Name : DAVID PAUL NALUMENYA
Batch code : LISUM30: 30 JAN24 - 30 APRIL 24
Submission date : 04th APRIL 2024
Submitted to : nalumenyadavid_internship - GITHUB
GITHUB URL : https://github.com/nalumenyadavid/VC/tree/nalumenyadavid-internship/week%205
WEBAPP URL: https://sales-predictor-2e4b9b61142b.herokuapp.com/predict

1. Creation of the model

Model Building

[47]:
```
# Import Linear Regression model
from sklearn.linear_model import LinearRegression
# initialise model
model=LinearRegression()
# Train model with x_train and y-train
model.fit(x_train,y_train)
```

[47]:
```
LinearRegression
LinearRegression()
```

[48]:
```
# make predictions /test model
y_pred=model.predict(x_test)
y_pred
```

[48]:
```
array([17.11920196, 16.86343137, 21.80867738, 24.55443423, 12.3155194 ,
       20.92742165, 10.10412313, 12.37902465, 11.99570844, 16.95369111,
       22.81007152, 15.1981792 ,  8.4657263 , 14.88506108, 18.54549016,
       18.5612111 , 18.70116245, 14.50770633,  9.74439917, 20.58825997,
       14.89035187, 17.71204411, 23.05479076,  7.72066599, 21.4435882 ,
       19.61759881, 13.81348356, 11.64299601, 18.42933279, 12.21072397,
       11.41183731,  9.96393166, 13.49958752, 15.19317807, 18.10601562,
        6.92406996, 14.20072023, 14.27620674, 14.10646271, 10.77352628,
       14.84385103, 11.94916737, 10.70309421, 10.40075312,  6.20529208,
       16.82109527, 16.46119818, 12.07762468, 10.73444639, 20.86473587,
       15.08126005, 15.41063402, 12.79667983, 14.11738167, 12.36964978,
        9.02390838, 20.50392858,  9.34145403,  5.36475925,  8.24787047])
```

```
# slopes/coefficients of x
model.coef_
```

```
array([0.04539939, 0.17757031, 0.00502354])
```

```
# intercept
model.intercept_
```

```
3.090172035290916
```

```
# Assignment
What will be the total sales if my investment on TV = 100, Radio=50 , Newspaper=10
What will be the total sales if my investment on TV = 10, Radio=500 , Newspaper=10
What will be the total sales if my investment on TV = 5, Radio=10 , Newspaper=100
What will be the total sales if my investment on TV = 1000, Radio=300 , Newspaper=50
```

```
  Cell In[52], line 2
    What will be the total sales if my investment on TV = 100, Radio=50 , Newspaper=10
                               ^
SyntaxError: expected 'else' after 'if' expression
```

```
# How to make predictions
model.predict([[100,50,10]])
```

```
array([16.55886148])
```

```
model.predict([[1000,300,50]])
```

```
array([102.01182817])
```

```
model.predict([[10,100,1000]])
```

```
array([26.32473465])
```

2. Evaluation of the model

Evaluate the model

[56]:
```
# Loss functions to know the difference between actual and predicted values.
# Different Error/Loss functions in Regression algorithm are
* MSE(Mean Squared error)
* MAE(Mean absolute error)
* RMSE(Root mean squared error)
```

```
  Cell In[56], line 3
    * MSE(Mean Squared error)
          ^
SyntaxError: invalid syntax. Perhaps you forgot a comma?
```

[57]:
```
from sklearn.metrics import mean_squared_error,mean_absolute_error,r2_score
```

[58]:
```
# MSE
MSE=mean_squared_error(y_test,y_pred)
MSE
```

[58]:
```
2.204438630669018
```

[59]:
```
# MAE
MAE=mean_absolute_error(y_test,y_pred)
MAE
```

[59]:
```
1.1992980850475556
```

[60]:
```
# RMSE
rmse=np.sqrt(MSE)
rmse
```

[60]:
```
1.484735205573377
```

[61]:
```
# r2_score
r2_score(y_test,y_pred)
```

[61]:
```
0.9134809669573122
```

[62]:
```
# 91% better model to make predictions.
# Model has learnt 91% of the information
```

3. Serialization of the model

```
[63]: # adjusted R2 score

[64]: adj_r2=1-(1-0.9134809669573123 1)*(60-1)/(60-3-1)
      adj_r2

[64]: 0.9088460187585968

[65]: # clearly adjusted r2 score < r2_score

[ ]:

[66]: y_test.shape

[66]: (60,)
```

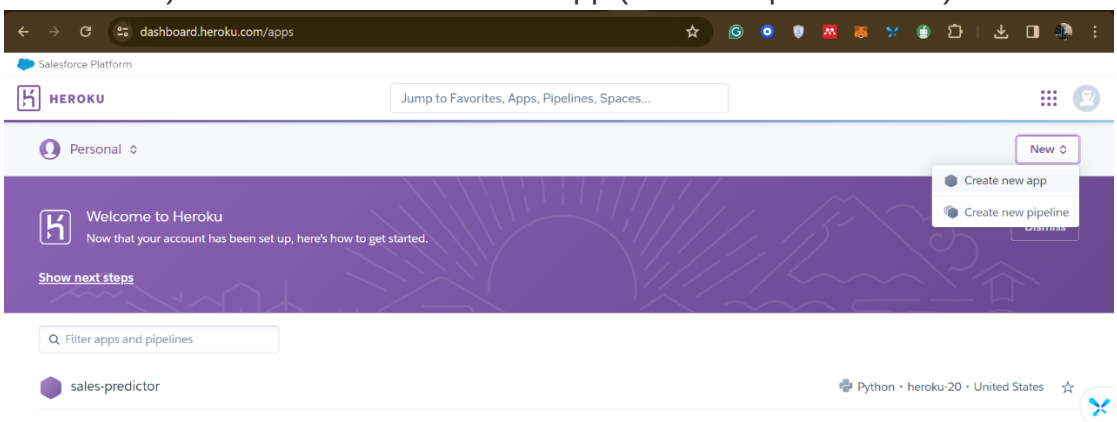
Lets serialize our model using Pickle

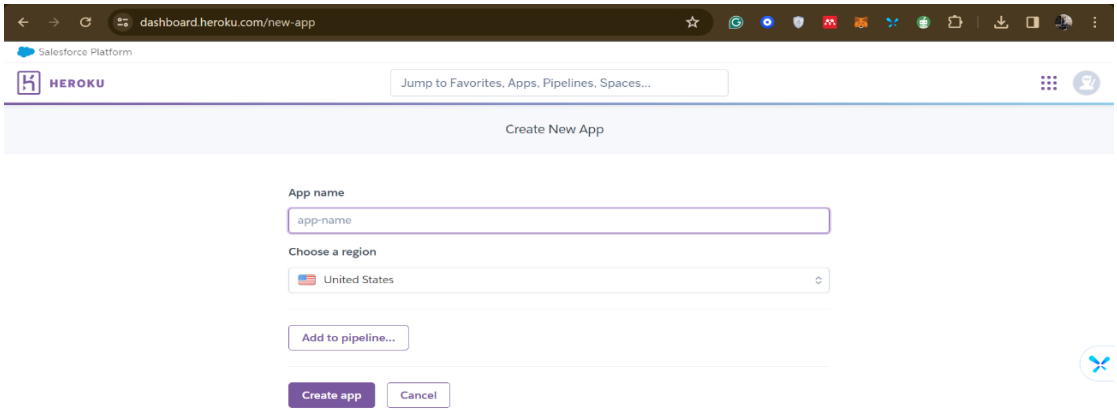
```
[69]: import pickle as pkl

[71]: with open('model.pkl','wb') as f:
          pkl.dump(model,f)
          print('pickling complete')

      pickling complete
```

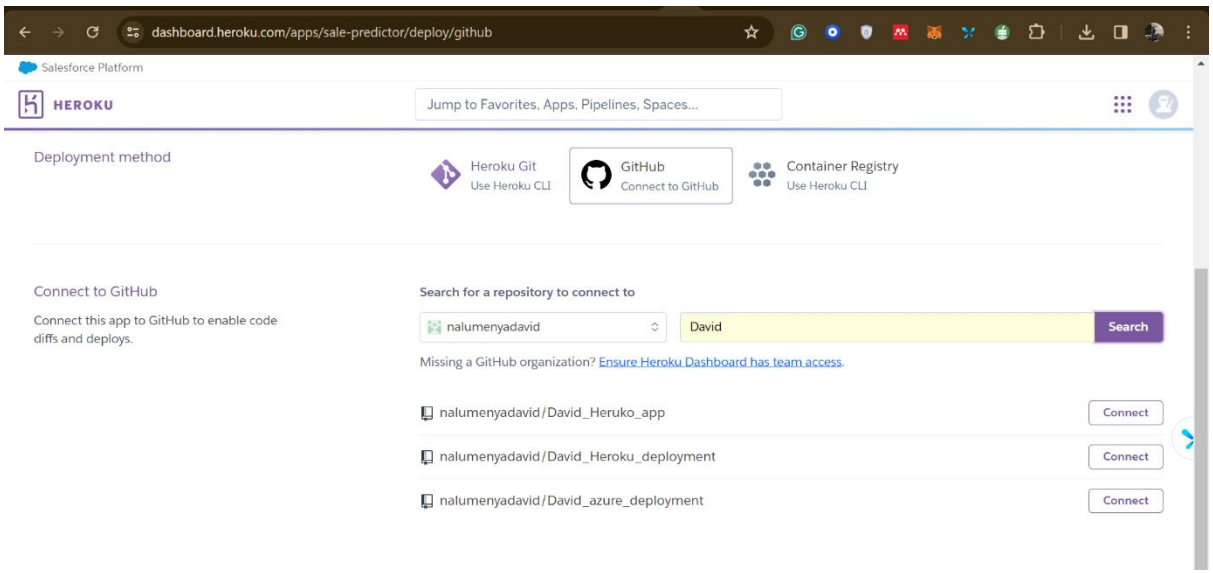
4. Creation of Flask app and deployment on pythonanywhere.com
    a) Opened up a free account on Heroku, it offers free server space however limited
    b) Downloaded and installed the Heroku CLI for error handling accessing app logs
    c) Changed the Heroku stack from Heroku 22 to Heroku 20, this helped with download and installation of some dependences that were deprecated in the later python releases (>3.9). This removed the errors and finally the app ran well.
    d) Created a new flask web app (click on Open web tab)



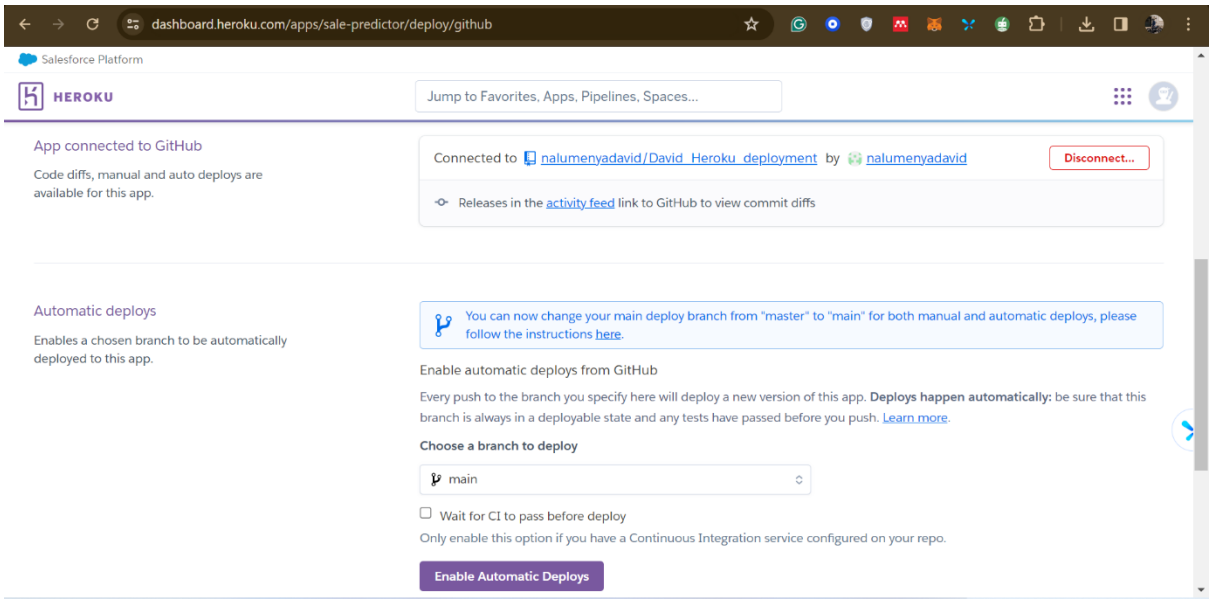


After creation of a new web app, names were: sales-predictor
Followed the instructions below, for deployment on to Heroku via Github API

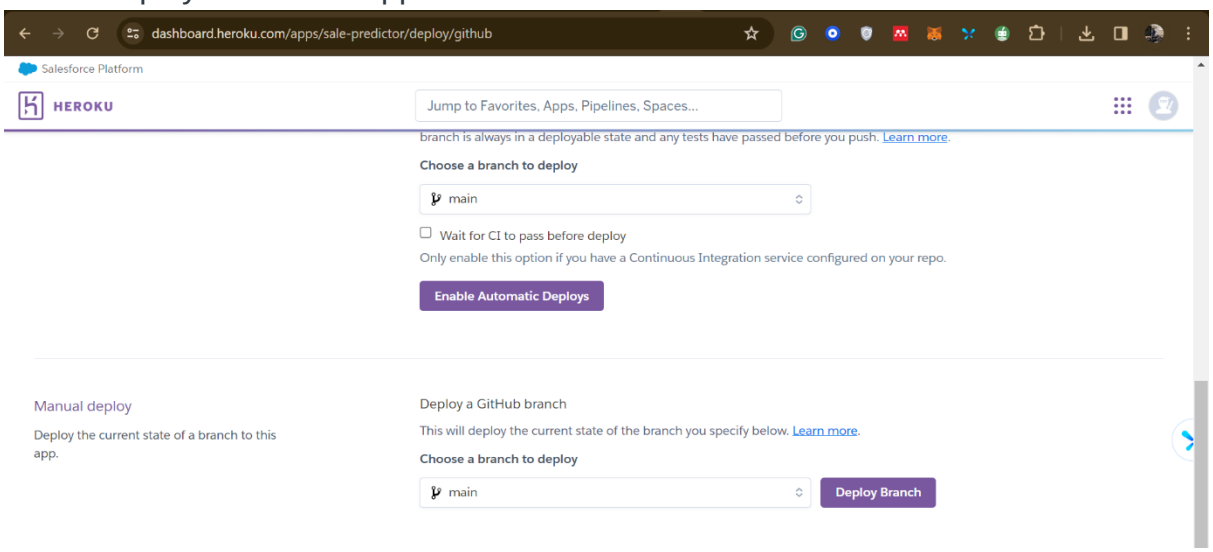
e) Connected the new instance of the web app to Github, using my valid Github account (nalumenyadavid), then connected to the “nalumenyadavid/David_Heroku_deployment” repository where I initially saved and kept all the web app scripts and code.



f) Deployed the flask web app after making sure every required file, script and code were in the same directory in the repository. I used manual deployment instead of automatic deploys (this requires more computational resources)



Then I deployed the web app over the heruko server.



g) Let’s run our flask app on the server using the link and predict