python hyperparameter campaign response

Result from original python code

logistic regression model - SMOTE
training set

	precision	recall	f1-score	support
0	0.68	0.62	0.65	4389
1	0.65	0.71	0.68	4389
accuracy			0.67	8778
macro avg	0.67	0.67	0.67	8778
weighted avg	0.67	0.67	0.67	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.75	1848
1	0.18	0.71	0.29	218
accuracy			0.64	2066
macro avg	0.57	0.67	0.52	2066
weighted avg	0.87	0.64	0.71	2066

XGBoost model - SMOTE - parameter tuning
[0] validation_0-auc:0.611373
Will train until validation_0-auc hasn't improved in 5 rounds.

training set

	precision	recall	f1-score	support
0	0.81	0.63	0.71	4389
1	0.70	0.86	0.77	4389
accuracy			0.74	8778
macro avg	0.76	0.74	0.74	8778
weighted avg	0.76	0.74	0.74	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.76	1848
1	0.19	0.74	0.31	218
accuracy			0.65	2066
macro avg	0.57	0.69	0.53	2066
weighted avg	0.87	0.65	0.71	2066

Result from original python code

```
XGBoost model - oversampled
[0]     validation_0-auc:0.71776
Will train until validation_0-auc hasn't improved in 5 rounds.
[1]     validation_0-auc:0.730129
[2]     validation_0-auc:0.731335
[3]     validation_0-auc:0.732199
[4]     validation_0-auc:0.732009
[5]     validation_0-auc:0.733986
[6]     validation_0-auc:0.734008
[7]     validation_0-auc:0.734353
[8]     validation_0-auc:0.734721
[9]     validation_0-auc:0.734507
[10]    validation_0-auc:0.737226
[11]    validation_0-auc:0.737584
[12]    validation_0-auc:0.737529
[13]    validation_0-auc:0.738018
[14]    validation_0-auc:0.738306
[15]    validation_0-auc:0.738075
[16]    validation_0-auc:0.73867
[17]    validation_0-auc:0.738399
[18]    validation_0-auc:0.738837
[19]    validation_0-auc:0.738752
[20]    validation_0-auc:0.738777
[21]    validation_0-auc:0.73744
[22]    validation_0-auc:0.738809
[23]    validation_0-auc:0.738641
Stopping. Best iteration:
[18]    validation_0-auc:0.738837
```

```
XGBoost model - undersampled
[0]     validation_0-auc:0.705229
Will train until validation_0-auc hasn't improved in 5 rounds.
[1]     validation_0-auc:0.713788
[2]     validation_0-auc:0.716027
[3]     validation_0-auc:0.716674
[4]     validation_0-auc:0.715722
[5]     validation_0-auc:0.716981
[6]     validation_0-auc:0.715989
[7]     validation_0-auc:0.717465
[8]     validation_0-auc:0.716698
[9]     validation_0-auc:0.718954
[10]    validation_0-auc:0.718443
[11]    validation_0-auc:0.720803
[12]    validation_0-auc:0.721902
[13]    validation_0-auc:0.721018
[14]    validation_0-auc:0.722452
[15]    validation_0-auc:0.723688
[16]    validation_0-auc:0.723585
[17]    validation_0-auc:0.726791
[18]    validation_0-auc:0.727038
[19]    validation_0-auc:0.727042
[20]    validation_0-auc:0.727542
[21]    validation_0-auc:0.727999
[22]    validation_0-auc:0.728137
[23]    validation_0-auc:0.729541
[24]    validation_0-auc:0.729021
[25]    validation_0-auc:0.728669
[26]    validation_0-auc:0.728642
[27]    validation_0-auc:0.73034
[28]    validation_0-auc:0.730049
[29]    validation_0-auc:0.730086
```

```
XGBoost model - SMOTE
[0]     validation_0-auc:0.719724
Will train until validation_0-auc hasn't improved in 5 rounds.
[1]     validation_0-auc:0.723431
[2]     validation_0-auc:0.735221
[3]     validation_0-auc:0.734822
[4]     validation_0-auc:0.733489
[5]     validation_0-auc:0.734515
[6]     validation_0-auc:0.73512
[7]     validation_0-auc:0.739788
[8]     validation_0-auc:0.737715
[9]     validation_0-auc:0.743504
[10]    validation_0-auc:0.743524
[11]    validation_0-auc:0.739335
[12]    validation_0-auc:0.740311
[13]    validation_0-auc:0.738329
[14]    validation_0-auc:0.7399
[15]    validation_0-auc:0.739269
Stopping. Best iteration:
[10]    validation_0-auc:0.743524
```

Compare result-1 (take log `monetary_value`)

- Original

logistic regression model - SMOTE
training set

	precision	recall	f1-score	support
0	0.68	0.62	0.65	4389
1	0.65	0.71	0.68	4389
accuracy			0.67	8778
macro avg	0.67	0.67	0.67	8778
weighted avg	0.67	0.67	0.67	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.75	1848
1	0.18	0.71	0.29	218
accuracy			0.64	2066
macro avg	0.57	0.67	0.52	2066
weighted avg	0.87	0.64	0.71	2066

- Modify code

logistic regression model - undersampled
training set

	precision	recall	f1-score	support
0	0.68	0.63	0.65	429
1	0.66	0.70	0.68	429
accuracy			0.67	858
macro avg	0.67	0.67	0.67	858
weighted avg	0.67	0.67	0.67	858

test set

	precision	recall	f1-score	support
0	0.95	0.62	0.75	1848
1	0.19	0.72	0.29	218
accuracy			0.63	2066
macro avg	0.57	0.67	0.52	2066
weighted avg	0.87	0.63	0.70	2066

Compare result-1 (take log `monetary_value`)

- Original

```
XGBoost model - SMOTE - parameter tuning
[0]     validation_0-auc:0.611373
Will train until validation_0-auc hasn't improved in 5 rounds.
[1]     validation_0-auc:0.733395
[2]     validation_0-auc:0.728699
[3]     validation_0-auc:0.738274
[4]     validation_0-auc:0.738525
[5]     validation_0-auc:0.732941
[6]     validation_0-auc:0.740621
[7]     validation_0-auc:0.741142
[8]     validation_0-auc:0.740015
[9]     validation_0-auc:0.739549
[10]    validation_0-auc:0.741946
[11]    validation_0-auc:0.737816
[12]    validation_0-auc:0.738247
[13]    validation_0-auc:0.737253
[14]    validation_0-auc:0.736756
[15]    validation_0-auc:0.736153
Stopping. Best iteration:
[10]    validation_0-auc:0.741946
```

- Modify code

```
XGBoost model - SMOTE - parameter tuning
[0]     validation_0-auc:0.675002
Will train until validation_0-auc hasn't improved in 5 rounds.
[1]     validation_0-auc:0.69401
[2]     validation_0-auc:0.717146
[3]     validation_0-auc:0.717519
[4]     validation_0-auc:0.729833
[5]     validation_0-auc:0.737114
[6]     validation_0-auc:0.736862
[7]     validation_0-auc:0.732843
[8]     validation_0-auc:0.732597
[9]     validation_0-auc:0.730563
[10]    validation_0-auc:0.734865
Stopping. Best iteration:
[5]     validation_0-auc:0.737114
```

Compare result-1 (LG Solver='newton-cg')

- Original

```
logistic regression model - undersampled
training set
              precision    recall  f1-score   support

           0       0.69      0.62      0.65       429
           1       0.65      0.72      0.69       429

    accuracy                           0.67       858
   macro avg       0.67      0.67      0.67       858
weighted avg       0.67      0.67      0.67       858

test set
              precision    recall  f1-score   support

           0       0.96      0.60      0.74      1848
           1       0.18      0.76      0.30       218

    accuracy                           0.62      2066
   macro avg       0.57      0.68      0.52      2066
weighted avg       0.87      0.62      0.69      2066
```

- Modify code

```
logistic regression model - undersampled
training set
              precision    recall  f1-score   support

           0       0.68      0.62      0.65       429
           1       0.65      0.71      0.68       429

    accuracy                           0.67       858
   macro avg       0.67      0.67      0.66       858
weighted avg       0.67      0.67      0.66       858

test set
              precision    recall  f1-score   support

           0       0.95      0.62      0.75      1848
           1       0.18      0.72      0.29       218

    accuracy                           0.63      2066
   macro avg       0.57      0.67      0.52      2066
weighted avg       0.87      0.63      0.70      2066
```

Compare result-1 (LG Solver='newton-cg')

- Original

logistic regression model - SMOTE
training set

	precision	recall	f1-score	support
0	0.68	0.62	0.65	4389
1	0.65	0.71	0.68	4389
accuracy			0.67	8778
macro avg	0.67	0.67	0.67	8778
weighted avg	0.67	0.67	0.67	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.75	1848
1	0.18	0.71	0.29	218
accuracy			0.64	2066
macro avg	0.57	0.67	0.52	2066
weighted avg	0.87	0.64	0.71	2066

- Modify code

logistic regression model - SMOTE
training set

	precision	recall	f1-score	support
0	0.68	0.62	0.65	4389
1	0.65	0.71	0.68	4389
accuracy			0.67	8778
macro avg	0.67	0.67	0.67	8778
weighted avg	0.67	0.67	0.67	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.76	1848
1	0.18	0.71	0.29	218
accuracy			0.64	2066
macro avg	0.57	0.67	0.52	2066
weighted avg	0.87	0.64	0.71	2066

Conclusion

- การเปลี่ยน hyperparameter ของ model อาจไม่ได้ช่วยให้ accuracy ของ model สูงขึ้นมากนัก และในบางครั้งก็อาจจะอธิบายที่มาของการปรับแต่งดังกล่าวไม่ได้ ว่ามีความเกี่ยวข้องกับ data นั้น ๆ อย่างไร
- การเพิ่ม feature น่าจะเป็นทางเลือกที่ดีกว่า ในการปรับ accuracy ของ model ให้ดีขึ้น