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Batch code : LISUM30: 30 JAN24 - 30 APRIL 24

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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-(1-0.91348096695731231)*(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

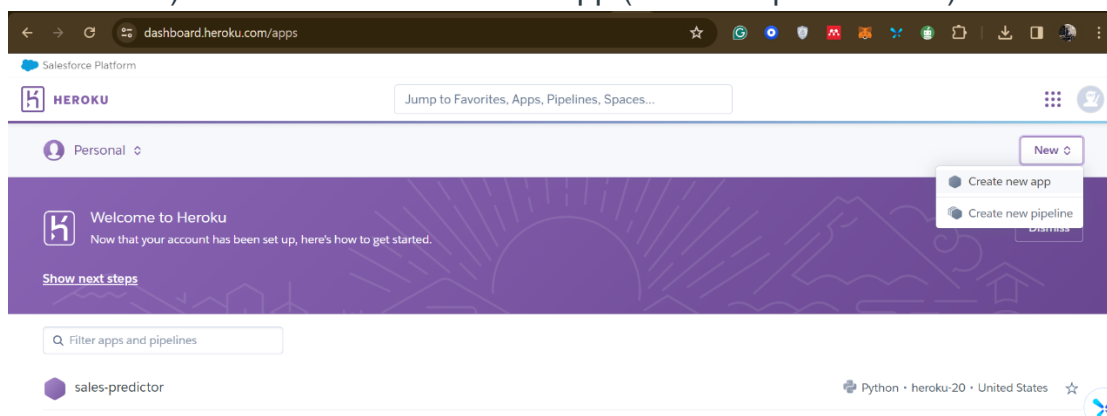
```
[69]: import pickle as pkl

[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

- Opened up a free account on Heroku, it offers free server space however limited
- Downloaded and installed the Heroku CLI for error handling accessing app logs
- 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.
- Created a new flask web app (click on Open web tab)



The screenshot shows the Heroku dashboard at `dashboard.heroku.com/new-app`. The page has a header with the Heroku logo and a search bar. Below the header is a section titled "Create New App". It contains a form with the following fields and buttons:

- App name:** A text input field with the placeholder text "app-name".
- Choose a region:** A dropdown menu showing "United States".
- Add to pipeline...** A button.
- Create app** and **Cancel** buttons at the bottom.

After creation of a new web app, names were: sales-predictor

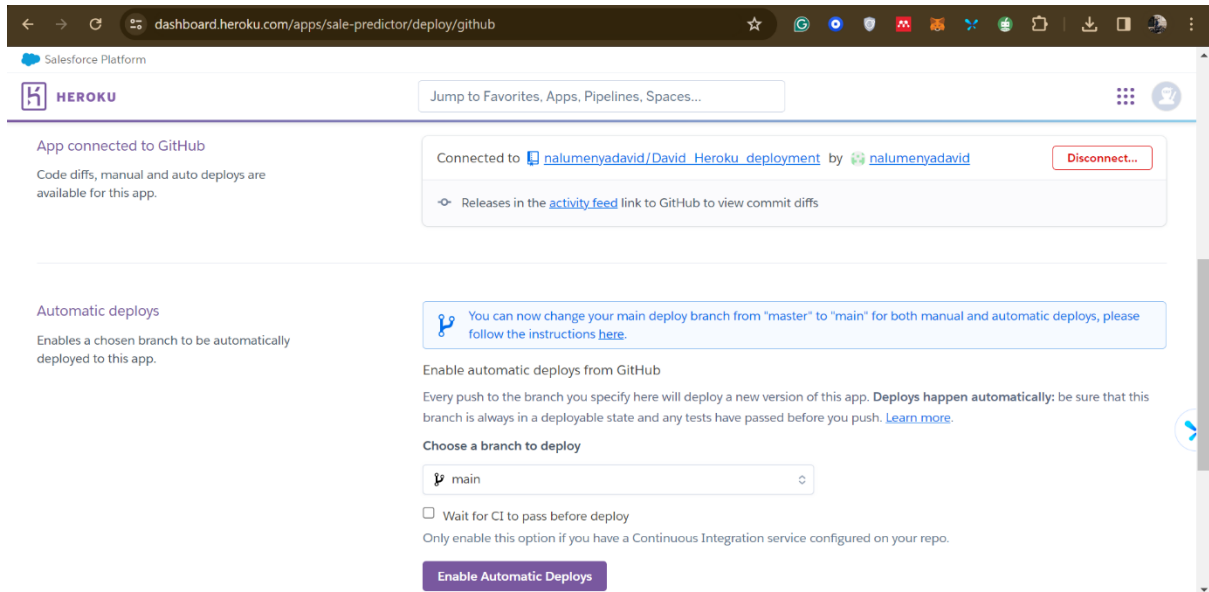
Followed the instructions below, for deployment on to Heroku via Github API

- 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.

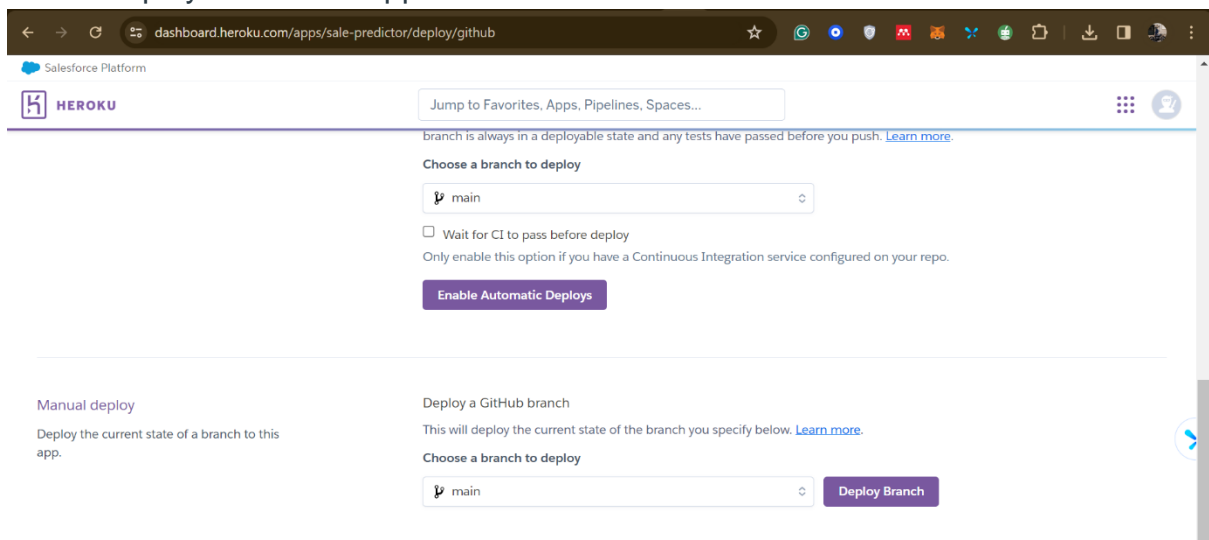
The screenshot shows the Heroku dashboard at `dashboard.heroku.com/apps/sale-predictor/deploy/github`. The page has a header with the Heroku logo and a search bar. Below the header is a section titled "Deployment method" with three options: "Heroku Git", "GitHub", and "Container Registry". The "GitHub" option is selected. Below this is a section titled "Connect to GitHub" with the text "Connect this app to GitHub to enable code diffs and deploys." To the right of this text is a search bar with the text "Search for a repository to connect to". The search bar has a dropdown menu showing "nalumenyadavid" and a search button labeled "Search". Below the search bar is a list of repositories with "Connect" buttons:

- `nalumenyadavid/David_Heruko_app` (Connect)
- `nalumenyadavid/David_Heroku_deployment` (Connect)
- `nalumenyadavid/David_azure_deployment` (Connect)

- 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

Predict total sales

389
300
20

Predict

Amount of total sales: \$ 74.12

