Lab - 1

PRML
AY 2020-21, Trimester - III

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Comparing models on the basis of:

Accuracy

Accuracy tells us what proportion of the data points we predicted correctly, i.e. *accurately*.

F1 Score

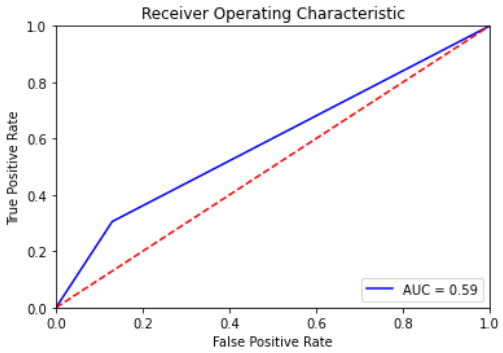
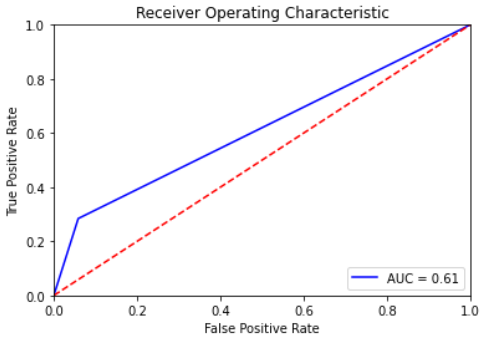
F1 is an overall measure of a model's accuracy that combines precision and recall. A good F1 score means that you have low false positives and low false negatives, so you're correctly identifying real threats and you are not disturbed by false alarms. An F1 score is considered perfect when it's 1, while the model is a total failure when it's 0.

AUC-ROC

The higher the AUC, better the performance of the model at distinguishing between the positive and negative classes.

Metrics for both the models at different threshold values

Threshold = 0.6

Metric	Logistic Regression(LR)	Random Forest(RF)
ROC Curve	 AUC = 0.59	 AUC = 0.61
TP	2406	2239
TN	6858	7417
FP	1021	462
FN	5473	5640
Accuracy	58.789186444980324	61.276811778144435
Precision	70.20717829004961	82.89522399111439

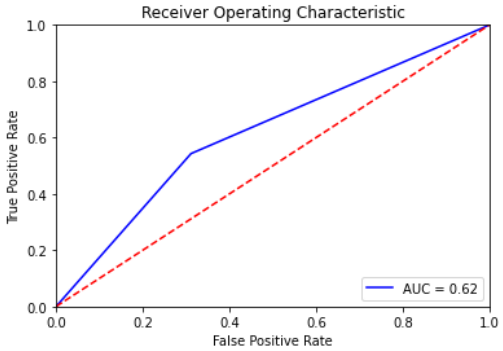
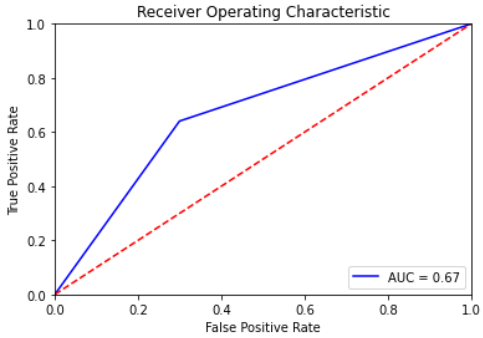
Recall	30.536870161187966	28.417311841604263
F1 Score	0.4256147178489298	0.4232514177693762

- Accuracy of RF is higher than that of LR
- LR has a comparatively better F1 Score
- AUC for RF is slightly higher than that of LR

The above imply that at a threshold of 0.6:

- For a better performance at distinguishing between the two classes or higher accuracy, Random Forest model seems to be a better choice.
- For having lower false positives and lower false negatives, Linear Regression model would be a better choice.

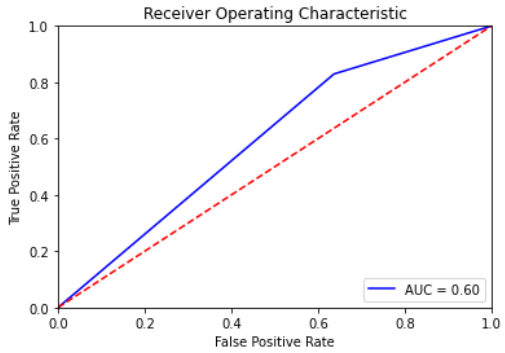
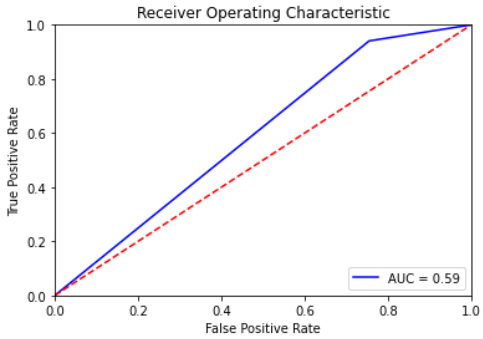
Threshold = 0.5

Metric	Logistic Regression(LR)	Random Forest(RF)
ROC Curve	 AUC = 0.62	 AUC = 0.67
TP	4279	5047
TN	5425	5519
FP	2454	2360
FN	3600	2832
Accuracy	61.58141896179718	67.05165630156111
Precision	63.55265112134264	68.1382476036182
Recall	54.30892245208783	64.05635232897576
F1 Score	0.5856830002737476	0.6603427973308911

- Accuracy of RF is higher than that of LR
- RF has a better F1 Score
- AUC for RF is higher than that of LR

The above imply that at a threshold of 0.5, Random Forest seems to be a better model.

Threshold = 0.4

Metric	Logistic Regression(LR)	Random Forest(RF)
ROC	 AUC = 0.60	 AUC = 0.59
TP	6535	7411
TN	2862	1930
FP	5017	5949
FN	1344	468
Accuracy	59.633202183018156	59.27782713542328
Precision	56.570290858725755	55.471556886227546
Recall	82.94199771544612	94.06015991877142
F1 Score	0.6726365086717101	0.6978671312208673

- Accuracy of LR is slightly higher than that of RF
- RF has a better F1 Score
- AUC for LR is higher than that of RF

The above imply that at a threshold of 0.4, Linear Regression seems to be a better model for accuracy or for performance at distinguishing between the classes whereas Random Forest looks like a better choice for a higher F1 score.

For the above thresholds:

- For a better performance at distinguishing (i.e better AUC) or a better accuracy, having a threshold of 0.5 is a better decision as both the given models perform better at predicting here.
- For having lower false predictions (i.e higher F1 scores), a threshold of 0.4 would be a better choice for both the models.