Data Science Intern at Data Glacier

Week-5 : Cloud and API Deployment

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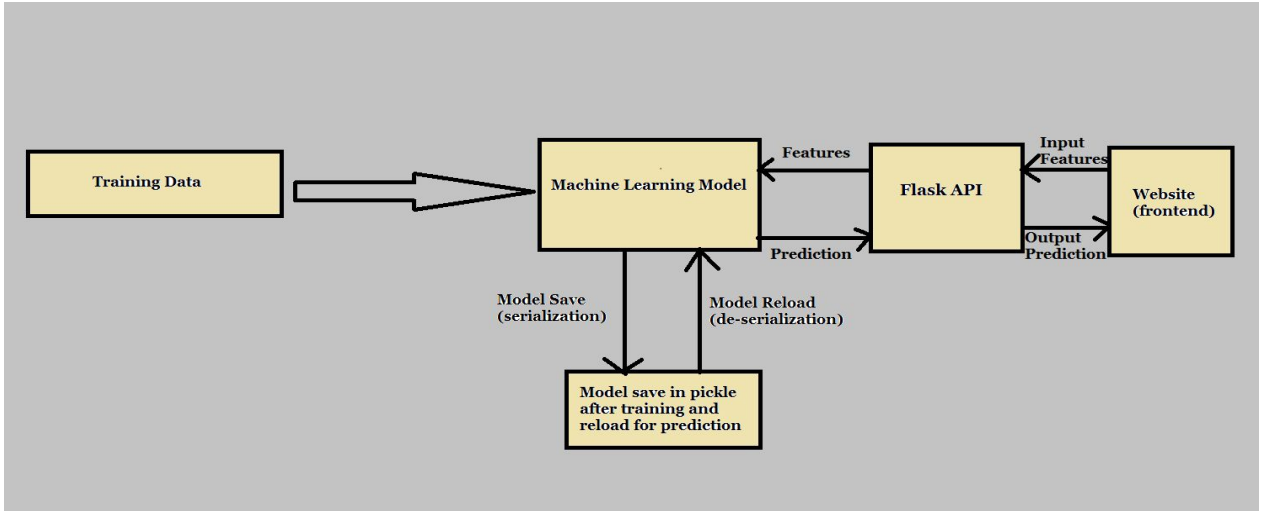
Submitted to : Data Glacier

Flask

Flask is a 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	est score	rview sc	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	est score	rview 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)**

```python
# 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 availabe data.

from sklearn.linear_model import LinearRegression
regressor = LinearRegression()

#Fitting model with trainig 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]]))
```

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from sklearn.linear_model import LinearRegression
regressor = LinearRegression()

#Fitting model with training data

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regressor.fit(X, y)
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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 trought 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)

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

```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

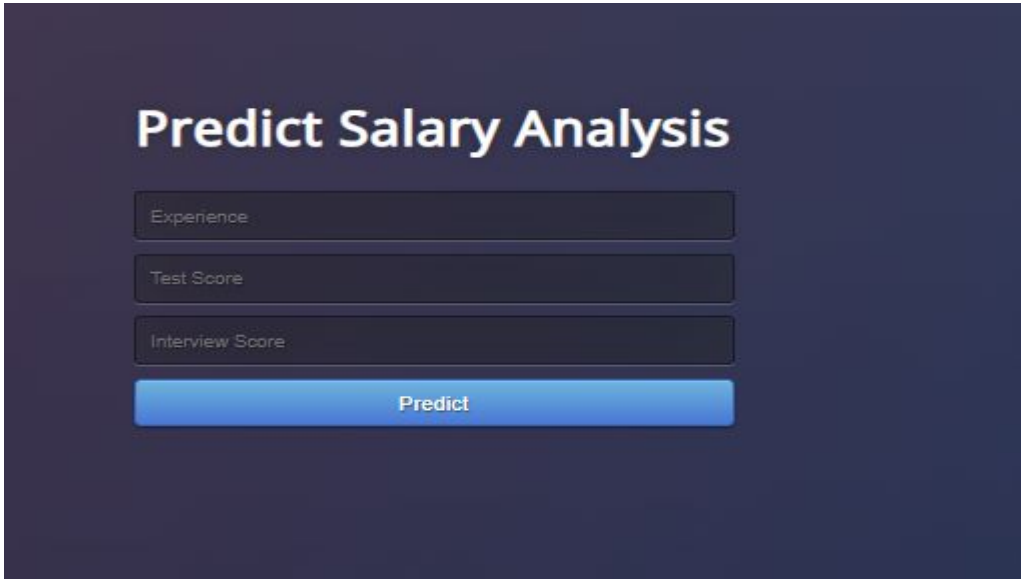
After executing **app.py** we will get this —

```
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

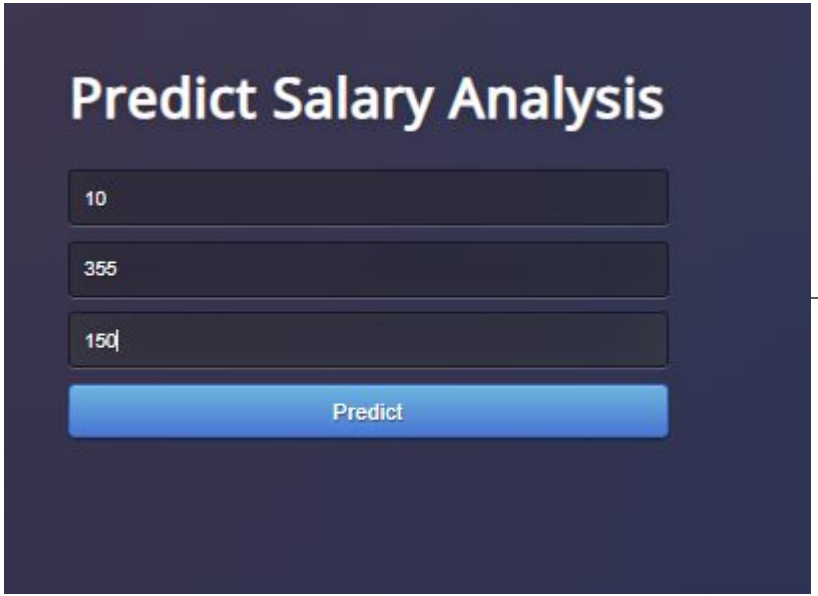
http://127.0.0.1:5000/

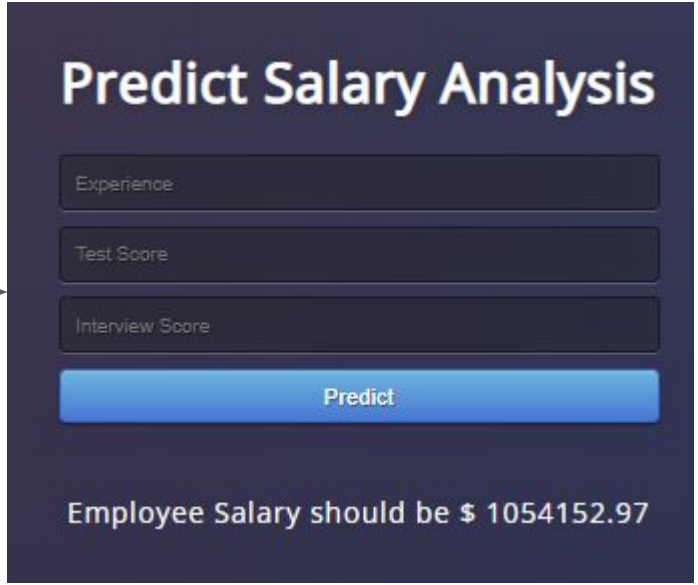
This is our **Home_Page**



After providing required input :

Here comes the output

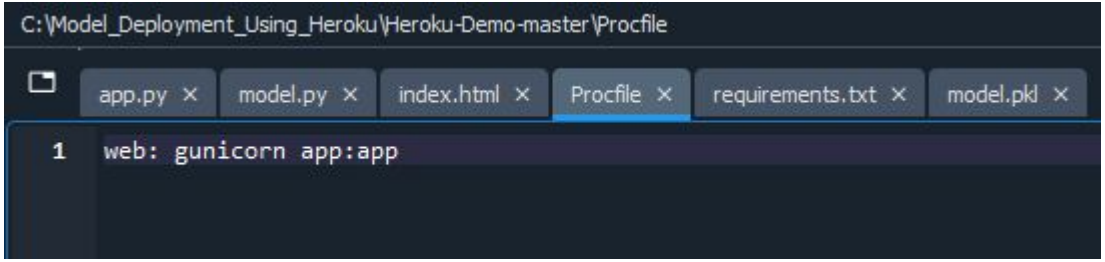




Deploy the Flask APP to Heroku

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.



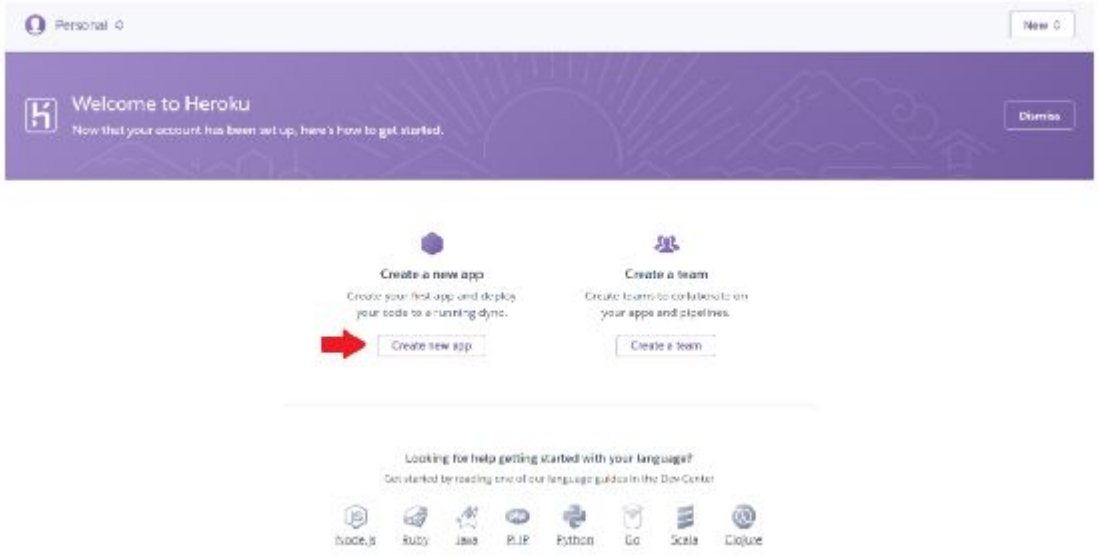
Requirements.txt file —

C:\Model_Deployment_Using_Heroku\Heroku-Demo-master\requirements.txt

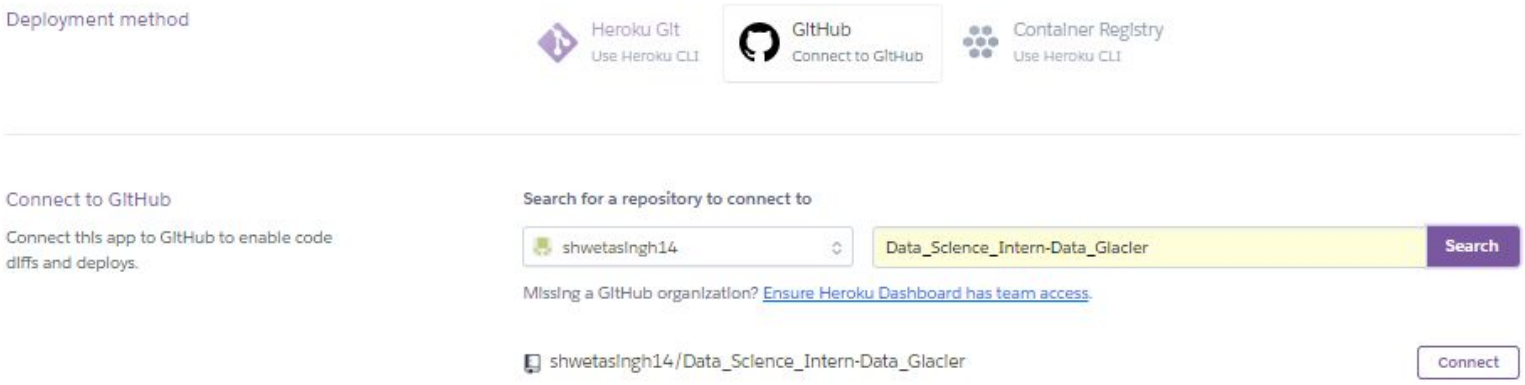
app.py × | model.py × | index.html × | Procfile × | requirements.txt × | model.pkl ×

```
Flask==2.2.2
gunicorn==20.1.0
itsdangerous==2.1.2
Jinja2==3.1.2
MarkupSafe==2.1.1
Werkzeug==2.2.2
numpy>=1.23.3
scipy>=1.9.2
scikit-learn>=1.1.2
matplotlib>=3.5.3
pandas>=1.4.4
```

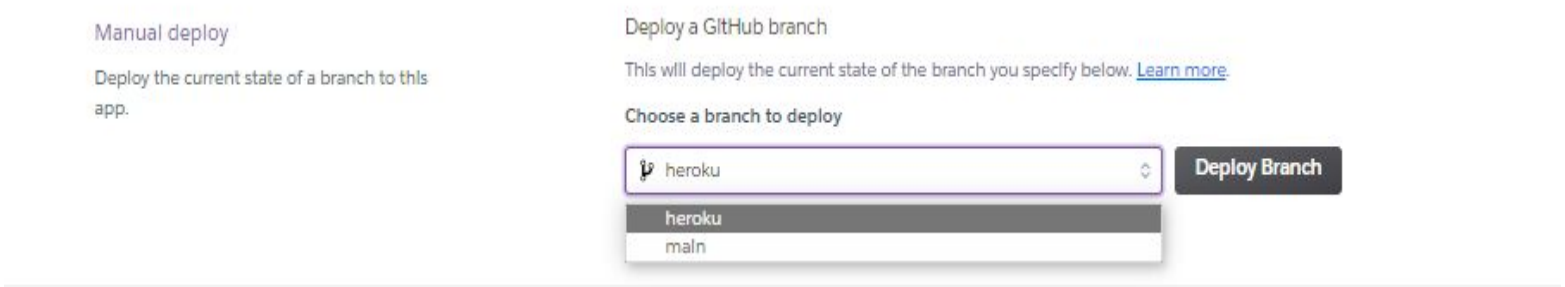
After sign-up on Heroku.com then click on create new app

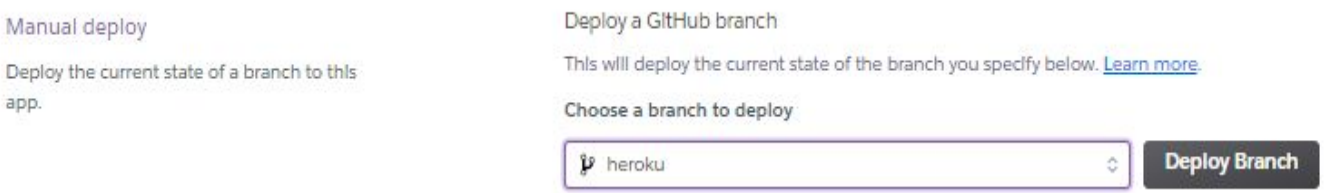


After creating an app we will connect to the github



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





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

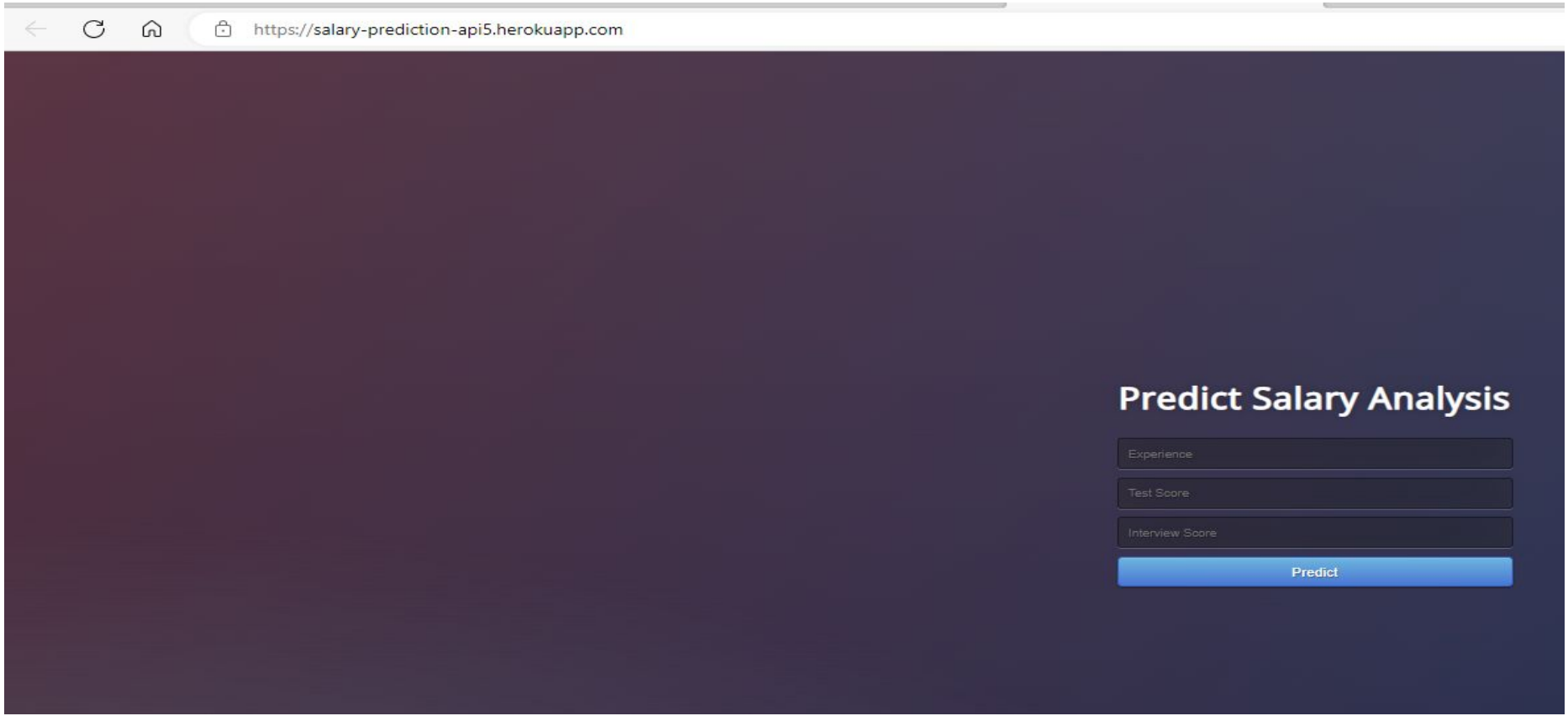
Release phase

Deploy to Heroku

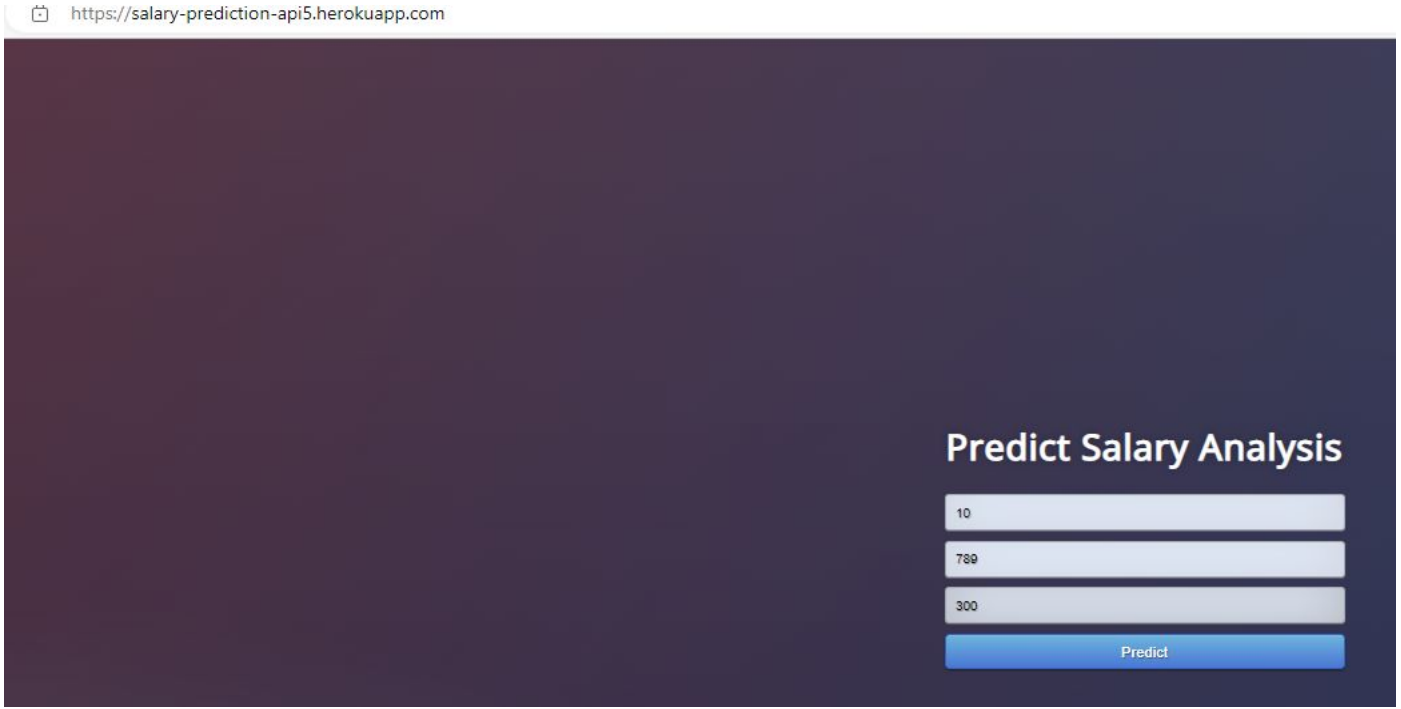
Your app was successfully deployed.

View

Here is the view of my app :



Input provided :



Final Result