Model Deployment using Flask

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Overview

- Deploying your basic machine learning model
- Learn how to use Flask to deploy a machine learning model into production
- Model deployment is a core topic in data scientist interviews – so start learning!

Abstract

This project has been written for the beginners of model deployment. With a simple linear regression example, a model was created on Spyder using Flask.

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What is Model Deployment?

Deployment is the method by which you integrate a machine learning model into an existing production environment to make practical business decisions based on data. In this way, we turn the model we have created into a product. At the same time, we offer the product to the user side.

What is Flask?

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. Extensions exist for object-relational mappers, form validation, upload handling, various open authentication technologies, and several common framework-related tools. The only feature that distinguishes Flask from other frameworks is that it is very easy to use.

Installing Flask on your Machine

Installing Flask is simple and straightforward. I generally use pip installed.

```
# If you are using pip
$ pip install flask

# For Linux
$ sudo apt-get install python3-flask
```

If you want to work with the latest Flask code before it’s released, install or update the code from the master branch:

```
# Living on the edge
$ pip install -U https://github.com/pallets/flask/archive/master.tar.gz
```

That's it. We are ready to deploying your machine learning model.

Setting up the Project WorkFlow

- Model Building
- Save the model and setup app
- Webpage Template
- Predict class and send results

Build Machine Learning Model

I prefer to work on Jupyter Notebook. — Our dataset has 25 rows and 2 columns. Let's take a look at what our dataset actually looks like. To do this, use the head() method:

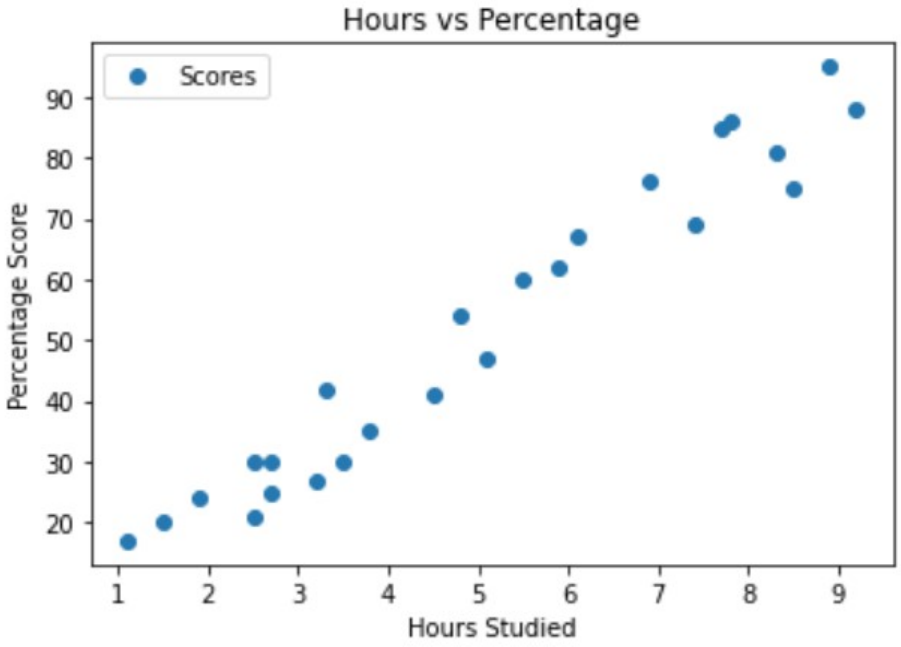
```
In [3]: scores.head()
```

Out[3]:

	Hours	Scores
0	2.5	21
1	5.1	47
2	3.2	27
3	8.5	75
4	3.5	30

Let's plot our data points on 2D graph to eyeball our dataset and see if we can manually find any relationship between the data.

```
In [4]: scores.plot(x='Hours', y='Scores', style='o')
        plt.title('Hours vs Percentage')
        plt.xlabel('Hours Studied')
        plt.ylabel('Percentage Score')
        plt.show()
```



Now that we have our attributes and labels, the next step is to split this data into training and test sets. We'll do this by using Scikit-Learn's built-in train_test_split() method:

```
In [6]: from sklearn.model_selection import train_test_split
        X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
```

```
In [7]: from sklearn.linear_model import LinearRegression
        regressor = LinearRegression()
        regressor.fit(X_train, y_train)
```

```
Out[7]: LinearRegression()
```

To retrieve the intercept and For retrieving the slope (coefficient of x):

```
In [8]: print(regressor.intercept_)

2.018160041434683

In [9]: print(regressor.coef_)

[9.91065648]
```

Making Predictions: Now that we have trained our algorithm, it's time to make some predictions.

```
In [10]: y_pred = regressor.predict(X_test)

In [11]: df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
         df
```

Out[11]:

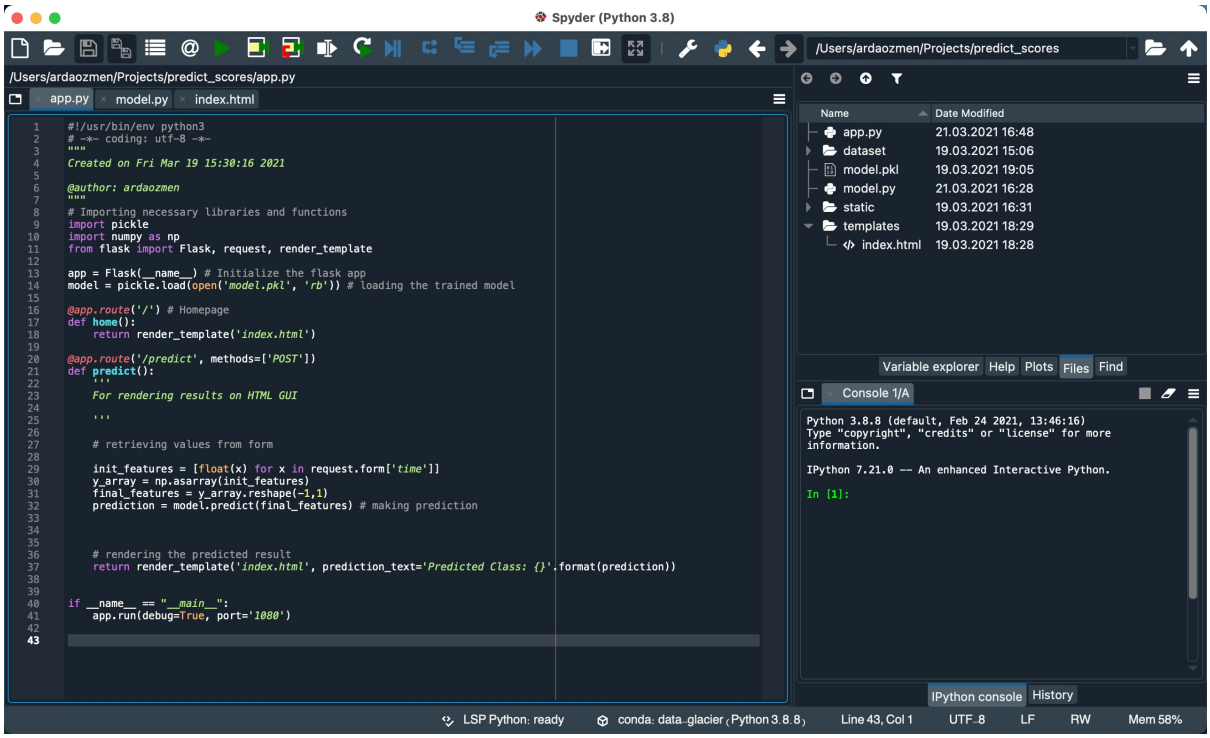
	Actual	Predicted
0	20	16.884145
1	27	33.732261
2	69	75.357018
3	30	26.794801
4	62	60.491033

Testing and Proofing:

```
In [13]: my_score = 5

In [14]: y_array = np.asarray(my_score)

In [15]: regressor.predict(y_array.reshape(-1,1))

Out[15]: array([51.57144244])

In [16]: (5 * 9.91065648) + 2.018160041434683

Out[16]: 51.571442441434684
```

Project Snapshots Spyder

usage



Save the Model (model.py)

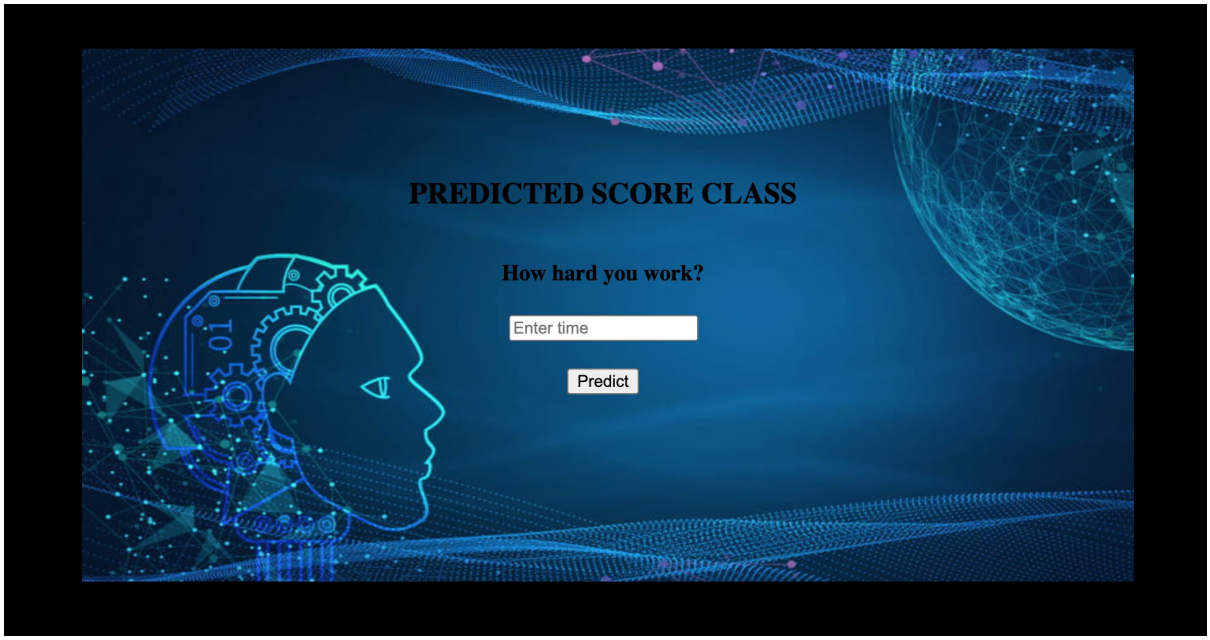
```python
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
Created on Fri Mar 19 14:33:31 2021

@author: ardaozmen
"""
# Importing necessary libraries
import pickle
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression

# Reading the data
scores = pd.read_csv('dataset/student_scores.csv')
X = scores.iloc[:, :-1].values
y = scores.iloc[:, :1].values

# Training Data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
regressor = LinearRegression()
regressor.fit(X_train, y_train)

pickle.dump(regressor, open('model.pkl', 'wb'))

```

Connect the Webpage with the Model (app.py)

```python
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
Created on Fri Mar 19 15:30:16 2021

@author: ardaozmen
"""
# Importing necessary libraries and functions
import pickle
import numpy as np
from flask import Flask, request, render_template

app = Flask(__name__) # Initialize the flask app
model = pickle.load(open('model.pkl', 'rb')) # loading the trained model

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

@app.route('/predict', methods=['POST'])
def predict():
    '''
    For rendering results on HTML GUI

    '''

    # retrieving values from form

    init_features = [float(x) for x in request.form['time']]
    y_array = np.asarray(init_features)
    final_features = y_array.reshape(-1,1)
    prediction = model.predict(final_features) # making prediction



    # rendering the predicted result
    return render_template('index.html', prediction_text='Predicted Class: {}'.format(prediction))


if __name__ == "__main__":
    app.run(debug=True, port='1080')

```

Working of the Deployed Model

We have successfully started the Flask server! Open your browser and go to this address – http://127.0.0.1:1080/. You will see that the Flask server has rendered the default template.



References:

- https://towardsdatascience.com/how-to-easily-deploy-machine-learningmodels-using-flask-b95af8fe34d4
- https://medium.datadriveninvestor.com/deploy-your-machine-learningmodel-using-flask-made-easy-now-635d2f12c50c