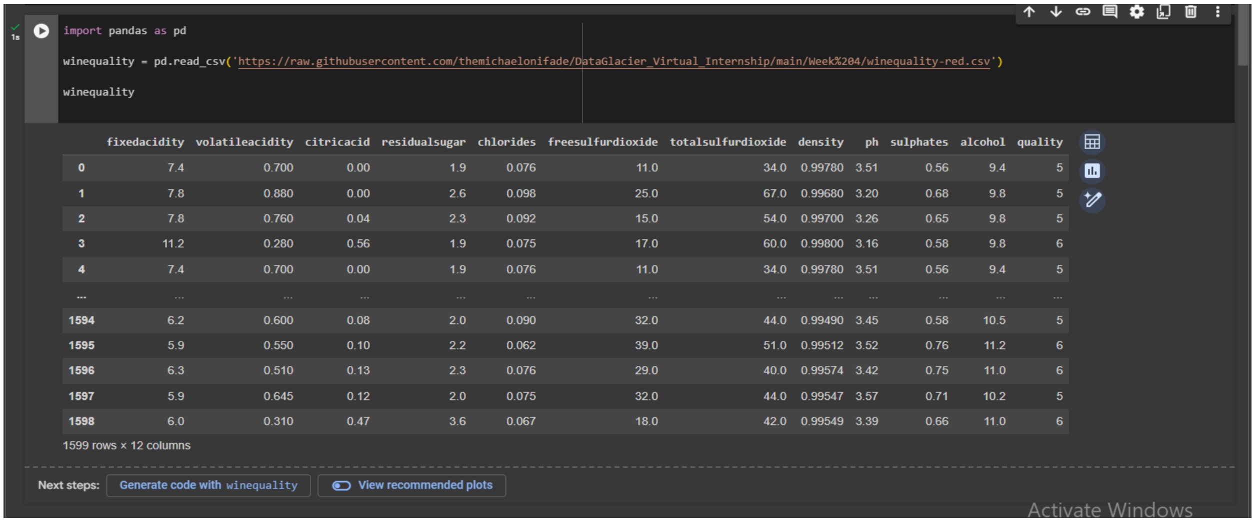
Table Data Details

Total number of observations	1599
Total number of files	1
Total number of features	12
Base format of the file	CSV
Size of the data	84KB

Table 1.1 Dataset Information

The process for the deployment is summarized as follows

1) Data import

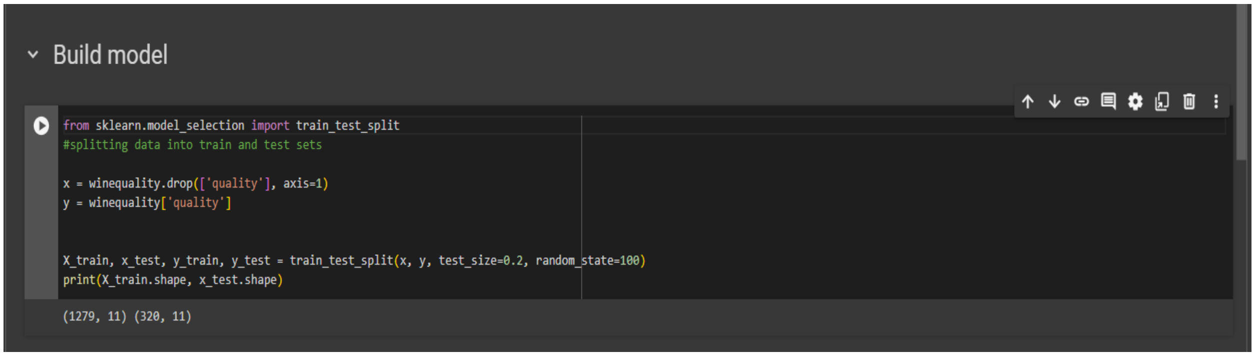


```
import pandas as pd

winequality = pd.read_csv('https://raw.githubusercontent.com/themichaelonifade/DataGlacier_Virtual_Internship/main/Week%204/winequality-red.csv')

winequality
```

	fixedacidity	volatileacidity	citricacid	residualsugar	chlorides	freesulfurdioxide	totalsulfurdioxide	density	ph	sulphates	alcohol	quality
0	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	5
1	7.8	0.880	0.00	2.6	0.098	25.0	67.0	0.99680	3.20	0.68	9.8	5
2	7.8	0.760	0.04	2.3	0.092	15.0	54.0	0.99700	3.26	0.65	9.8	5
3	11.2	0.280	0.56	1.9	0.075	17.0	60.0	0.99800	3.16	0.58	9.8	6
4	7.4	0.700	0.00	1.9	0.076	11.0	34.0	0.99780	3.51	0.56	9.4	5
...	...	...	...	...	...	...	...	...	...	...	...	...
1594	6.2	0.600	0.08	2.0	0.090	32.0	44.0	0.99490	3.45	0.58	10.5	5
1595	5.9	0.550	0.10	2.2	0.062	39.0	51.0	0.99512	3.52	0.76	11.2	6
1596	6.3	0.510	0.13	2.3	0.076	29.0	40.0	0.99574	3.42	0.75	11.0	6
1597	5.9	0.645	0.12	2.0	0.075	32.0	44.0	0.99547	3.57	0.71	10.2	5
1598	6.0	0.310	0.47	3.6	0.067	18.0	42.0	0.99549	3.39	0.66	11.0	6

1599 rows × 12 columns

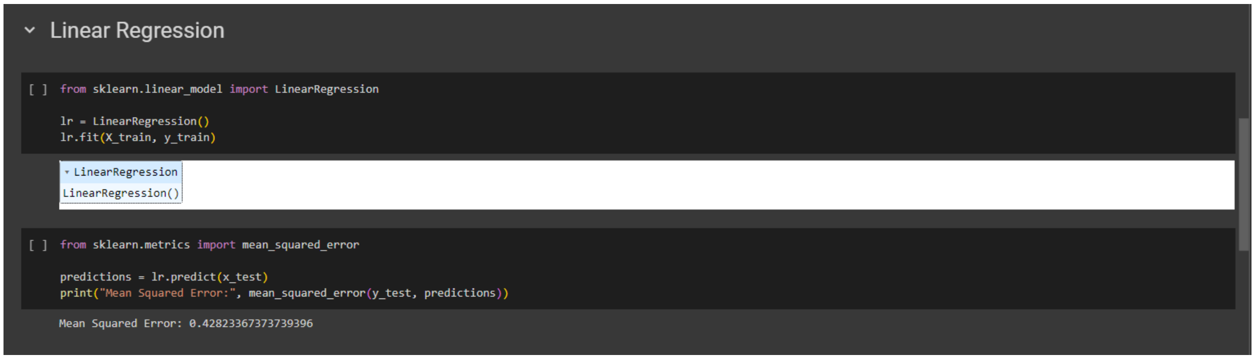
2) Model Building



Build model

```
from sklearn.model_selection import train_test_split
#splitting data into train and test sets

x = winequality.drop(['quality'], axis=1)
y = winequality['quality']


X_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=100)
print(X_train.shape, x_test.shape)
```

```
(1279, 11) (320, 11)
```



Linear Regression

```
from sklearn.linear_model import LinearRegression

lr = LinearRegression()
lr.fit(X_train, y_train)
```

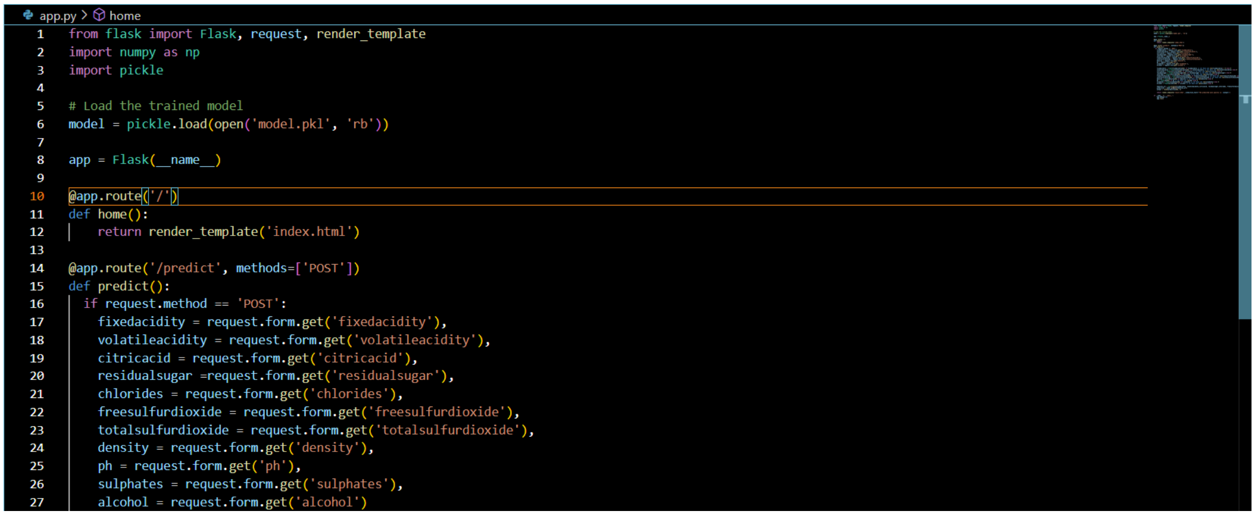
```
▾ LinearRegression
LinearRegression()
```

```
from sklearn.metrics import mean_squared_error

predictions = lr.predict(x_test)
print("Mean Squared Error:", mean_squared_error(y_test, predictions))
```

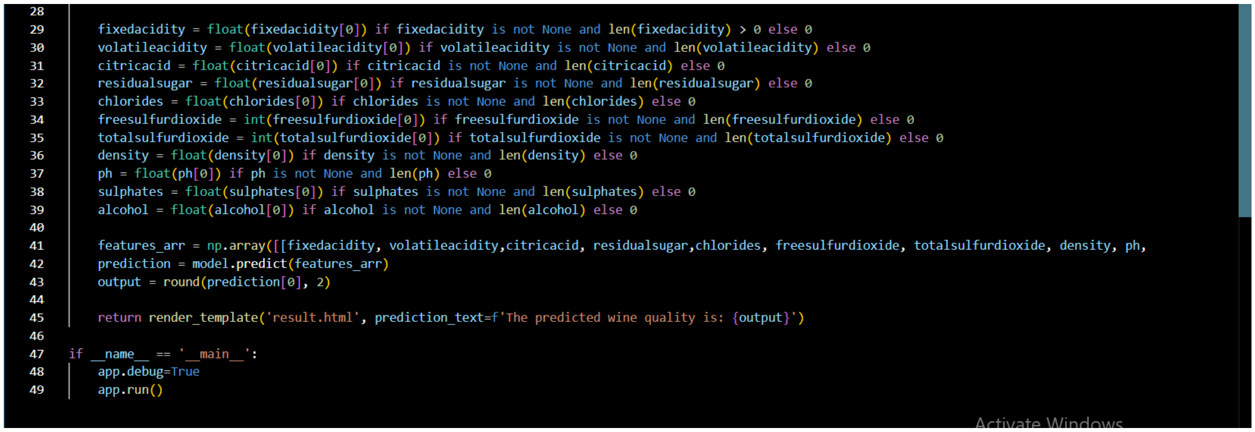
```
Mean Squared Error: 0.42823367373739396
```

3) Turning Model into web application using flask

App.py file

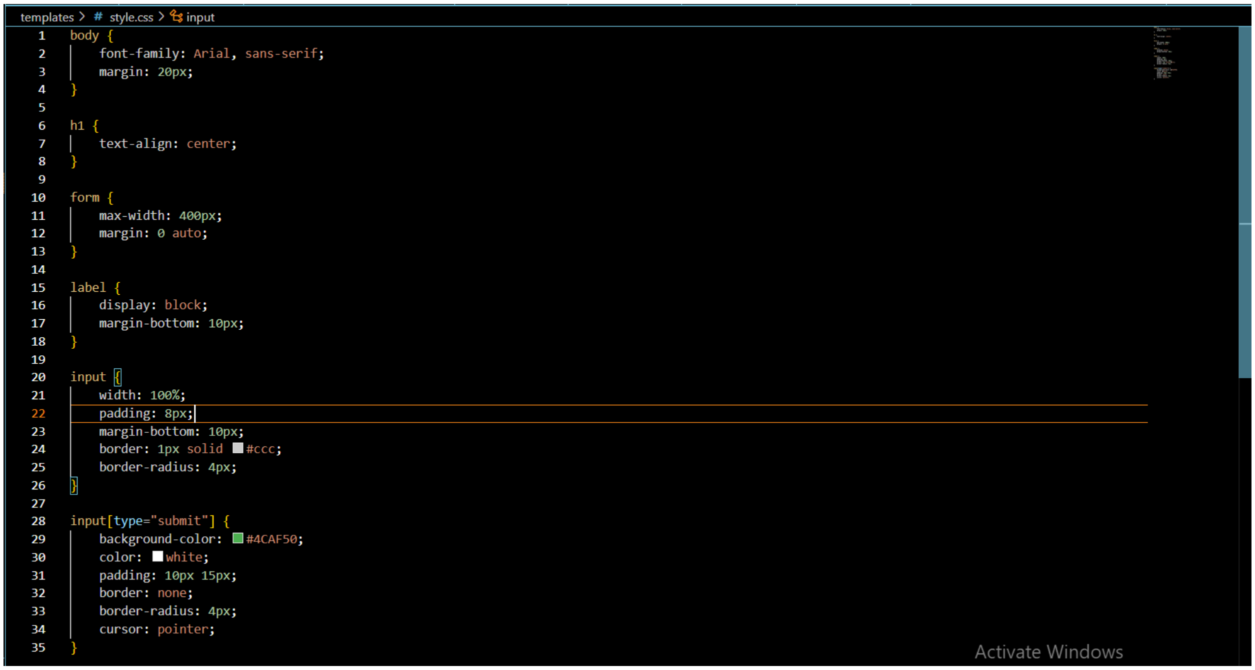


```python
from flask import Flask, request, render_template
import numpy as np
import pickle

# Load the trained model
model = pickle.load(open('model.pkl', 'rb'))

app = Flask(__name__)

@app.route('/')
def home():
    return render_template('index.html')

@app.route('/predict', methods=['POST'])
def predict():
  if request.method == 'POST':
    fixedacidity = request.form.get('fixedacidity'),
    volatileacidity = request.form.get('volatileacidity'),
    citricacid = request.form.get('citricacid'),
    residualsugar =request.form.get('residualsugar'),
    chlorides = request.form.get('chlorides'),
    freesulfurdioxide = request.form.get('freesulfurdioxide'),
    totalsulfurdioxide = request.form.get('totalsulfurdioxide'),
    density = request.form.get('density'),
    ph = request.form.get('ph'),
    sulphates = request.form.get('sulphates'),
    alcohol = request.form.get('alcohol')
```



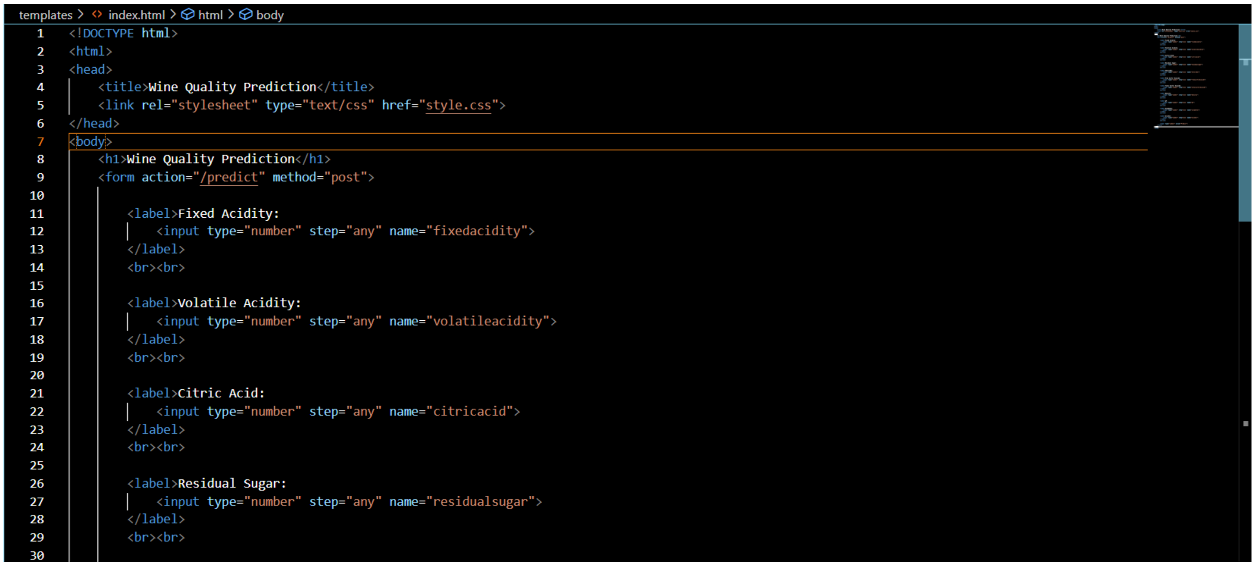
```python

    fixedacidity = float(fixedacidity[0]) if fixedacidity is not None and len(fixedacidity) > 0 else 0
    volatileacidity = float(volatileacidity[0]) if volatileacidity is not None and len(volatileacidity) else 0
    citricacid = float(citricacid[0]) if citricacid is not None and len(citricacid) else 0
    residualsugar = float(residualsugar[0]) if residualsugar is not None and len(residualsugar) else 0
    chlorides = float(chlorides[0]) if chlorides is not None and len(chlorides) else 0
    freesulfurdioxide = int(freesulfurdioxide[0]) if freesulfurdioxide is not None and len(freesulfurdioxide) else 0
    totalsulfurdioxide = int(totalsulfurdioxide[0]) if totalsulfurdioxide is not None and len(totalsulfurdioxide) else 0
    density = float(density[0]) if density is not None and len(density) else 0
    ph = float(ph[0]) if ph is not None and len(ph) else 0
    sulphates = float(sulphates[0]) if sulphates is not None and len(sulphates) else 0
    alcohol = float(alcohol[0]) if alcohol is not None and len(alcohol) else 0

    features_arr = np.array([[fixedacidity, volatileacidity,citricacid, residualsugar,chlorides, freesulfurdioxide, totalsulfurdioxide, density, ph,
    prediction = model.predict(features_arr)
    output = round(prediction[0], 2)

    return render_template('result.html', prediction_text=f'The predicted wine quality is: {output}')

if __name__ == '__main__':
    app.debug=True
    app.run()
```

Style.css

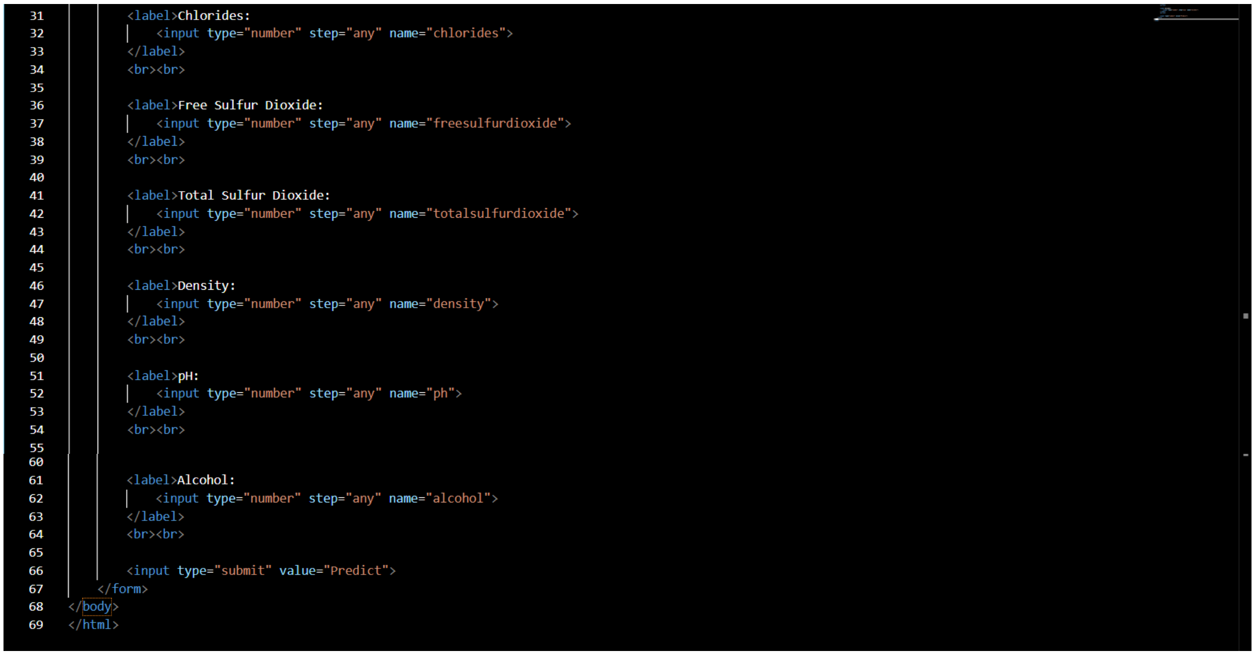


```css
body {
    font-family: Arial, sans-serif;
    margin: 20px;
}

h1 {
    text-align: center;
}

form {
    max-width: 400px;
    margin: 0 auto;
}

label {
    display: block;
    margin-bottom: 10px;
}

input {
    width: 100%;
    padding: 8px;
    margin-bottom: 10px;
    border: 1px solid #ccc;
    border-radius: 4px;
}

input[type="submit"] {
    background-color: #4CAF50;
    color: white;
    padding: 10px 15px;
    border: none;
    border-radius: 4px;
    cursor: pointer;
}
```

Index.html

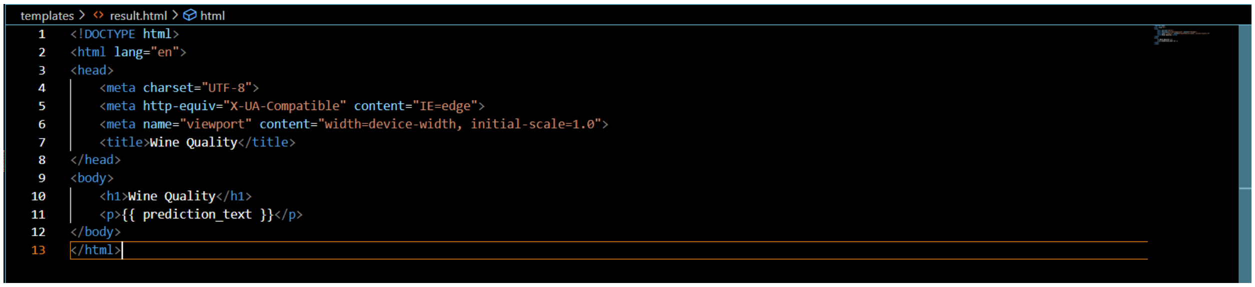


```html
<!DOCTYPE html>
<html>
<head>
    <title>Wine Quality Prediction</title>
    <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
    <h1>Wine Quality Prediction</h1>
    <form action="/predict" method="post">

        <label>Fixed Acidity:
            <input type="number" step="any" name="fixedacidity">
        </label>
        <br><br>

        <label>Volatile Acidity:
            <input type="number" step="any" name="volatileacidity">
        </label>
        <br><br>

        <label>Citric Acid:
            <input type="number" step="any" name="citricacid">
        </label>
        <br><br>

        <label>Residual Sugar:
            <input type="number" step="any" name="residualsugar">
        </label>
        <br><br>

```



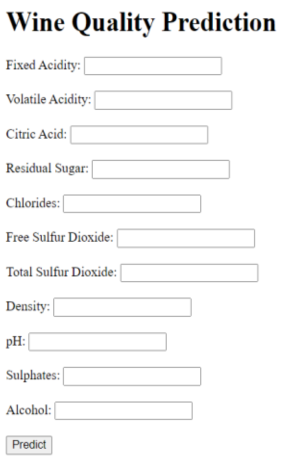
```
        <label>Chlorides:
            <input type="number" step="any" name="chlorides">
        </label>
        <br><br>

        <label>Free Sulfur Dioxide:
            <input type="number" step="any" name="freesulfurdioxide">
        </label>
        <br><br>

        <label>Total Sulfur Dioxide:
            <input type="number" step="any" name="totalsulfurdioxide">
        </label>
        <br><br>

        <label>Density:
            <input type="number" step="any" name="density">
        </label>
        <br><br>

        <label>pH:
            <input type="number" step="any" name="ph">
        </label>
        <br><br>


        <label>Alcohol:
            <input type="number" step="any" name="alcohol">
        </label>
        <br><br>

        <input type="submit" value="Predict">
    </form>
</body>
</html>
```

Result.html



```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Wine Quality</title>
</head>
<body>
    <h1>Wine Quality</h1>
    <p>{{ prediction_text }}</p>
</body>
</html>
```

Final output



Wine Quality Prediction

Fixed Acidity:

Volatile Acidity:

Citric Acid:

Residual Sugar:

Chlorides:

Free Sulfur Dioxide:

Total Sulfur Dioxide:

Density:

pH:

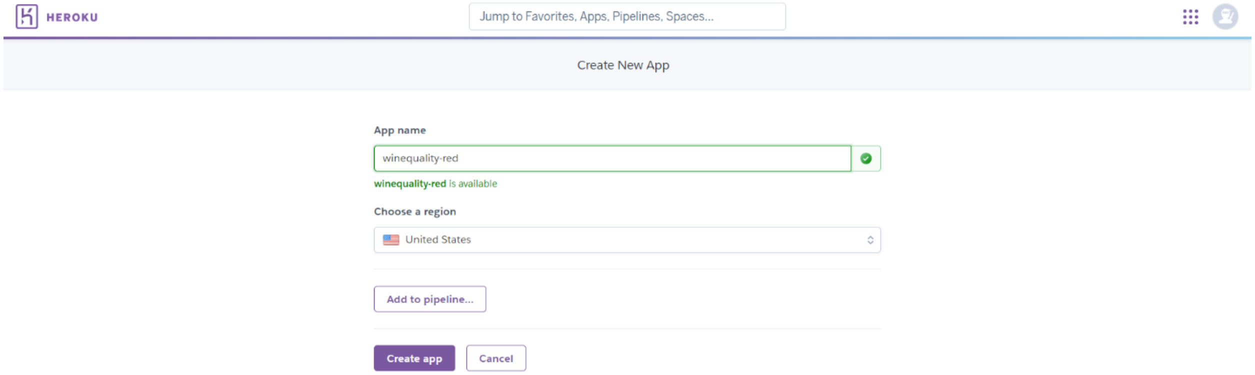
Sulphates:

Alcohol:

Model deployment on Heroku

For deployment on Heroku, my Github account repository that hosted the files required was linked to heroku and manually deployed

Entering app details

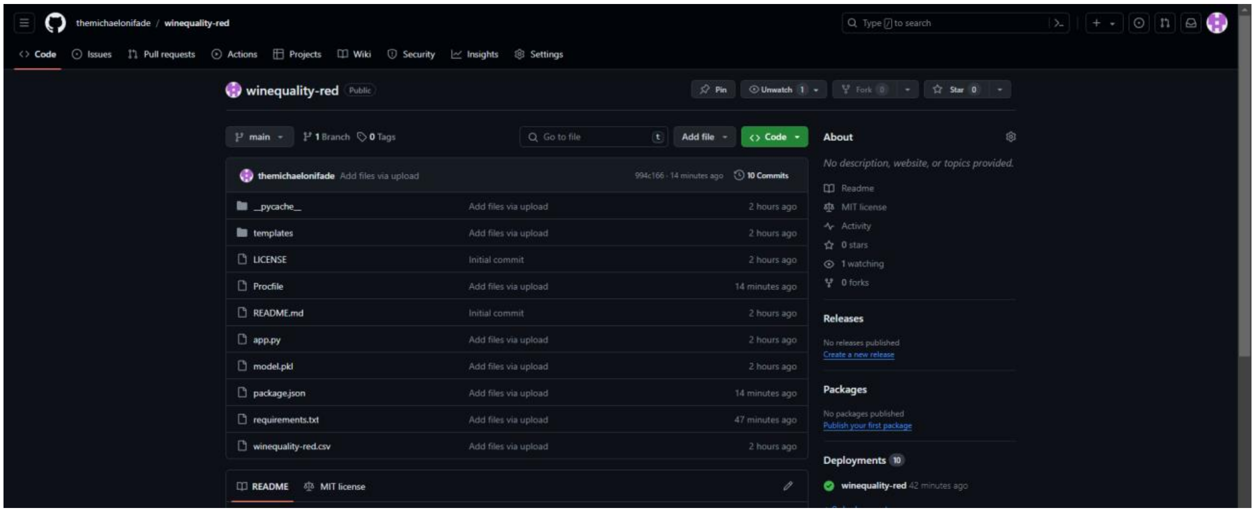


App name: winequality-red

winequality-red is available

Choose a region: United States

Connect repository



themichaelonifade Add files via upload 994c166 · 14 minutes ago 10 Commits

pycache	Add files via upload	2 hours ago
templates	Add files via upload	2 hours ago
LICENSE	Initial commit	2 hours ago
Procfile	Add files via upload	14 minutes ago
README.md	Initial commit	2 hours ago
app.py	Add files via upload	2 hours ago
model.pkl	Add files via upload	2 hours ago
package.json	Add files via upload	14 minutes ago
requirements.txt	Add files via upload	47 minutes ago
winequality-red.csv	Add files via upload	2 hours ago

About

No description, website, or topics provided.

Releases

No releases published
Create a new release

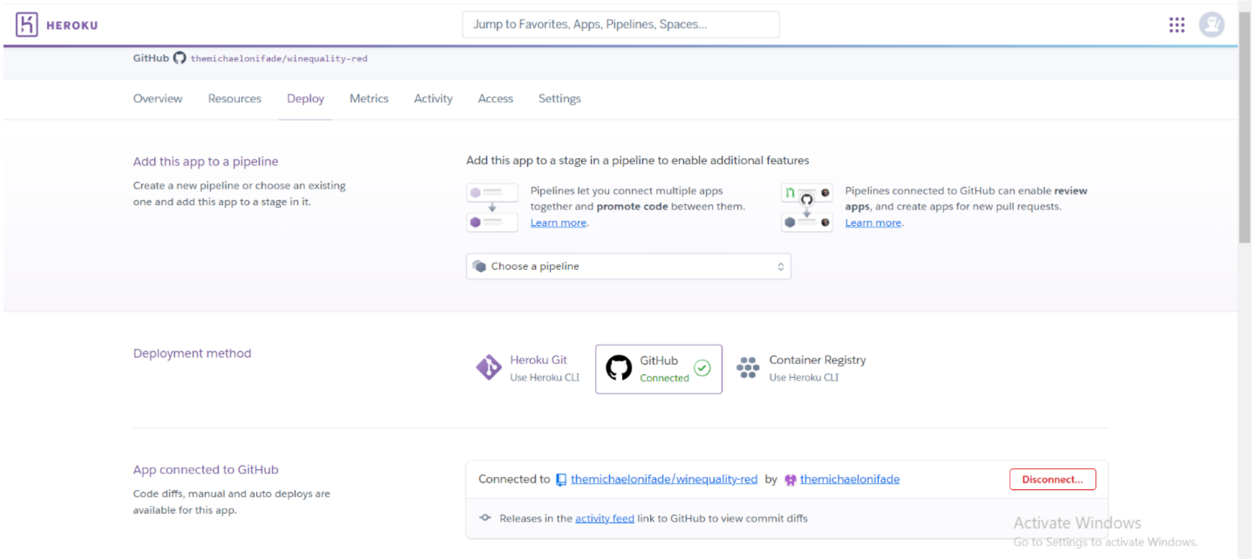
Packages

No packages published
Publish your first package

Deployments 10

winequality-red 42 minutes ago

Manual deployment



HEROKU

Jump to Favorites, Apps, Pipelines, Spaces...

GitHub themichaelonifade/winequality-red

Overview Resources Deploy Metrics Activity Access Settings

Add this app to a pipeline

Create a new pipeline or choose an existing one and add this app to a stage in it.

Add this app to a stage in a pipeline to enable additional features

Pipelines let you connect multiple apps together and **promote code** between them. Learn more.

Pipelines connected to GitHub can enable **review apps**, and create apps for new pull requests. Learn more.

Choose a pipeline

Deployment method

Heroku Git
Use Heroku CLI

GitHub
Connected

Container Registry
Use Heroku CLI

App connected to GitHub

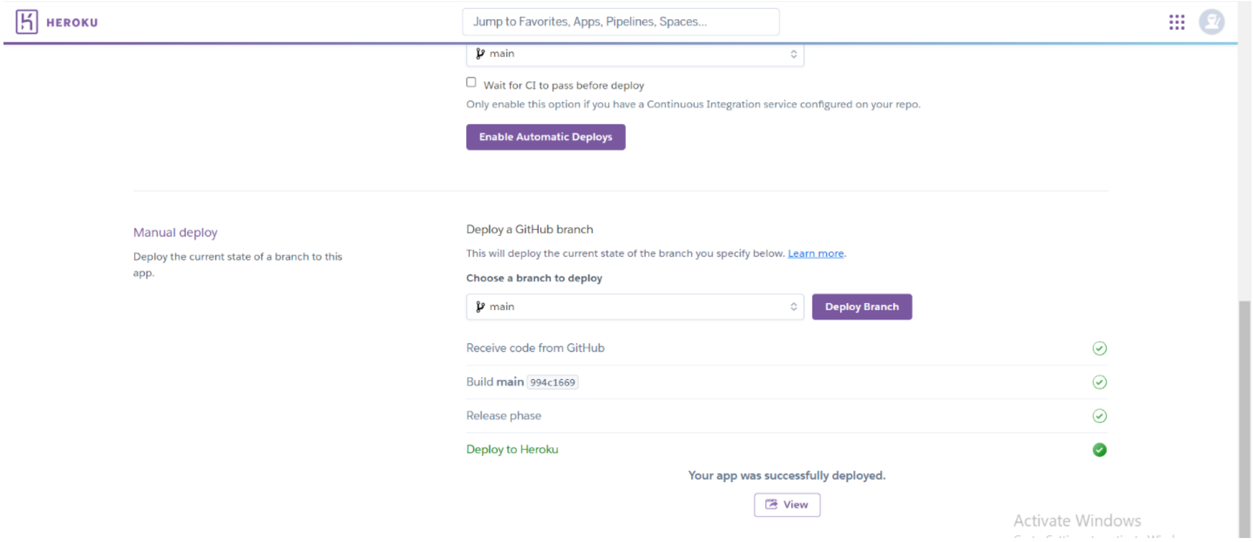
Code diffs, manual and auto deploys are available for this app.

Connected to themichaelonifade/winequality-red by themichaelonifade

Disconnect...

Releases in the activity feed link to GitHub to view commit diffs

Activate Windows
Go to Settings to activate Windows.



HEROKU

Jump to Favorites, Apps, Pipelines, Spaces...

main

□ Wait for CI to pass before deploy

Only enable this option if you have a Continuous Integration service configured on your repo.

Enable Automatic Deploys

Manual deploy

Deploy the current state of a branch to this app.

Deploy a GitHub branch

This will deploy the current state of the branch you specify below. Learn more.

Choose a branch to deploy

main

Deploy Branch

Receive code from GitHub ✓

Build **main** 994c1669 ✓

Release phase ✓

Deploy to Heroku ✓

Your app was successfully deployed.

View

Activate Windows

App url =

https://winequality-red-17ad802c5079.herokuapp.com/