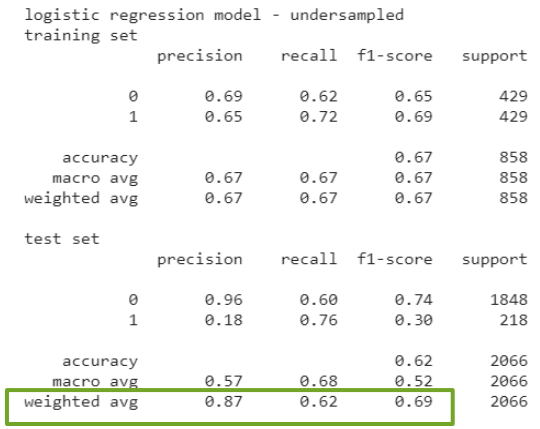
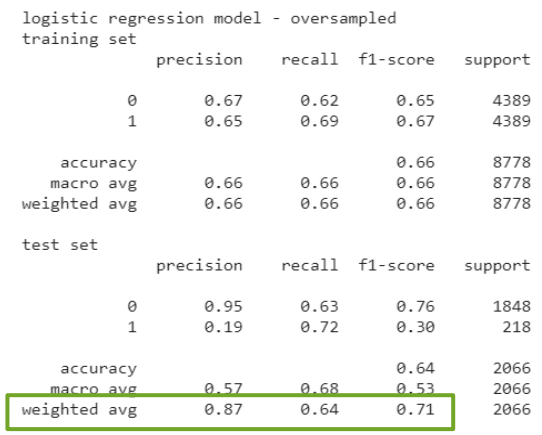
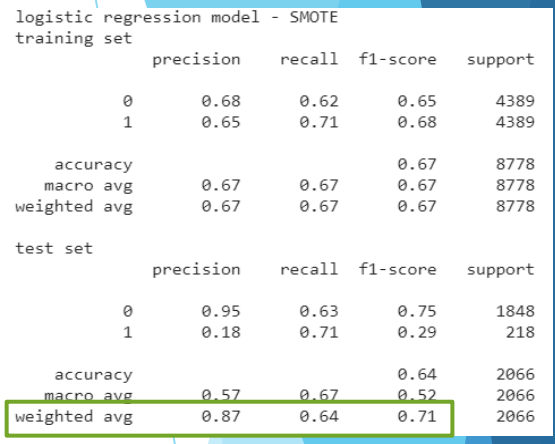
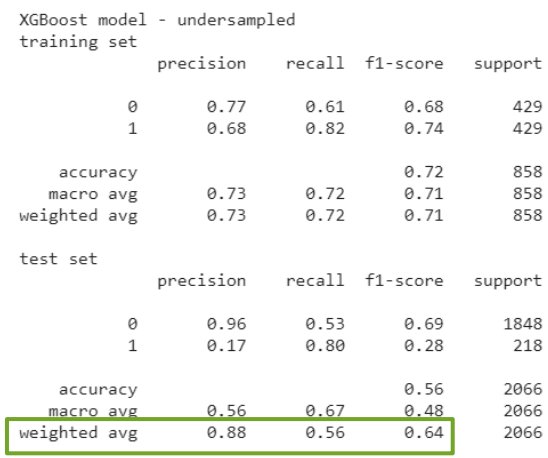
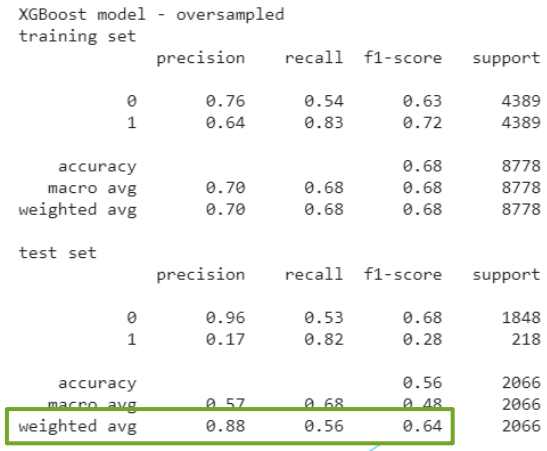
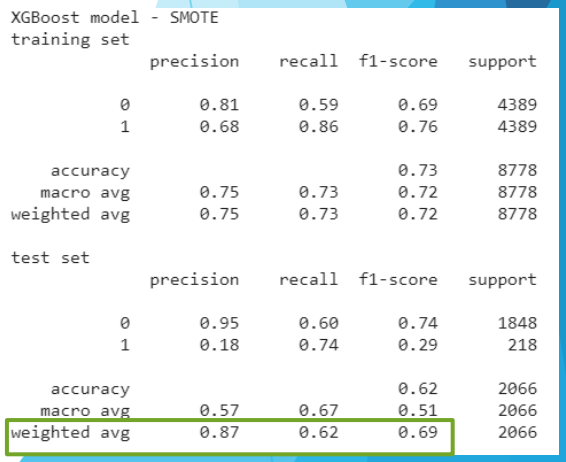
Model performance : Original file

	Undersampled	Oversampled	SMOTE
Logistic Regression model - RMF			
	AUC = 0.72	AUC = 0.72	AUC = 0.72
XGBoost model - RFM			
	AUC = 0.73	AUC = 0.73	AUC = 0.74

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

logistic regression model - oversampled
training set

	precision	recall	f1-score	support
0	0.67	0.62	0.65	4389
1	0.65	0.69	0.67	4389
accuracy			0.66	8778
macro avg	0.66	0.66	0.66	8778
weighted avg	0.66	0.66	0.66	8778

test set

	precision	recall	f1-score	support
0	0.95	0.63	0.76	1848
1	0.19	0.72	0.30	218
accuracy			0.64	2066
macro avg	0.57	0.68	0.53	2066
weighted avg	0.87	0.64	0.71	2066

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 - undersampled
training set

	precision	recall	f1-score	support
0	0.77	0.61	0.68	429
1	0.68	0.82	0.74	429
accuracy			0.72	858
macro avg	0.73	0.72	0.71	858
weighted avg	0.73	0.72	0.71	858

test set

	precision	recall	f1-score	support
0	0.96	0.53	0.69	1848
1	0.17	0.80	0.28	218
accuracy			0.56	2066
macro avg	0.56	0.67	0.48	2066
weighted avg	0.88	0.56	0.64	2066

XGBoost model - oversampled
training set

	precision	recall	f1-score	support
0	0.76	0.54	0.63	4389
1	0.64	0.83	0.72	4389
accuracy			0.68	8778
macro avg	0.70	0.68	0.68	8778
weighted avg	0.70	0.68	0.68	8778

test set

	precision	recall	f1-score	support
0	0.96	0.53	0.68	1848
1	0.17	0.82	0.28	218
accuracy			0.56	2066
macro avg	0.57	0.68	0.48	2066
weighted avg	0.88	0.56	0.64	2066

XGBoost model - SMOTE
training set

	precision	recall	f1-score	support
0	0.81	0.59	0.69	4389
1	0.68	0.86	0.76	4389
accuracy			0.73	8778
macro avg	0.75	0.73	0.72	8778
weighted avg	0.75	0.73	0.72	8778

test set

	precision	recall	f1-score	support
0	0.95	0.60	0.74	1848
1	0.18	0.74	0.29	218
accuracy			0.62	2066
macro avg	0.57	0.67	0.51	2066
weighted avg	0.87	0.62	0.69	2066

Model performance : Tuning

- Drop the data between 2011 and 2012
- Feature: frequency, total_visit, total_day_visit, monetary_value, ticket_size, active_month

	Undersampled	Oversampled	SMOTE

Logistic Regression model

logistic regression model - undersampled
training set

	precision	recall	f1-score	support
0	0.71	0.61	0.65	429
1	0.66	0.75	0.70	429
accuracy			0.68	858
macro avg	0.68	0.68	0.68	858
weighted avg	0.68	0.68	0.68	858

test set

	precision	recall	f1-score	support
0	0.96	0.57	0.72	1848
1	0.18	0.81	0.30	218
accuracy			0.60	2066
macro avg	0.57	0.69	0.51	2066
weighted avg	0.88	0.60	0.67	2066

AUC = 0.73

logistic regression model - oversampled
training set

	precision	recall	f1-score	support
0	0.69	0.59	0.64	4389
1	0.64	0.74	0.69	4389
accuracy			0.66	8778
macro avg	0.67	0.66	0.66	8778
weighted avg	0.67	0.66	0.66	8778

test set

	precision	recall	f1-score	support
0	0.96	0.58	0.72	1848
1	0.18	0.79	0.29	218
accuracy			0.60	2066
macro avg	0.57	0.68	0.51	2066
weighted avg	0.88	0.60	0.68	2066

AUC = 0.74

logistic regression model - SMOTE
training set

	precision	recall	f1-score	support
0	0.69	0.60	0.64	4389
1	0.65	0.73	0.69	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	0.96	0.59	0.73	1848
1	0.18	0.78	0.30	218
accuracy			0.61	2066
macro avg	0.57	0.69	0.52	2066
weighted avg	0.88	0.61	0.69	2066

AUC = 0.74

XGBoost model

XGBoost model - undersampled
training set

	precision	recall	f1-score	support
0	0.76	0.57	0.65	429
1	0.66	0.82	0.73	429
accuracy			0.70	858
macro avg	0.71	0.70	0.69	858
weighted avg	0.71	0.70	0.69	858

test set

	precision	recall	f1-score	support
0	0.96	0.51	0.67	1848
1	0.16	0.81	0.27	218
accuracy			0.55	2066
macro avg	0.56	0.66	0.47	2066
weighted avg	0.87	0.55	0.63	2066

AUC = 0.72

XGBoost model - oversampled
training set

	precision	recall	f1-score	support
0	0.74	0.56	0.64	4389
1	0.65	0.80	0.72	4389
accuracy			0.68	8778
macro avg	0.69	0.68	0.68	8778
weighted avg	0.69	0.68	0.68	8778

test set

	precision	recall	f1-score	support
0	0.96	0.56	0.71	1848
1	0.17	0.78	0.28	218
accuracy			0.59	2066
macro avg	0.57	0.67	0.50	2066
weighted avg	0.87	0.59	0.66	2066

AUC = 0.72

XGBoost model - SMOTE
training set

	precision	recall	f1-score	support
0	0.78	0.73	0.75	4389
1	0.74	0.80	0.77	4389
accuracy			0.76	8778
macro avg	0.76	0.76	0.76	8778
weighted avg	0.76	0.76	0.76	8778

test set

	precision	recall	f1-score	support
0	0.94	0.74	0.83	1848
1	0.22	0.61	0.32	218
accuracy			0.73	2066
macro avg	0.58	0.67	0.57	2066
weighted avg	0.86	0.73	0.77	2066

AUC = 0.75

Summary

- The data in timeframe before 2013 were dropped from the dataset and try on new selected features for calculation.

- Compare the original and tuning model based on F1-score, accuracy and AUC score, found that the best model is XGBoost – SMOTE with F1-score = 0.32, accuracy = 0.77 and AUC = 0.75, while the original model has F1-score ~0.28-0.30, accuracy ~0.61-0.71 and AUC ~0.72-0.73