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Steps followed in Flask Deployment

1.0 Choosing a Toy Dataset (Iris Flower Dataset)

Sepal_Length	Sepal_Width	Petal_Length	Petal_Width	Class
5.1	3.5	1.4	0.2	Setosa
4.9	3	1.4	0.2	Setosa
4.7	3.2	1.3	0.2	Setosa
4.6	3.1	1.5	0.2	Setosa
5	3.6	1.4	0.2	Setosa
5.4	3.9	1.7	0.4	Setosa
4.6	3.4	1.4	0.3	Setosa
5	3.4	1.5	0.2	Setosa
4.4	2.9	1.4	0.2	Setosa
4.9	3.1	1.5	0.1	Setosa
5.4	3.7	1.5	0.2	Setosa
4.8	3.4	1.6	0.2	Setosa
4.8	3	1.4	0.1	Setosa
4.3	3	1.1	0.1	Setosa
5.8	4	1.2	0.2	Setosa
5.7	4.4	1.5	0.4	Setosa
5.4	3.9	1.3	0.4	Setosa
5.1	3.5	1.4	0.3	Setosa
5.7	3.8	1.7	0.3	Setosa

2.0 Pre-processing and Modelling

MODEL DEPLOYMENT USING FLASK - CHUKWUJEKWU JOSEPH EZEMA

```
# 1.0 Import Libraries

import pandas as pd
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
import pickle
from flask import Flask, render_template, request
```

```
# 2.0 Load the Iris Data

data = pd.read_csv('iris.csv')
data
```

	Sepal_Length	Sepal_Width	Petal_Length	Petal_Width	Class
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	Virginica
146	6.3	2.5	5.0	1.9	Virginica
147	6.5	3.0	5.2	2.0	Virginica
148	6.2	3.4	5.4	2.3	Virginica
149	5.9	3.0	5.1	1.8	Virginica

150 rows × 5 columns

```
# 3.0 Split Data

X = data.drop('Class', axis=1)
y = data['Class']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

[4]

```
# 4.0 Train Model

model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

[5]

```
RandomForestClassifier(random_state=42)
```

```
# 5.0 Evaluate Model

y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print('Model Accuracy:', accuracy)
```

[6]

```
Model Accuracy: 1.0
```

```
#
with open('iris_model.pkl', 'wb') as file:
    pickle.dump(model, file)
```

[7]

After building the model, I dumped it using pickle for flask application. I also saved the model to a python file (model.py)

3.0 Created HTMLs and CSS Files for Web Page Deployment

I. **index.html – for inputting the values to predict.**

templates > index.html > html > body > form > input#petal_width

```
<!DOCTYPE html>
<html>
  <head>
    <title>Iris Flower Predictor</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='style.css') }}">
  </head>
  <body>
    <h1>Iris Flower Predictor</h1>
    <form action="/predict" method="post">
      <label for="sepal_length">Sepal Length:</label>
      <input type="number" id="sepal_length" name="sepal_length" step="0.1" required>
      <br>
      <label for="sepal_width">Sepal Width:</label>
      <input type="number" id="sepal_width" name="sepal_width" step="0.1" required>
      <br>
      <label for="petal_length">Petal Length:</label>
      <input type="number" id="petal_length" name="petal_length" step="0.1" required>
      <br>
      <label for="petal_width">Petal Width:</label>
      <input type="number" id="petal_width" name="petal_width" step="0.1" required>
      <br>
      <input type="submit" value="Predict">
    </form>
  </body>
</html>

```

II. result.html – for showing the predicted results.

templates > result.html > ...

```html
<!DOCTYPE html>
<html>
  <head>
    <title>Iris Flower Predictor - Result</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='style.css') }}">
  </head>
  <body>
    <h1>Iris Flower Predictor - Result</h1>
    <p>You entered the following values:</p>
    <ul>
      <li>Sepal Length: {{ sepal_length }}</li>
      <li>Sepal Width: {{ sepal_width }}</li>
      <li>Petal Length: {{ petal_length }}</li>
      <li>Petal Width: {{ petal_width }}</li>
    </ul>
    <p>The predicted species is: {{ species }}</p>
  </body>
</html>

```

III. style.css – web page formatting

static > # style.css > body

```css
body {
  font-family: Arial, sans-serif;
  background-color: #f0f0f0;
}

h1 {
  text-align: center;
}

form {
  width: 400px;
  margin: 0 auto;
  background-color: white;
  padding: 20px;
  border-radius: 10px;
  box-shadow: 0px 0px 10px rgba(0, 0, 0, 0.1);
}

label {
  display: block;
  margin-bottom: 5px;
}

input[type="number"] {
  width: 100%;
  padding: 10px;
  margin-bottom: 10px;
  border: 1px solid #ccc;
  border-radius: 5px;
  box-sizing: border-box;
}

```

4.0 Created a Flask App

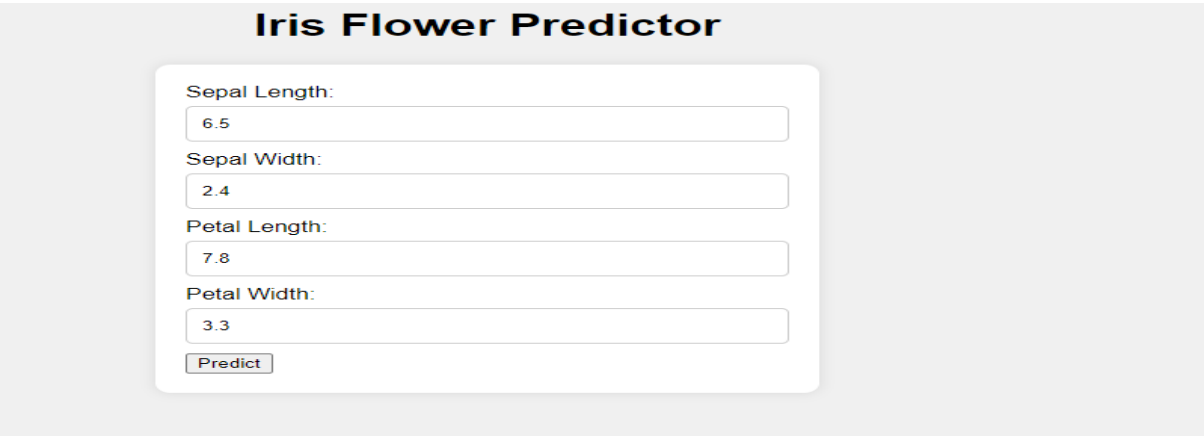
app.py > ...

```python
import pickle
from flask import Flask, render_template, request, jsonify

# Load the model
with open('iris_model.pkl', 'rb') as file:
    model = pickle.load(file)

# Create a Flask app
app = Flask(__name__)

# Define a route to handle the index page
@app.route('/')
def index():
    return render_template('index.html')

# Define a route to handle the prediction
@app.route('/predict', methods=['POST'])
def predict():
    # Get the input values from the form
    sepal_length = float(request.form['sepal_length'])
    sepal_width = float(request.form['sepal_width'])
    petal_length = float(request.form['petal_length'])
    petal_width = float(request.form['petal_width'])

    # Print the input data received from the form
    print(f"Input Data: [{sepal_length}, {sepal_width}, {petal_length}, {petal_width}]")

    # Make a prediction using the model
    prediction = model.predict([[sepal_length, sepal_width, petal_length, petal_width]])
    species = prediction[0]

    # Return the result to the user
    return render_template('result.html', sepal_length=sepal_length, sepal_width=sepal_width, petal_length=petal_length, petal_width=petal_width, species=species)

# Run the app
if __name__ == '__main__':
    app.run(debug=True)

```

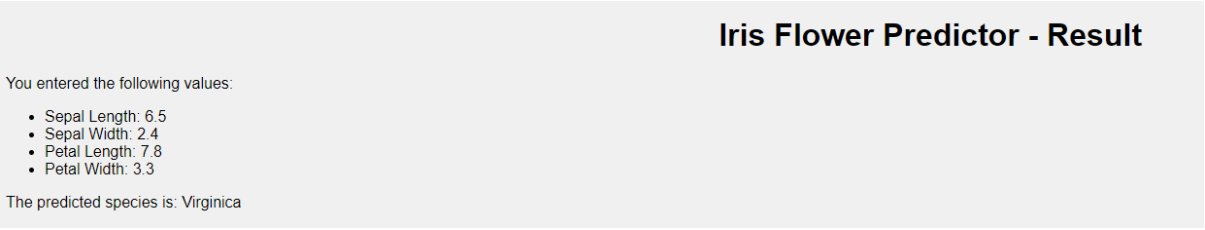
5.0 App Deployment using Command Prompt

```
C:\Users\jezema\OneDrive - Teesside University\DATA GLACIER INTERNSHIPS\Flask Deployment\iris-flask-repo>

C:\Users\jezema\OneDrive - Teesside University\DATA GLACIER INTERNSHIPS\Flask Deployment\iris-flask-repo>python app.py
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:299: UserWarning: Trying to unpickle estimator DecisionTreeClassifier from versio
n 1.0.2 when using version 1.2.1. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:299: UserWarning: Trying to unpickle estimator RandomForestClassifier from versio
n 1.0.2 when using version 1.2.1. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:299: UserWarning: Trying to unpickle estimator DecisionTreeClassifier from versio
n 1.0.2 when using version 1.2.1. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:299: UserWarning: Trying to unpickle estimator RandomForestClassifier from versio
n 1.0.2 when using version 1.2.1. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
 * Debugger is active!
 * Debugger PIN: 689-074-837
127.0.0.1 - - [06/Mar/2023 16:52:58] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [06/Mar/2023 16:53:00] "GET /static/style.css HTTP/1.1" 304 -
Input Data: [4.5, 2.3, 1.3, 0.3]
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature names, but RandomForestClassifier
 was fitted with feature names
  warnings.warn(
127.0.0.1 - - [06/Mar/2023 16:53:43] "POST /predict HTTP/1.1" 200 -
127.0.0.1 - - [06/Mar/2023 16:53:43] "GET /static/style.css HTTP/1.1" 304 -
Input Data: [6.5, 2.4, 7.8, 3.3]
C:\Users\jezema\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.10_qbz5n2kfra8p0\LocalCache\local-packages\Python310\site-packages\sklearn\base.py:420: UserWarning: X does not have valid feature names, but RandomForestClassifier
 was fitted with feature names
  warnings.warn(
127.0.0.1 - - [06/Mar/2023 16:54:30] "POST /predict HTTP/1.1" 200 -
127.0.0.1 - - [06/Mar/2023 16:54:30] "GET /static/style.css HTTP/1.1" 304 -
```

6.0 **Web Page for Testing**



7.0 Web Page for Predicted Result



SUMMARY:

This project involved creating a machine learning model to predict the species of an iris flower based on its sepal and petal dimensions. The iris flower dataset was used to train and test the model, which was built using Python's scikit-learn library. A Flask web application was created to allow users to input the dimensions of an iris flower and get a predicted species as output. Two HTML files were created for the web application: index.html for inputting values and result.html for displaying the predicted result. The app was then deployed on the local machine using the command prompt. A screenshot of the web page for testing, with input values of Sepal Length 6.5, Sepal Width 2.4, Petal Length 7.8, and Petal Width 3.3 was shown. The predicted result for these values was Virginica, which was displayed on the web page for predicted result. Overall, this project introduced machine learning modelling and web application deployment using Flask.