DATA SCIENCE INTERNSHIP AT DATA GLACIER

WEEK 4 – MODEL DEPLOYMENT USING FLASK

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Model deployment using Flask

Introduction

in this project, I am going to creat a API for machine learning deployment using Python Flask Frameworks. As a demonstration, I am taking the Diabeties dataset which classifying wheather the chances of gettting diabeties or Not. This dataset is already cleaned and ready for model building.

Dataset Information

I have taken the diabeties datset which have 8 features and 768 records. The target value is 1 and 0, 1 is person getting high chance of diabeties and 0 is low chance of diabetes. Since, our dataset is already cleaned, there is no null value. The below image showing the datset.

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

The information of the columns is showing below. It shows the data types of columns, null value counts and shape of the columns.

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
 0   Pregnancies               768 non-null    int64
 1   Glucose                   768 non-null    int64
 2   BloodPressure             768 non-null    int64
 3   SkinThickness             768 non-null    int64
 4   Insulin                   768 non-null    int64
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64
 8   Outcome                   768 non-null    int64
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

3 Machine Learning Model Implementation

3.1 Data Splitting

I seperates the data for training and testing purpose. Here, 10% of data for testing and 90% for training. Data splitting is used for compute the metrics of the model and identify the model overfitting.

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(X , Y , test_size = 0.10)
```

3.2 Logistics Regression

For demonstration, I am using logistics regression for model building, it is more efficient for binary classification and perform well with small amount of data. It estimates the probability of event occuring

and not occuring. The target value is bounded between 0 to 1 with threashold of 0.5. if any value lies below 0.5, it considered as negative (low chance of getting diabetes) and above 0.5 considered as positive (high chance of getting diabetes).

```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(x_train, y_train)
```

```
              precision    recall  f1-score   support

           0       0.94      0.85      0.89        59
           1       0.62      0.83      0.71        18

    accuracy                           0.84        77
   macro avg       0.78      0.84      0.80        77
weighted avg       0.87      0.84      0.85        77
```

3.3 Save the model

After, the model is saved in pickle file for model deployment. For that, I am importing pickle library.

```
import pickle
pickle.dump(model, open('models.pkl','wb'))
model.predict(([[0,113,30,38,93,44.3,0.193,40]]))
```

4 Web Application

For deploy the model in web application, python flask framework are used. It can allow us to predict the patient has getting chance of

diabetes or not with simply typing the data in the field. For that, I am using visual studio code editor. Befor that I had to create a virual environment, then, I made the directory called flask. For model development, we need following files.

app.py

index.html

model.pkl

4.1 App.py

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

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

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

@app.route('/predict',methods=['POST','GET'])
def predict():

    int_features = [float(x) for x in request.form.values()]
    final_features = [np.array(int_features)]
    prediction = model.predict(final_features)


    if prediction==0:
        return render_template('index.html',
                               prediction_text='Patient has Low chance of getting Diabetes'.format(prediction),
                               )
    else:
        return render_template('index.html',
                               prediction_text= 'Patient has High chance of getting Diabetes'.format(prediction)
                               )

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

App.py is the main file which contains the code for python flask. Here, are we going to create API. Let’s look at the following terminology for python flask.

Flask application instances by passing __name__ as the first argument to the Flask class. To allowing the Flask to get HTML file which is belonging to same directory.

@ app.rout (/) the routing technique is used for users to remember application URLs. It is useful to access the desired page directly without having to navigate from the home page.

Renter template is used to navigates the HTML file in the templates folder. It helps us to collect information from outside file instead of hard coding the html file in app.py.

Debug = True is used for debugging the code and it shows if we have any error.

4.2 index.html

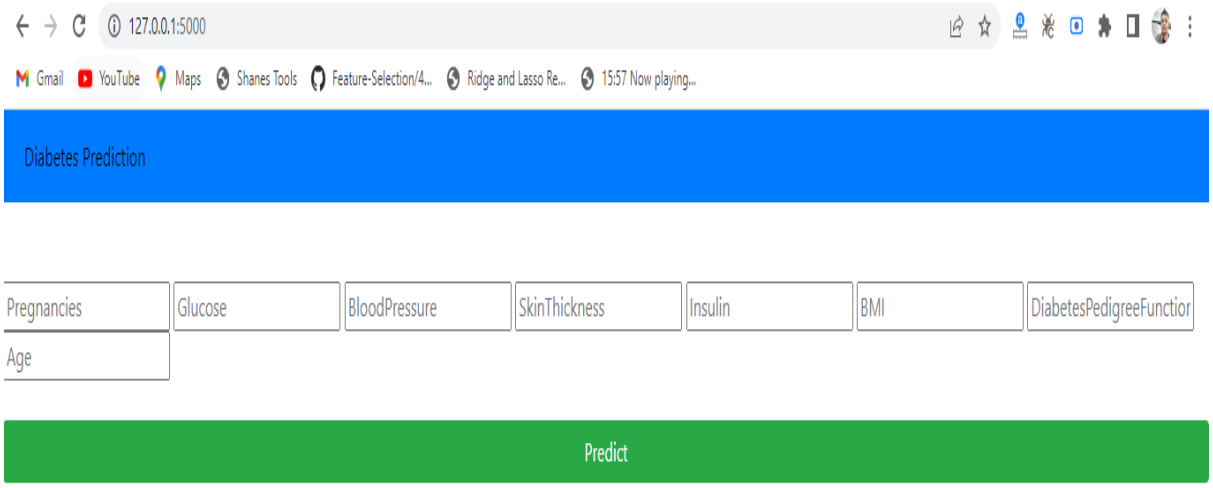
It is the html file which contains all the text and fields which we going to type the data for prediction.

```
<!DOCTYPE html>
<html >

<head>
  <meta charset="UTF-8">
  <title>Diabetes Prediction</title>


 <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css">

<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>

<script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.16.0/umd/popper.min.js"></script>

<script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js"></script>


</head>

<body>
<nav class="navbar navbar-expand-sm bg-primary navbar-light">
  <ul class="navbar-nav">
    <li class="nav-item active">
      <a class="nav-link" href="index.html">Diabetes Prediction</a>
    </li>

  </ul>
</nav>


  <br>
   <br>
```

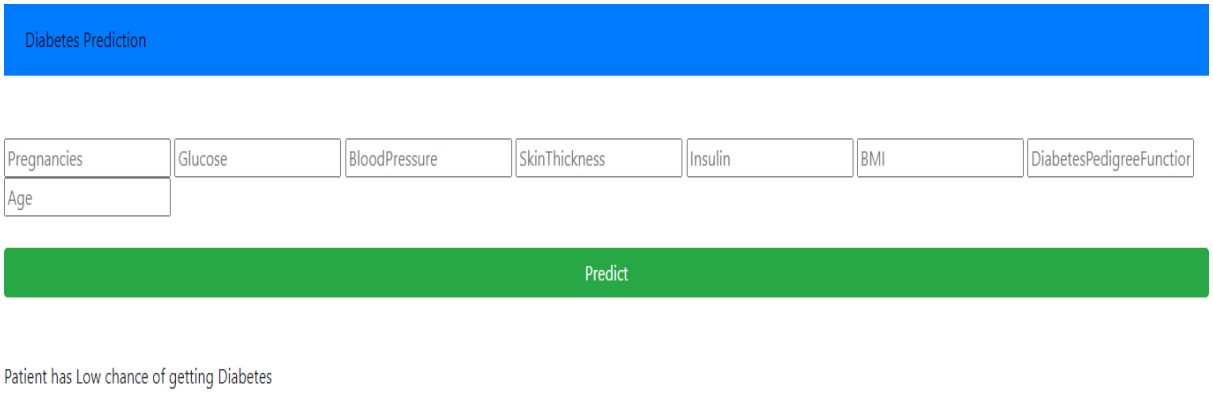
5 Running Code in Local Host

After, all the above procedure is completed, we can run the code in Local Host. The outcome of the code is shown in the web browser.

```
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
C:\Users\Kavinilavan\flask\venv\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator LogisticRegress
ion from version 1.0.2 when using version 1.1.2. 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: 104-650-624
```



Finally, we can type our input data to predict the outcome, let assume we have the new data 0, 113, 30, 38, 93, 44.3, 0.193, 40.



This model shows the prediction of patient has low chance of getting diabetes.

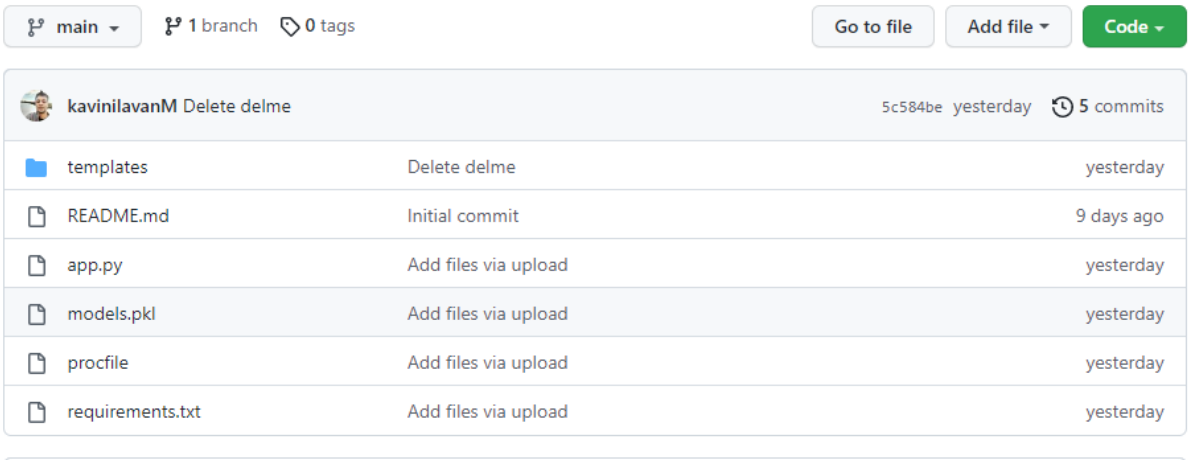
6. Model deployment in Cloud

For model deployment in cloud, I am using Heroku, it is a plotform as a service (paas) that enables us to build, run and operate application entirely in cloud. After, testing our model in localhost, next step is deploy in cloud. There is three different way to deploy in herokku. One way is to connect with github that people prefer most because it is easy.

There are two files are required to deploy in heroku i.e., requirement.txt and procfile, requirement file contains all the necessary library to deploy and another file is Procfile. It is a Process file that is required for all Heroku applications. Procfile specifies the commands that are executed by the app on start up. The following steps are deploying the model in Heroku.

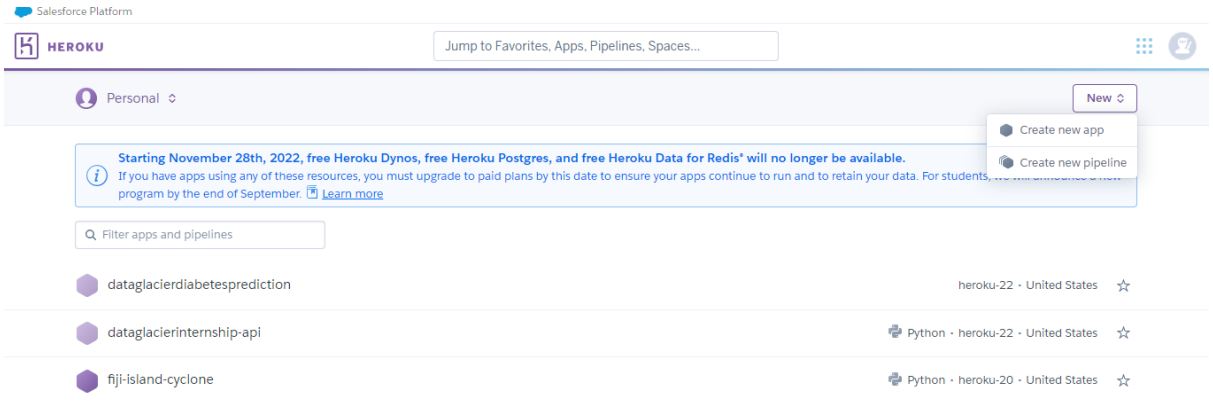
Step 1

Upload all necessary file in GitHub repository. The below image showing all the files required for deploy.



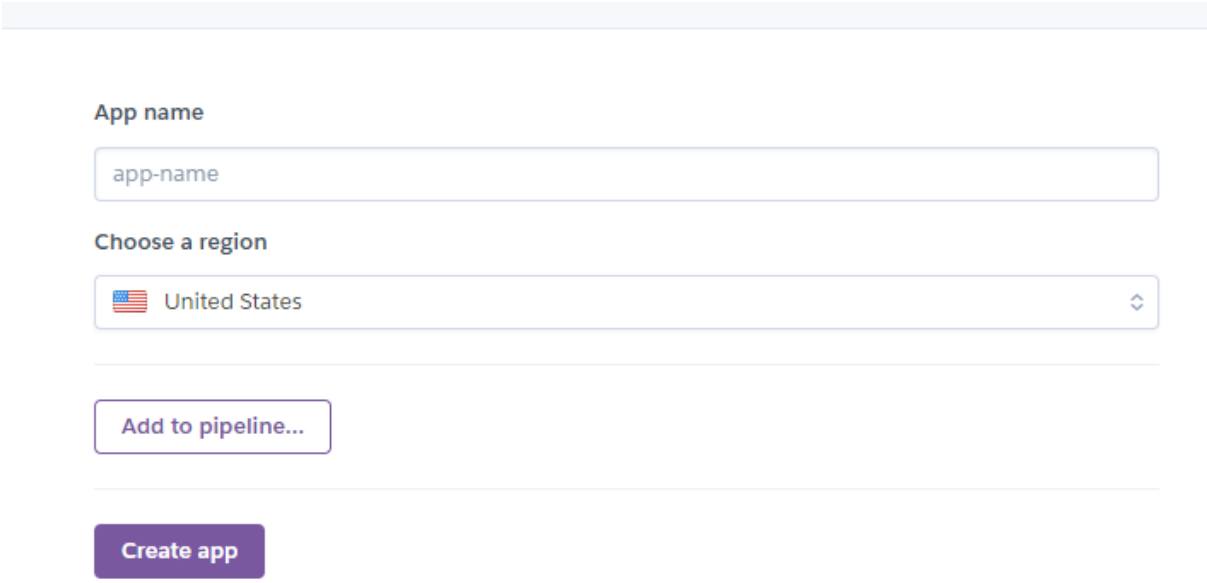
Step 2

After uploaded all the necessary file in github, now log in into heroku. And, click creat new app.



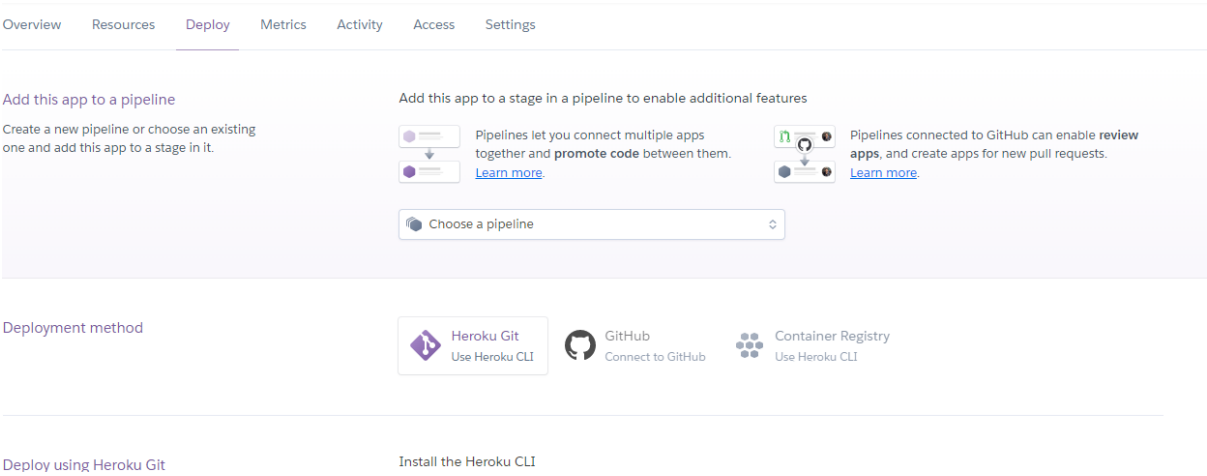
Step 3

Now, creat the app name, my app name is dataglacierinternship-api , after create the app name do creat app, the region should be united states.



Step 4

After creating app, now time to connect with github. After connecting with github, type the repository wher our files are available.



Step 5

After clicking, deploy , app was built sucessfully in a few min. now we can see the app in https://dataglacierinternship-api.herokuapp.com/ this url.