Vikas-Logistic Regression Estimated Salary classification matrics

June 27, 2023

[24]:
```
##data manupulation
import pandas as pd
## data visuali
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

[25]:
```
data=pd.read_csv('C:/Users/Vikas/Downloads/SocialNetworkAds.csv')
```

[26]:
```
 data
```

[26]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
..	…	…	…	…	…
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

[400 rows x 5 columns]

[27]:
```
 ## i want to see the top 5 col
data.head(5)
```

[27]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

[28]:
```
# i want to see the botom 5 col
data.tail(5)
```

[28]:
```
     User ID  Gender  Age  EstimatedSalary  Purchased
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1
```

[29]:
```
## i want to see in dataset all col
data.columns
```

[29]:
```
Index(['User ID', 'Gender', 'Age', 'EstimatedSalary', 'Purchased'],
dtype='object')
```

[30]:
```
## i want to see count of col all null values how much col and rows all␣
#information indataset
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   User ID          400 non-null    int64
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64
 3   EstimatedSalary  400 non-null    int64
 4   Purchased        400 non-null    int64
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

[31]:
```
## i want to see the max, min ,count,mean standard deviation.
data.describe().T
```

[31]:
```
                 count          mean           std         min           25%  \
User ID          400.0  1.569154e+07  71658.321581  15566689.0  15626763.75
Age              400.0  3.765500e+01     10.482877        18.0        29.75
EstimatedSalary  400.0  6.974250e+04  34096.960282     15000.0     43000.00
Purchased        400.0  3.575000e-01      0.479864         0.0         0.00

                      50%         75%         max
User ID          15694341.5  15750363.0  15815236.0
Age                 37.0        46.0        60.0
EstimatedSalary  70000.0     88000.0     150000.0
Purchased            0.0         1.0         1.0
```

[32]:
```
## i want to see the count of null values each col in dataset
data.isnull().sum()
```

[32]:
```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

[33]:
```
## extracting the idependent variables
x=data.iloc[:,[2,3]].values
```

[34]:
```
## extract dependent variable
y=data.iloc[:,4].values
```

[35]:
```
 x
```

[35]:
```
array([[    19,  19000],
       [    35,  20000],
       [    26,  43000],
       [    27,  57000],
       [    19,  76000],
       [    27,  58000],
       [    27,  84000],
       [    32, 150000],
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       [    26,  52000],
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```

[36]:
```
y
```

[36]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
```

```
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
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0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
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1, 1, 0, 1], dtype=int64)
```
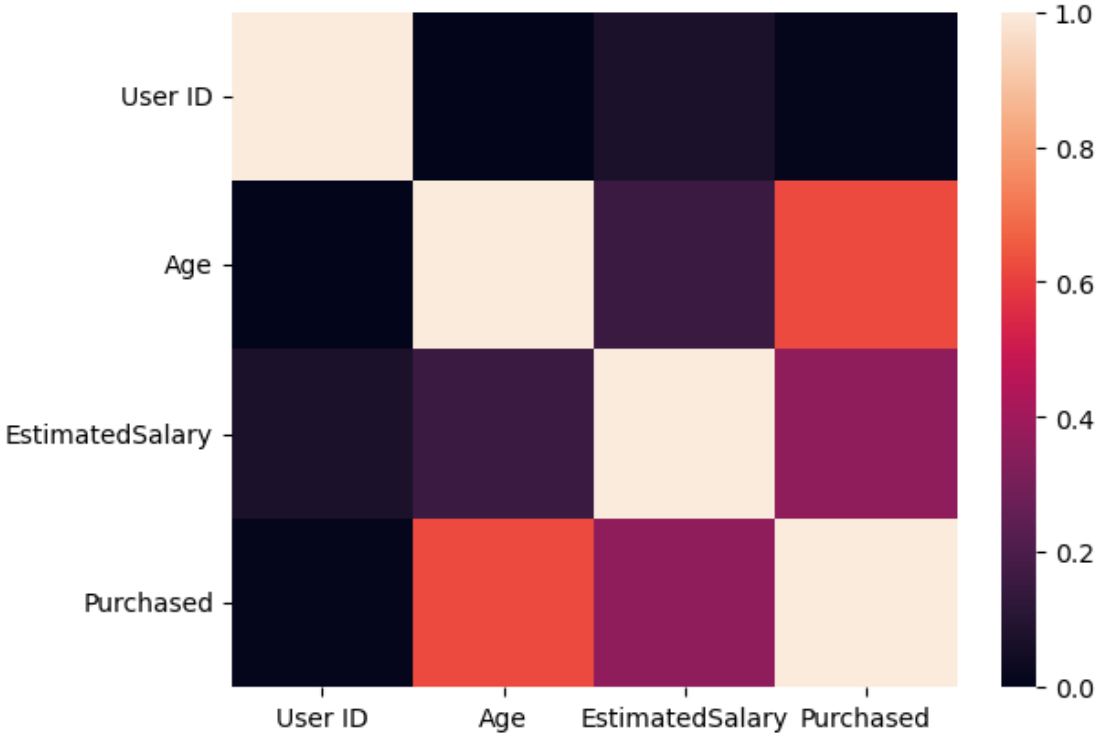
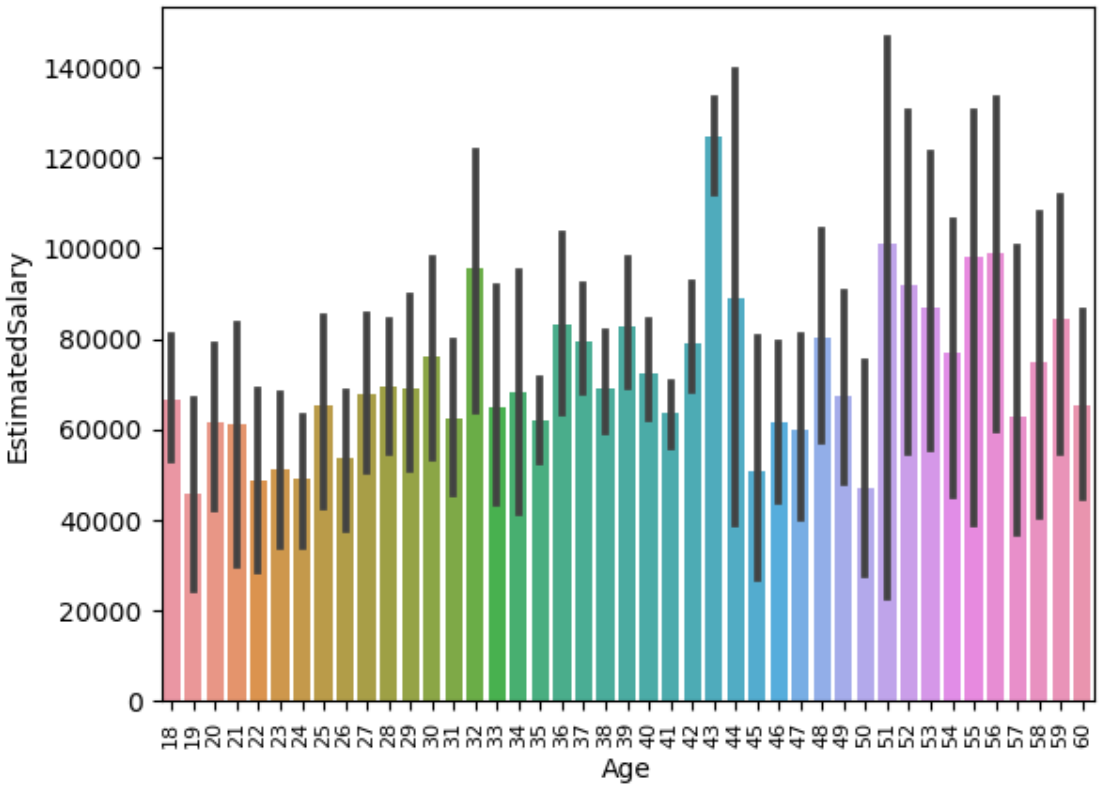

[37]:
```
## visualize the data
sns.heatmap(data.corr())
```

```
C:\Users\Vikas\AppData\Local\Temp\ipykernel_7304\907416350.py:2: FutureWarning:
The default value of numeric_only in DataFrame.corr is deprecated. In a future
version, it will default to False. Select only valid columns or specify the
value of numeric_only to silence this warning.
  sns.heatmap(data.corr())
```

[37]: <Axes: >



[38]:
```
## another way you visualize it,
sns.barplot(x='Age',y='EstimatedSalary',data=data)
plt.xticks(rotation='vertical',size=8)
plt.show()
```



[39]:
```
## spliting the data into training & testing set
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=1/3,
random_state=0)
```

[40]:
```
 from sklearn.preprocessing import StandardScaler
sc_x=StandardScaler()
x_train=sc_x.fit_transform(x_train)
x_test=sc_x.transform(x_test)
```

[41]:
```
 ## fitting the Logistic regression to training dataset
from sklearn.linear_model import LogisticRegression
logr=LogisticRegression(random_state=0)
logr.fit(x_train,y_train)
```

[41]:
```
LogisticRegression(random_state=0)
```

[42]:
```
x_test
```

[42]:
```
array([[-0.76605872,  0.52531653],
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```

```
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       [ 2.19287089, -0.81114232],
       [-1.35784464, -1.49422128],
       [ 0.41751312,  2.36665983]])
```

[44]:
```
y_pred=logr.predict(x_test)
```

[46]:
```
y_pred
```

[46]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1,
       0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0,
       0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1,
       0, 1], dtype=int64)
```

[49]:
```
## here i identityfy is purchased or not predicted
logr.predict_proba(x_test)
```

[49]:
```
array([[0.89124462, 0.10875538],
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       [0.84259855, 0.15740145],
```

```
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```

```
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```

```
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       [0.06707292, 0.93292708],
       [0.99491506, 0.00508494],
       [0.10877986, 0.89122014]])
```

[50]:
```
## i want to see score
logr.score(x_test,y_test)
```

[50]:
```
0.8731343283582089
```

[64]:
```
#3 confusion matrics
from sklearn.metrics import confusion_matrix

cm = confusion_matrix(y_test, y_pred)
print ("Confusion Matrix : \n", cm)
```

```
Confusion Matrix :
 [[79  6]
 [11 38]]
```

[67]:
```
# caluclate the accuracy
from sklearn.metrics import accuracy_score

print ("Accuracy : ", accuracy_score(y_test, y_pred))
```

```
Accuracy :  0.8731343283582089
```

[68]:
```
## i want to see the errors
from sklearn import metrics
print('MEA:',metrics.mean_absolute_error(y_test,y_pred))
print('MSE:',metrics.mean_squared_error(y_test,y_pred))
print('RMSE:',np.sqrt(metrics.mean_absolute_error(y_test,y_pred)))
```

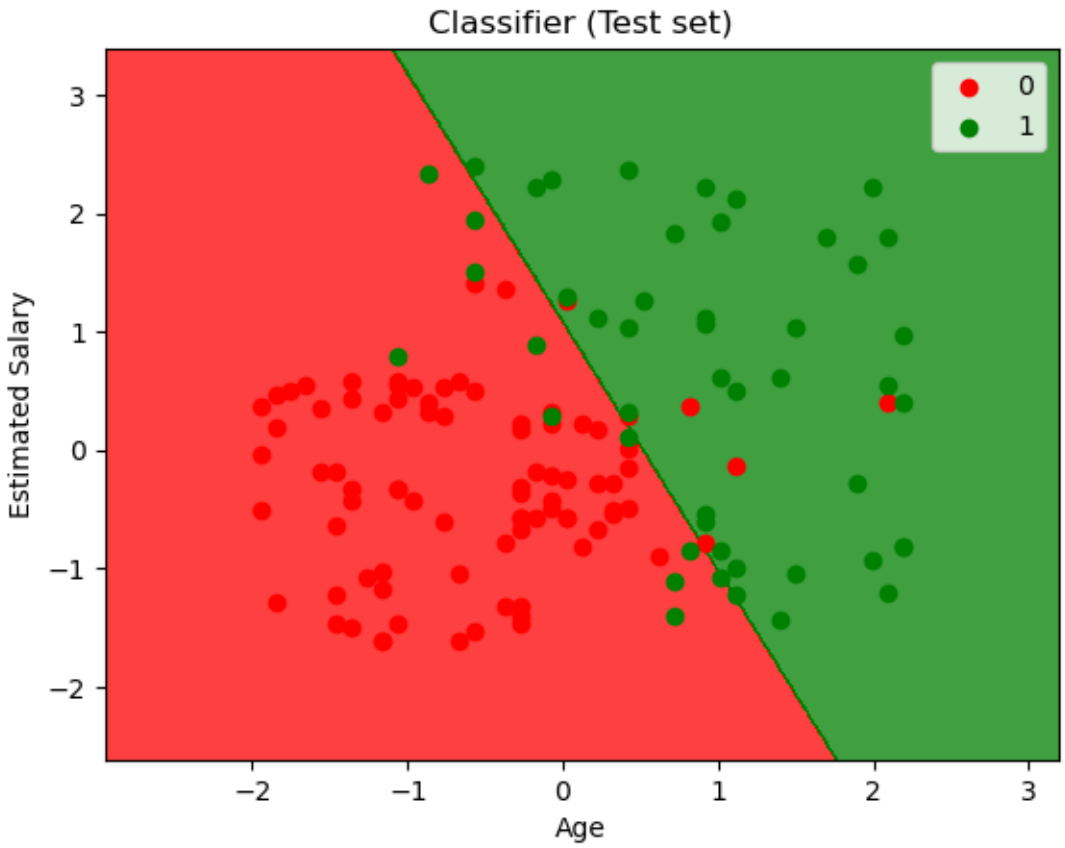
```
MEA: 0.12686567164179105
MSE: 0.12686567164179105
RMSE: 0.35618207653079775
```

[71]:
```
import numpy as np
print("Mean of y_test: ", np.mean(y_test))
print("Mean of y_pred: ", np.mean(y_pred))

print("Median of y_test: ", np.median(y_test))
print("Median of y_pred: ", np.median(y_pred))
```

```
Mean of y_test:  0.3656716417910448
Mean of y_pred:  0.3283582089552239
Median of y_test:  0.0
Median of y_pred:  0.0
```

[75]:
```
from matplotlib.colors import ListedColormap

x_set, y_set = x_test, y_test
x1, x2 = np.meshgrid(np.arange(start = x_set[:, 0].min() - 1,
                               stop = x_set[:, 0].max() + 1, step = 0.01),
                     np.arange(start = x_set[:, 1].min() - 1,
                               stop = x_set[:, 1].max() + 1, step = 0.01))

plt.contourf(x1, x2, logr.predict(
             np.array([x1.ravel(), x2.ravel()]).T).reshape(
             x1.shape), alpha = 0.75, cmap = ListedColormap(('red', 'green')))

plt.xlim(x1.min(), x1.max())
plt.ylim(x2.min(), x2.max())

for i, j in enumerate(np.unique(y_set)):
    plt.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)

plt.title('Classifier (Test set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```

```
C:\Users\Vikas\AppData\Local\Temp\ipykernel_7304\102137657.py:17: UserWarning:
*c* argument looks like a single numeric RGB or RGBA sequence, which should be
avoided as value-mapping will have precedence in case its length matches with
*x* & *y*.  Please use the *color* keyword-argument or provide a 2D array with a
single row if you intend to specify the same RGB or RGBA value for all points.
  plt.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1],
```


Classifier (Test set)
Estimated Salary
Age
0
1
3
2
1
0
−1
−2
−2
−1
0
1
2
3

[ ]: