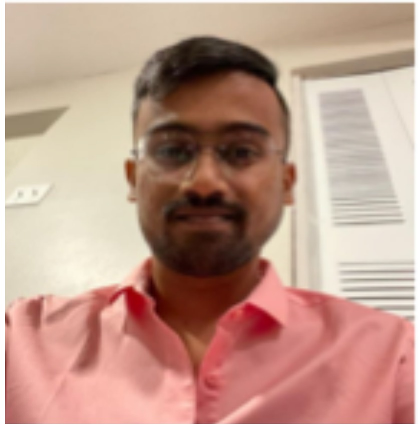
HCDR Team 1

Phase 2

Zack Seliger

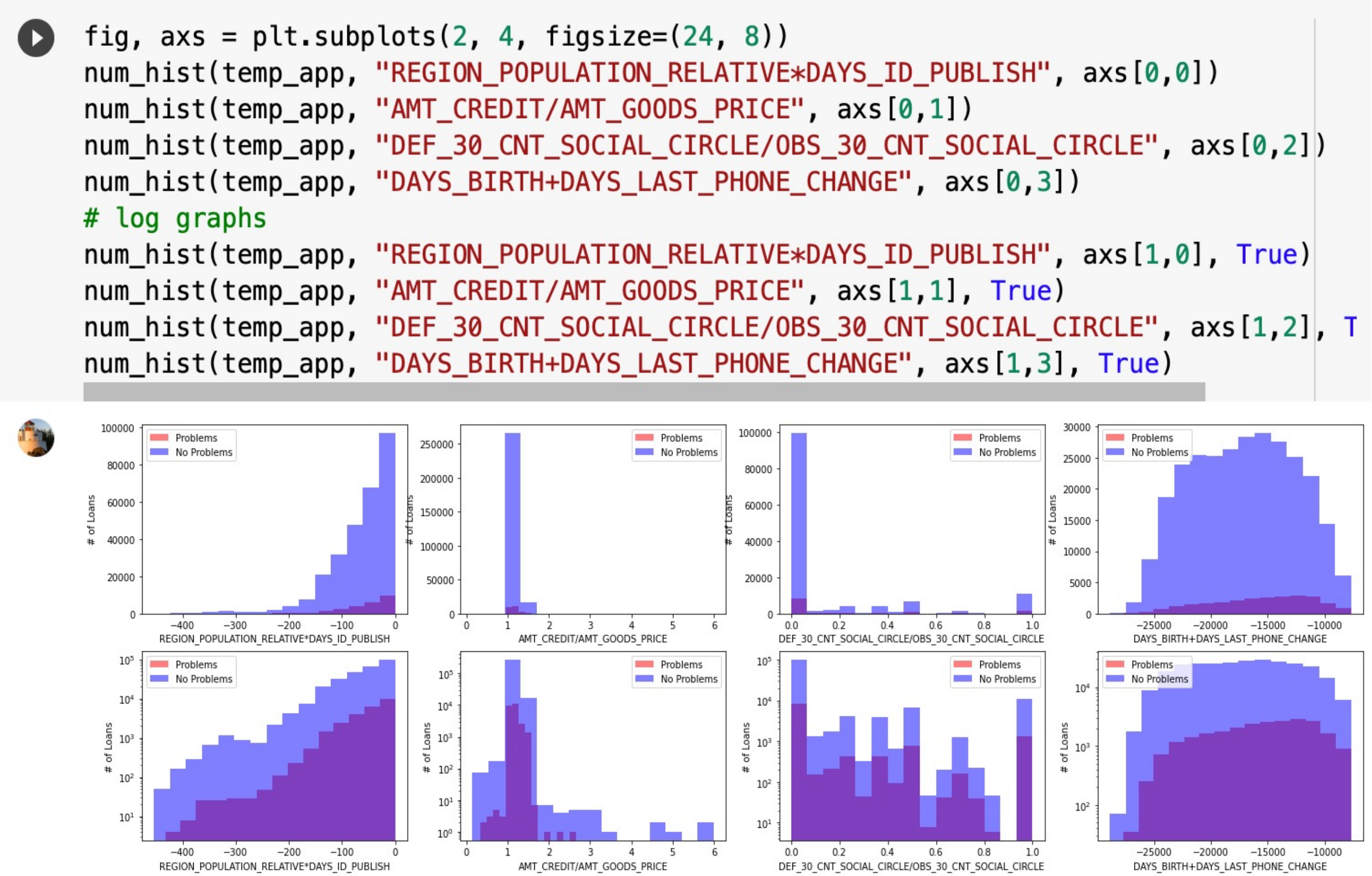
Keegan Moore

Jagan Lakku



Raja Simha Reddy

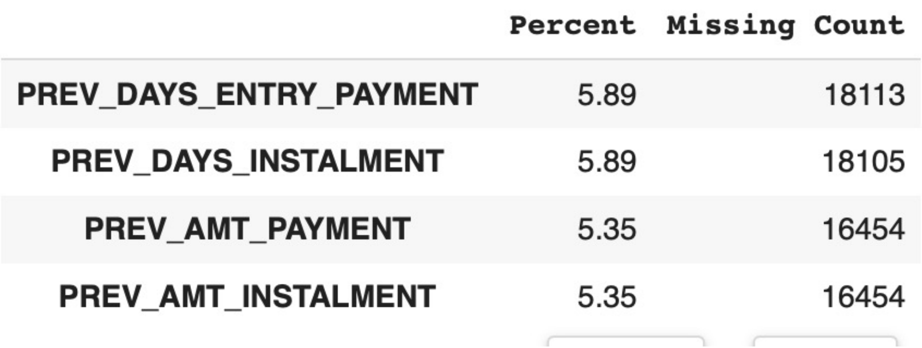
ANALYSIS OF NEW FEATURES



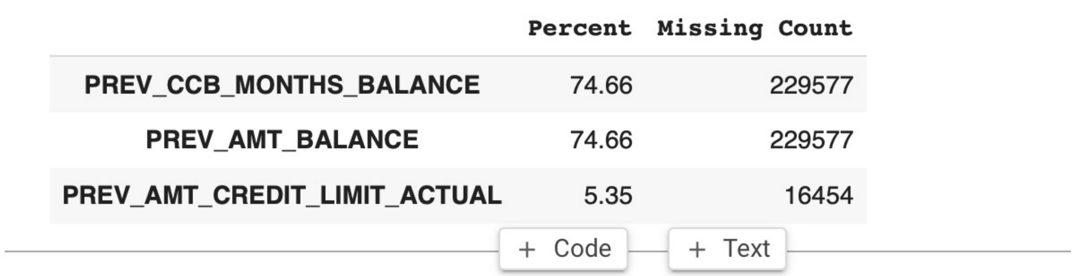
```
fig, axs = plt.subplots(2, 4, figsize=(24, 8))
num_hist(temp_app, "REGION_POPULATION_RELATIVE*DAYS_ID_PUBLISH", axs[0,0])
num_hist(temp_app, "AMT_CREDIT/AMT_GOODS_PRICE", axs[0,1])
num_hist(temp_app, "DEF_30_CNT_SOCIAL_CIRCLE/OBS_30_CNT_SOCIAL_CIRCLE", axs[0,2])
num_hist(temp_app, "DAYS_BIRTH+DAYS_LAST_PHONE_CHANGE", axs[0,3])
# log graphs
num_hist(temp_app, "REGION_POPULATION_RELATIVE*DAYS_ID_PUBLISH", axs[1,0], True)
num_hist(temp_app, "AMT_CREDIT/AMT_GOODS_PRICE", axs[1,1], True)
num_hist(temp_app, "DEF_30_CNT_SOCIAL_CIRCLE/OBS_30_CNT_SOCIAL_CIRCLE", axs[1,2], T
num_hist(temp_app, "DAYS_BIRTH+DAYS_LAST_PHONE_CHANGE", axs[1,3], True)
```

- ➢ Extending the work done in phase 1 , we explored more deep into the data sets considering all the secondary data and These relationships are quite interesting
- ➢ By referencing the graphs above this set, REGION_POPULATION_RELATIVE and DAYS_ID_PUBLISH have graphs with one high point around the middle.
  However, REGION_POPULATION_RELATION*DAYS_ID_PUBLISH has a clear trend that, the further to the right, the more problems the client has with repayment

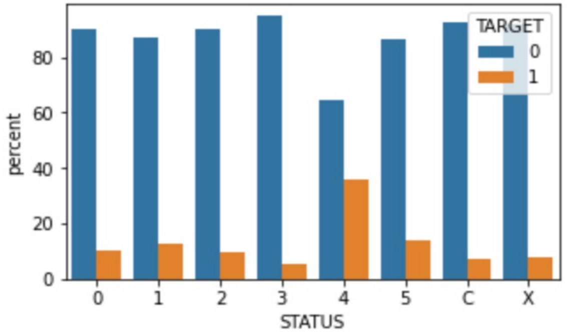
More New Features



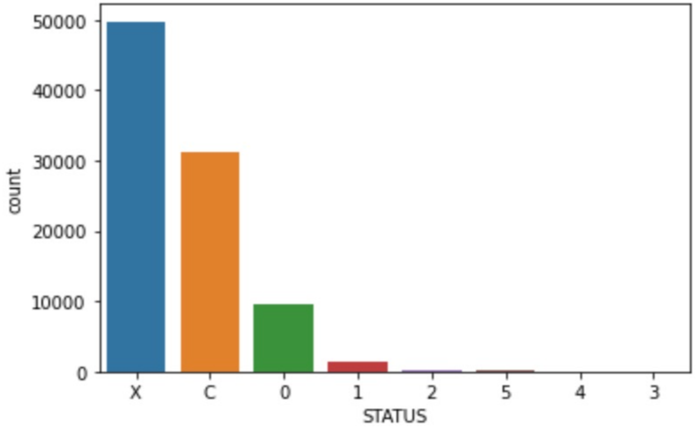
	Percent	Missing Count
PREV_DAYS_ENTRY_PAYMENT	5.89	18113
PREV_DAYS_INSTALMENT	5.89	18105
PREV_AMT_PAYMENT	5.35	16454
PREV_AMT_INSTALMENT	5.35	16454



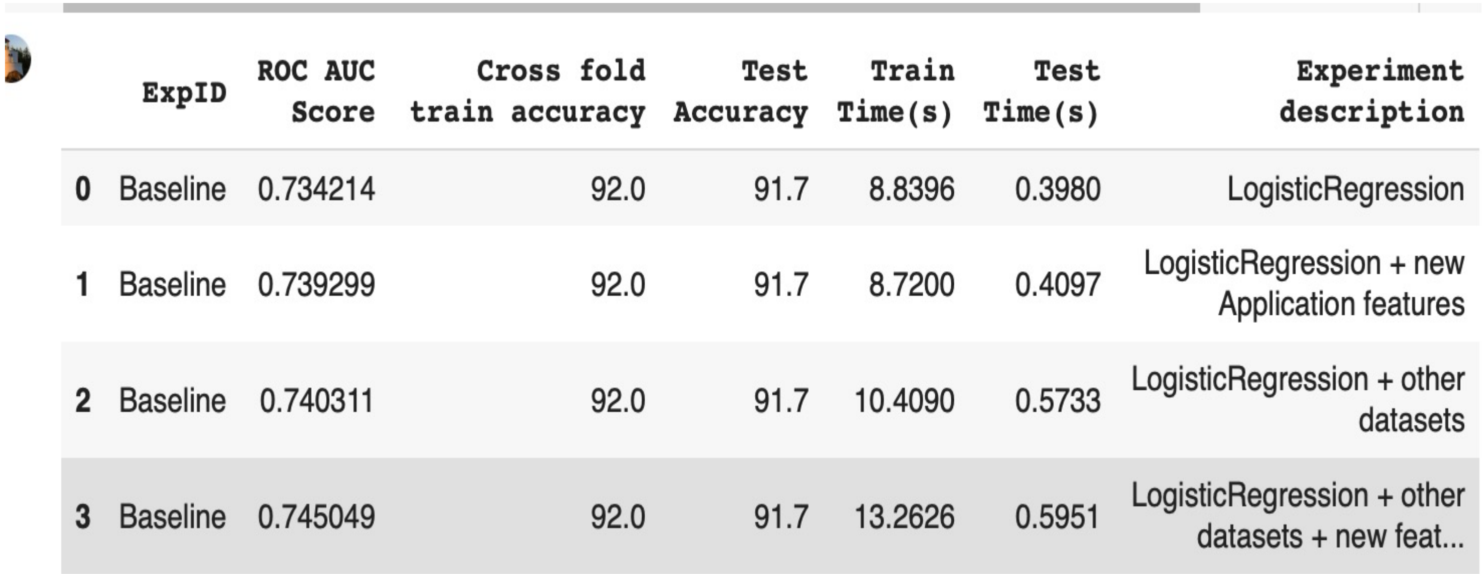
	Percent	Missing Count
PREV_CCB_MONTHS_BALANCE	74.66	229577
PREV_AMT_BALANCE	74.66	229577
PREV_AMT_CREDIT_LIMIT_ACTUAL	5.35	16454



```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa501a8ee50>
```



Exploration Of Datasets on Baselinemodel

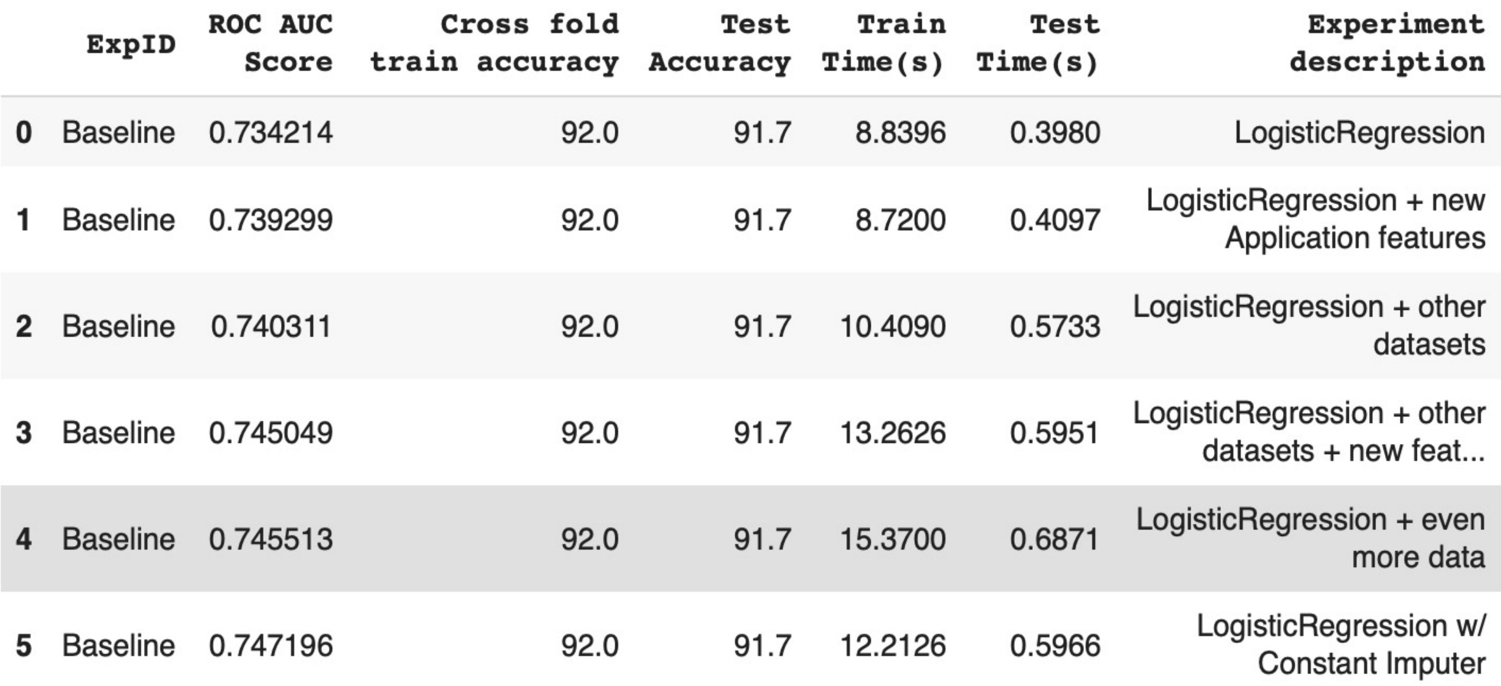


	ExpID	ROC AUC Score	Cross fold train accuracy	Test Accuracy	Train Time(s)	Test Time(s)	Experiment description
0	Baseline	0.734214	92.0	91.7	8.8396	0.3980	LogisticRegression
1	Baseline	0.739299	92.0	91.7	8.7200	0.4097	LogisticRegression + new Application features
2	Baseline	0.740311	92.0	91.7	10.4090	0.5733	LogisticRegression + other datasets
3	Baseline	0.745049	92.0	91.7	13.2626	0.5951	LogisticRegression + other datasets + new feat...

- ➢ Conducted EDA on all the Secondary Data
- ➢ Did Baseline Model for Application data and all Secondary Data
- ➢ Explored LogisticRegression on New Application Features and other Datasets and found the ROC AUC score which doesn’t really improve
- ➢ LogisticRegression seemed to improve with the new feature on all the Datasets

TWEAKING IMPUTERS

- We should be using the categorical imputer with a constant strategy. Instead of assigning NaN data with the most frequent category, maybe we should instead create a new category for all of this data.
- This would deal with certain categories, like employment data types, where it seemed that unemployed clients were labelled as NaN and shouldn't be grouped in with other categories.
- When compared it with experiment 3, it performs better. We should continue using this change to the imputer in the future



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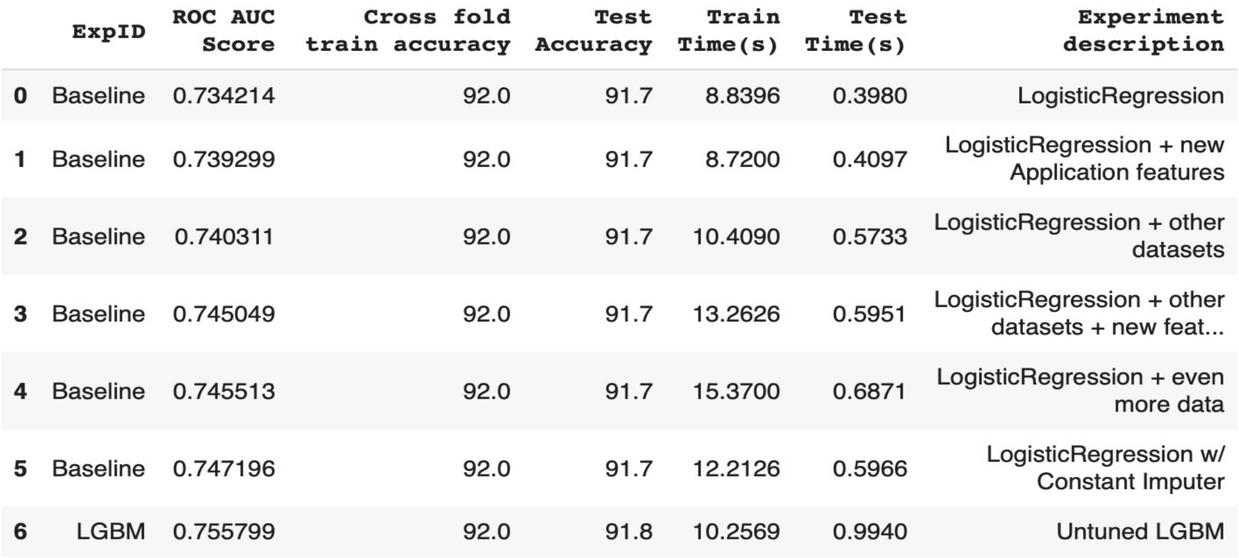
3	Baseline	0.745049	92.0	91.7	13.2626	0.5951	LogisticRegression + other datasets + new feat...
4	Baseline	0.745513	92.0	91.7	15.3700	0.6871	LogisticRegression + even more data
5	Baseline	0.747196	92.0	91.7	12.2126	0.5966	LogisticRegression w/ Constant Imputer

UNTUNED LGBM

- Trained an LGBM Classifier on the data from application plus the data from our datasets and new engineered features
- It performs the best of any models we have yet. We still need to tune it, and can add more data
- These new features clearly make our model better. Now, we need to do optimize it using Grid Search



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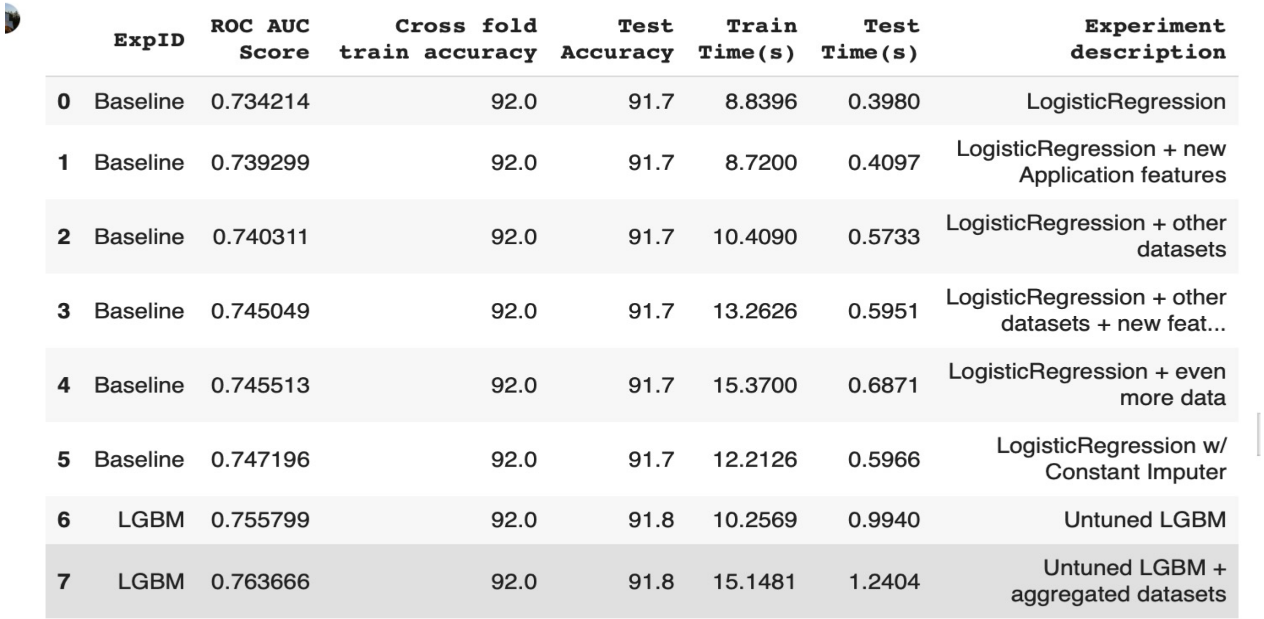
6	LGBM	0.755799	92.0	91.8	10.2569	0.9940	Untuned LGBM



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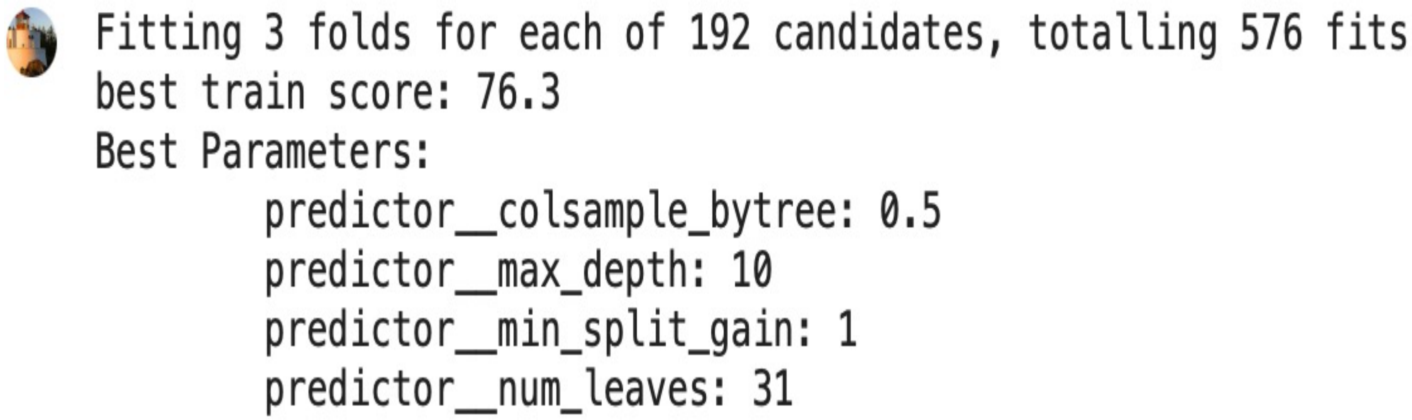
6	LGBM	0.755799	92.0	91.8	10.2569	0.9940	Untuned LGBM
7	LGBM	0.763666	92.0	91.8	15.1481	1.2404	Untuned LGBM + aggregated datasets

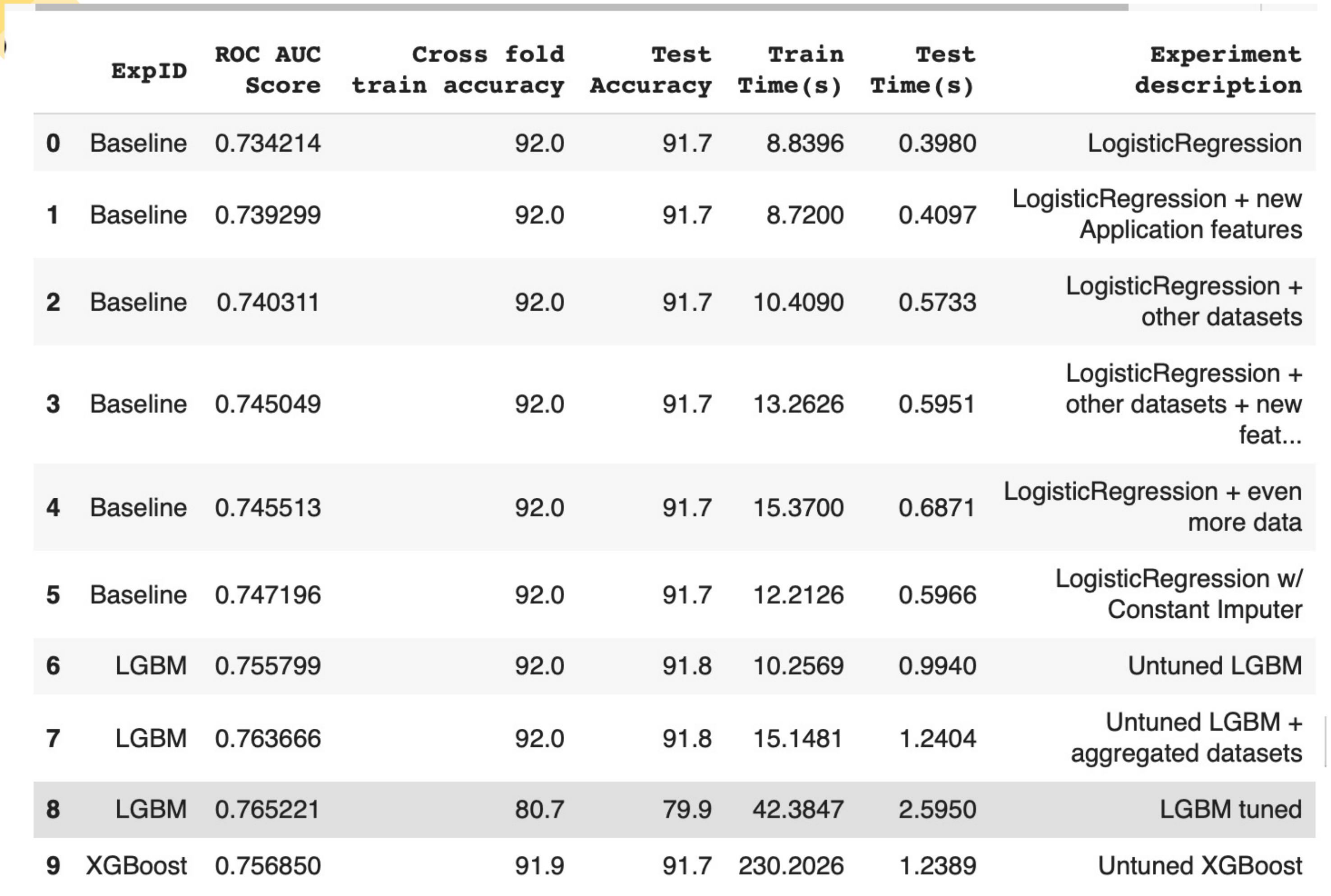
GRID SEARCH FOR LGBM



```
Fitting 3 folds for each of 192 candidates, totalling 576 fits
best train score: 76.3
Best Parameters:
        predictor__colsample_bytree: 0.5
        predictor__max_depth: 10
        predictor__min_split_gain: 1
        predictor__num_leaves: 31
```

- Since Grid Search takes a while when testing for larger values of n_estimators, we tested all other hyperparameters before testing n_estimators
- And the best parameters which fit the LGBM model for given data is as below

TUNED LGBM



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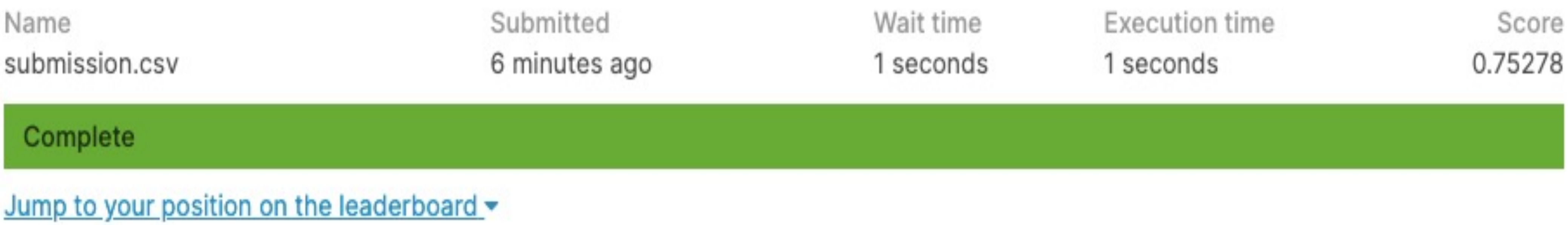
7	LGBM	0.763666	92.0	91.8	15.1481	1.2404	Untuned LGBM + aggregated datasets
8	LGBM	0.765221	80.7	79.9	42.3847	2.5950	LGBM tuned
9	XGBoost	0.756850	91.9	91.7	230.2026	1.2389	Untuned XGBoost

- We have added the extra data that we got from the "More Data" experiment to an LGBM model with tuned hyperparameters to see if it can improve the
- Untuned XGBoost Model:

We have tested if XGBoost can do any better than Tuned LGBM , but LGBM does it more better .

KAGGLE SUBMISSION



Name	Submitted	Wait time	Execution time	Score
submission.csv	6 minutes ago	1 seconds	1 seconds	0.75278

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