

Data Science Intern at Data Glacier

Week-5 : Cloud and API Deployment

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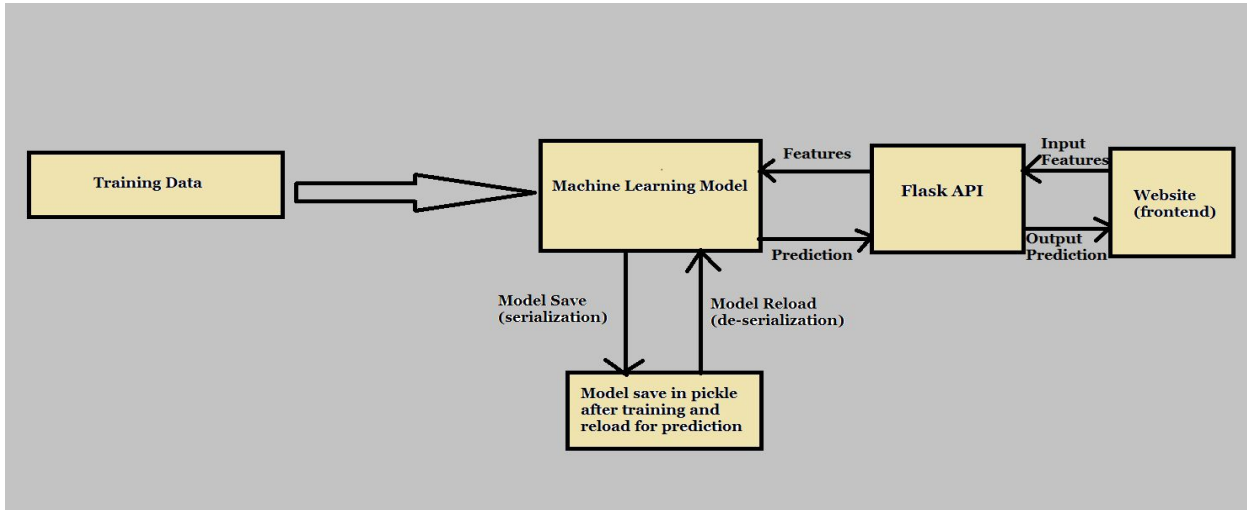
Submission Date : 2nd November 2022

Submitted to : Data Glacier

Flask

Flask is a **web application framework written in python**, in simple terms it helps end users interact with your python code (in this case our ML models) directly from their web browser without needing any libraries, code files, etc.

Machine learning model deployment using Flask:



First we will import some libraries here and then read dataset----

```
# Importing the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import pickle

dataset = pd.read_csv('hiring.csv')
```

Dataset : (Hiring.csv)

Field are:Experience, Test_Score,Interview_Score and Salary

dataset - DataFrame

| Index | xperienc | test score | erview sci | salary |
|-------|----------|------------|------------|--------|
| 0 | 0 | 8 | 9 | 50000 |
| 1 | 0 | 8 | 6 | 45000 |
| 2 | five | 6 | 7 | 60000 |
| 3 | two | 10 | 10 | 65000 |
| 4 | seven | 9 | 6 | 70000 |
| 5 | three | 7 | 10 | 62000 |
| 6 | ten | 7.85714 | 7 | 72000 |
| 7 | eleven | 7 | 8 | 80000 |

These are part of Data:

| Name ^ | Type | Size | Value |
|-----------|------------------------------------|--------|---|
| dataset | DataFrame | (8, 4) | Column names: experience, test_score, interview_score, salary |
| model | linear_model_base.LinearRegression | 1 | LinearRegression object of sklearn.linear_model_base module |
| regressor | linear_model_base.LinearRegression | 1 | LinearRegression object of sklearn.linear_model_base module |
| X | DataFrame | (8, 3) | Column names: experience, test_score, interview_score |
| y | Series | (8,) | Series object of pandas.core.series module |

Here y is dependent Variable :



X-Dataframe

X - DataFrame

| Index | xperienc | test score | interview sc |
|-------|----------|------------|--------------|
| 0 | 0 | 8 | 9 |
| 1 | 0 | 8 | 6 |
| 2 | 5 | 6 | 7 |
| 3 | 2 | 10 | 10 |
| 4 | 7 | 9 | 6 |
| 5 | 3 | 7 | 10 |
| 6 | 10 | 7.85714 | 7 |
| 7 | 11 | 7 | 8 |

y - Series

| Index | salary |
|-------|--------|
| 0 | 50000 |
| 1 | 45000 |
| 2 | 60000 |
| 3 | 65000 |
| 4 | 70000 |
| 5 | 62000 |
| 6 | 72000 |
| 7 | 80000 |

First we will build model : (model.py)

```
# Importing the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import pickle

dataset = pd.read_csv('hiring.csv')

dataset['experience'].fillna(0, inplace=True)

dataset['test_score'].fillna(dataset['test_score'].mean(), inplace=True)

X = dataset.iloc[:, :3]

#Converting words to integer values
def convert_to_int(word):
    word_dict = {'one':1, 'two':2, 'three':3, 'four':4, 'five':5, 'six':6, 'seven':7, 'eight':8,
                 'nine':9, 'ten':10, 'eleven':11, 'twelve':12, 'zero':0, 0: 0}
    return word_dict[word]

X['experience'] = X['experience'].apply(lambda x : convert_to_int(x))

y = dataset.iloc[:, -1]

#Splitting Training and Test Set
#Since we have a very small dataset, we will train our model with all available data.

from sklearn.linear_model import LinearRegression
regressor = LinearRegression()

#Fitting model with training data
regressor.fit(X, y)

# Saving model to disk
pickle.dump(regressor, open('model.pkl','wb'))

# Loading model to compare the results
model = pickle.load(open('model.pkl','rb'))
print(model.predict([[2, 9, 6]]))
```

#Splitting Training and Test Set

```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
```

#Fitting model with training data

```
regressor.fit(X, y)
```

Saving model to disk

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

Loading model to compare the results

```
model = pickle.load(open('model.pkl','rb'))  
print(model.predict([[2, 9, 6]]))
```

Now model.pkl file is ready

Now we will create (app.py)
import some libraries—

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

Here i have used flask to post my model.
render_template is used for redirect to home page

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

app = Flask(__name__)
model = pickle.load(open('model.pkl', 'rb'))

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

@app.route('/predict',methods=['POST'])
def predict():
    """
    For rendering results on HTML GUI
    """
    int_features = [int(x) for x in request.form.values()]
    final_features = [np.array(int_features)]
    prediction = model.predict(final_features)

    output = round(prediction[0], 2)

    return render_template('index.html', prediction_text='Employee Salary should be $ {}'.format(output))

@app.route('/predict_api',methods=['POST'])
def predict_api():
    """
    For direct API calls trough request
    """
    data = request.get_json(force=True)
    prediction = model.predict([np.array(list(data.values()))])

    output = prediction[0]
    return jsonify(output)

if __name__ == "__main__":
    app.run(debug=False)
```

When we execute this code it will redirect to home page (index.html)

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

```
<!DOCTYPE html>
<html>
<!--From https://codepen.io/frytyler/pen/EGdtg-->
<head>
  <meta charset="UTF-8">
  <title>ML API</title>
  <link href="https://fonts.googleapis.com/css?family=Pacifico" rel="stylesheet" type="text/css">
  <link href="https://fonts.googleapis.com/css?family=Arimo" rel="stylesheet" type="text/css">
  <link href="https://fonts.googleapis.com/css?family=Hind:300" rel="stylesheet" type="text/css">
  <link href="https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300" rel="stylesheet" type="text/css">
  <link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
</head>
<body>
  <div class="login">
    <h1>Predict Salary Analysis</h1>

    <!-- Main Input For Receiving Query to our ML -->
    <form action="{{ url_for('predict') }}" method="post">
      <input type="text" name="experience" placeholder="Experience" required="required" />
      <input type="text" name="test_score" placeholder="Test Score" required="required" />
      <input type="text" name="interview_score" placeholder="Interview Score" required="required" />

      <button type="submit" class="btn btn-primary btn-block btn-large">Predict</button>
    </form>

    <br>
    <br>
    {{ prediction_text }}
  </div>
</body>
</html>
```

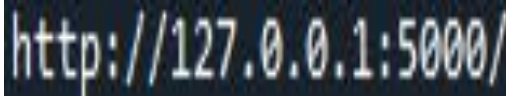
← Home_page (index.html)

Deployment and Output

After executing **app.py** we will get this —

```
In [2]: runfile('C:/ML_model_Flask_Deployment/ML_model_Flask_Deployment/app.py', wdir='C:/
ML_model_Flask_Deployment/ML_model_Flask_Deployment')
* Serving Flask app "app" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```

Then we will copy this path in the browser



http://127.0.0.1:5000/

This is our **Home_Page**

Predict Salary Analysis

Predict

After providing required input :

Predict Salary Analysis

Here comes the output

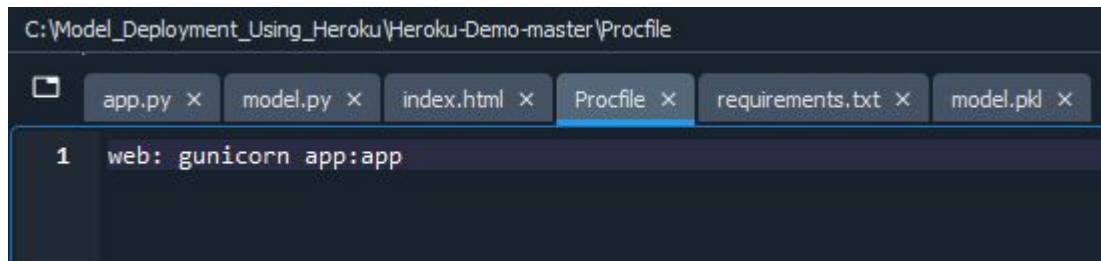
Predict Salary Analysis

Employee Salary should be \$ 1054152.97

Deploy the Flask APP to Heroku

The first thing to do in deploying the Flask app to Heroku is to Sign up and Log In to Heroku. After which you can create a Procfile and requirement.txt file, which handles the configuration part in order to deploy the model into the Heroku server.

web: gunicorn is the fixed command for the Procfile.

A screenshot of a code editor window. The title bar at the top reads "C:\Model_Deployment_Using_Heroku\Heroku-Demo-master\Procfile". Below the title bar, there is a tab bar with six tabs: "app.py x", "model.py x", "index.html x", "Procfile x" (which is currently selected and highlighted with a blue underline), "requirements.txt x", and "model.pkl x". The main editing area shows a single line of code on line 1: "web: gunicorn app:app".

```
C:\Model_Deployment_Using_Heroku\Heroku-Demo-master\Procfile

1 web: gunicorn app:app
```

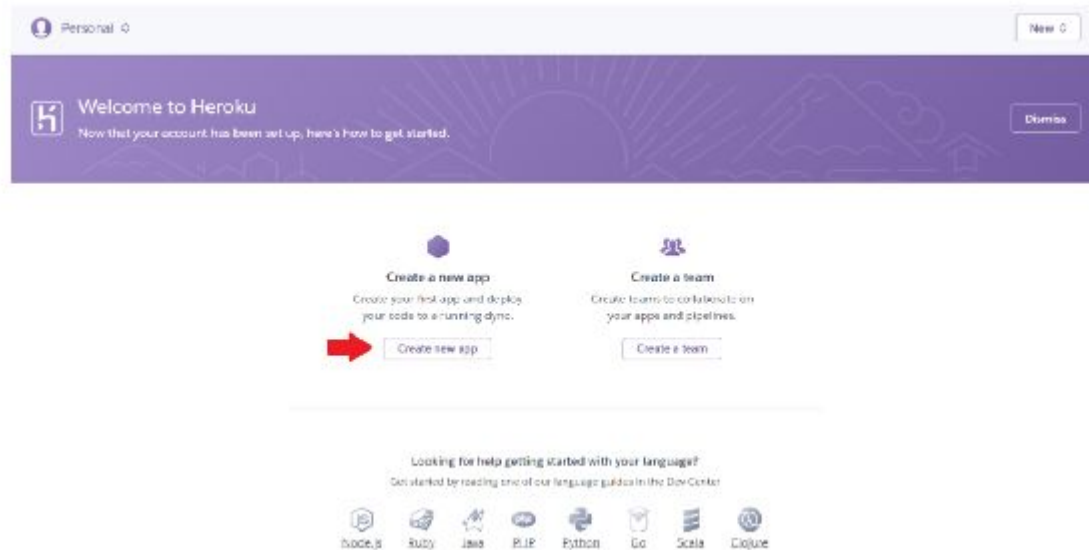
Requirements.txt file —



A screenshot of a code editor window with a dark theme. The title bar at the top shows the file path: C:\Model_Deployment_Using_Heroku\Heroku-Demo-master\requirements.txt. Below the title bar is a tab bar with six tabs: app.py, model.py, index.html, Procfile, requirements.txt (which is the active tab and highlighted with a blue underline), and model.pkl. The main editing area shows the contents of requirements.txt, which is a list of Python dependencies with their versions. The text is as follows:

```
1 flask==2.2.2
2 gunicorn==20.1.0
3 itsdangerous==2.1.2
4 Jinja2==3.1.2
5 MarkupSafe==2.1.1
6 Werkzeug==2.2.2
7 numpy>=1.23.3
8 scipy>=1.9.2
9 scikit-learn>=1.1.2
10 matplotlib>=3.5.3
11 pandas>=1.4.4
12
13
```

After sign-up on Heroku.com then click on create new app



After creating an app we will connect to the github

Deployment method



Heroku Glit
Use Heroku CLI



GitHub
Connect to GitHub



Container Registry
Use Heroku CLI

Connect to GitHub

Connect this app to GitHub to enable code
diffs and deploys.


Search for a repository to connect to

 shwetasingh14

Data_Science_Intern-Data_Glacier

Search

Missing a GitHub organization? [Ensure Heroku Dashboard has team access.](#)

 shwetasingh14/Data_Science_Intern-Data_Glacier

Connect

Here I have changed my branch from **main** to **heroku** where my procfile and requirement.txt exist and i chose manual deploy –

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

 heroku 

heroku

main

Deploy Branch

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

 heroku 

Deploy Branch

After few minutes my app successfully deployed

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

 heroku



Deploy Branch

Receive code from GitHub



Build heroku 4d66bdf6



Release phase



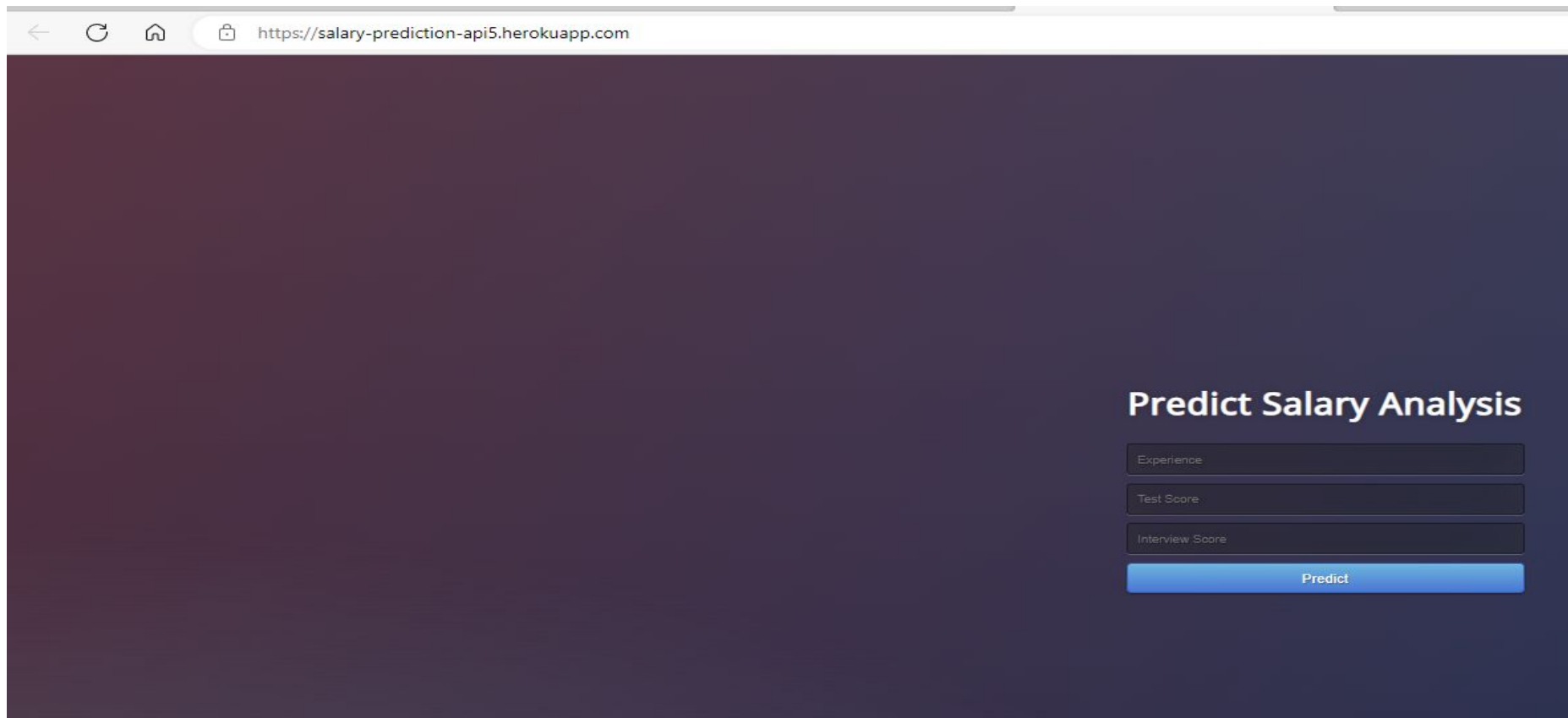
Deploy to Heroku



Your app was successfully deployed.

 View

Here is the view of my app :



The screenshot shows a web browser window with the address bar displaying `https://salary-prediction-api5.herokuapp.com`. The page has a dark blue gradient background. On the right side, there is a section titled "Predict Salary Analysis" in white text. Below the title, there are three input fields with placeholder text: "Experience", "Test Score", and "Interview Score". At the bottom of this section is a blue button labeled "Predict".

Predict Salary Analysis

Experience

Test Score

Interview Score

Predict

Input provided :

<https://salary-prediction-api5.herokuapp.com>

Predict Salary Analysis


10

789

300

Predict

Final Result

 <https://salary-prediction-api5.herokuapp.com/predict>

Predict Salary Analysis

Predict

Employee Salary should be \$ 2213914.37