WQD7005 AA1

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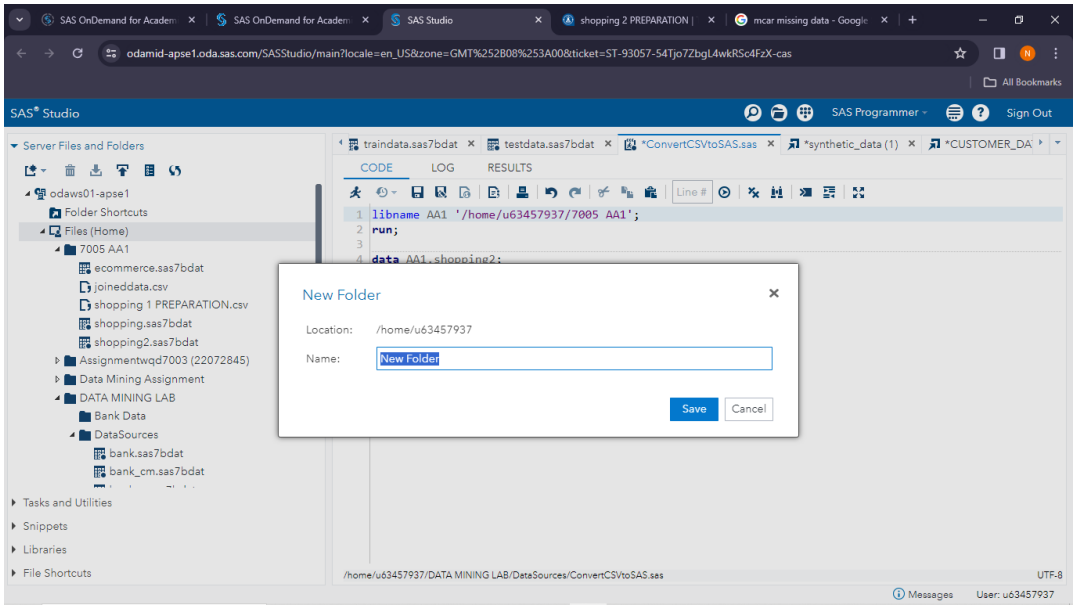
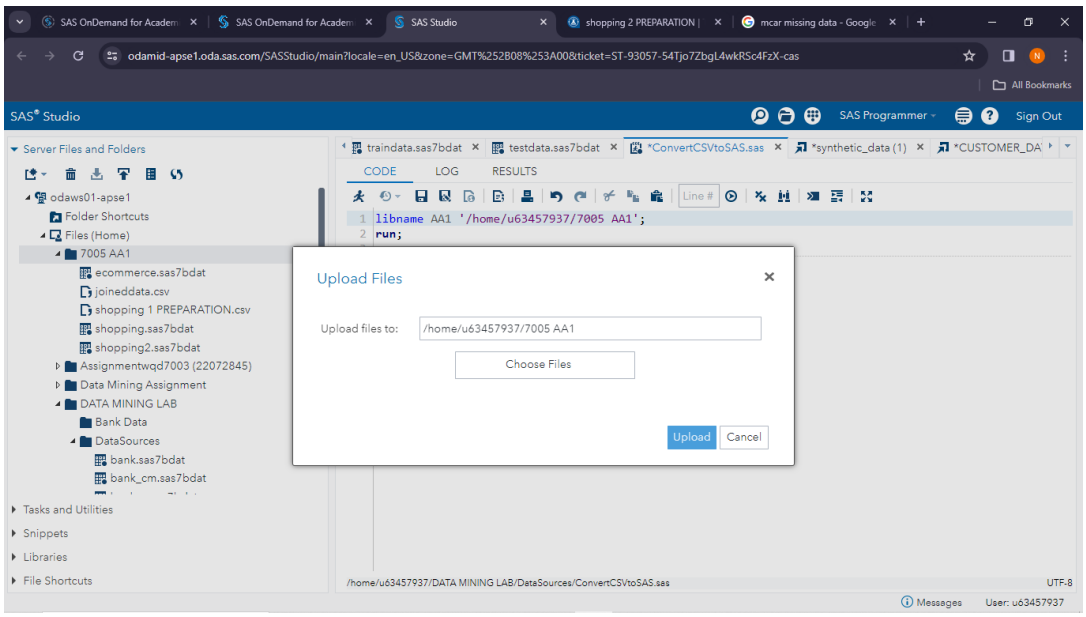
SAS e-Miner is used for data Preprocessing and data modelling to handle missing value, identify variable and data modelling.

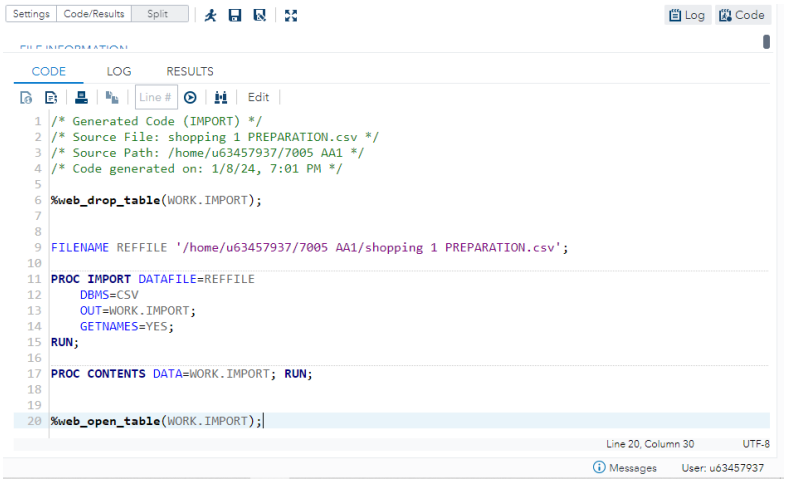
1) First, to use the clean dataset into SAS EM, the dataset must be uploaded into SAS Studio to transform the csv format into SAS7bdat and to create a library that linked into SAS EM.



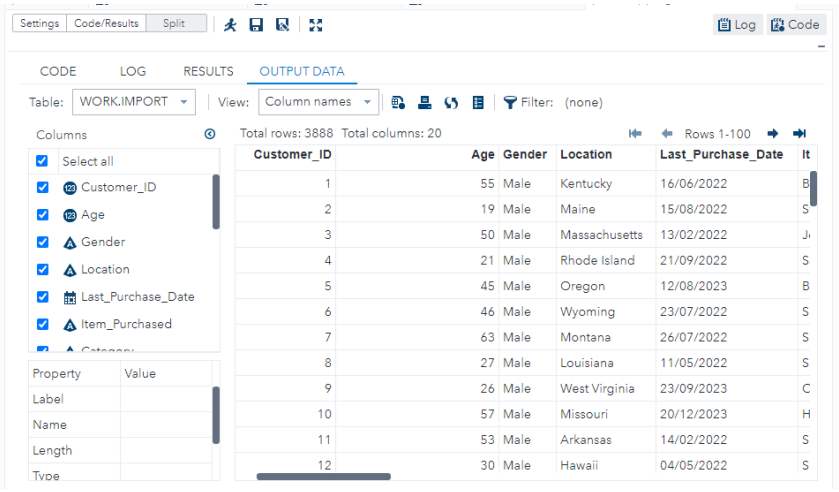
New folder is created.



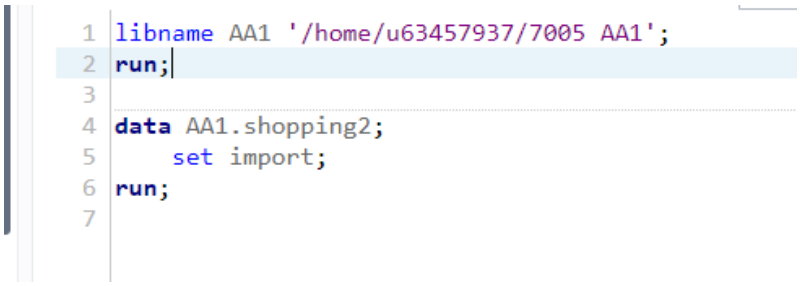
Upload the dataset into folder.



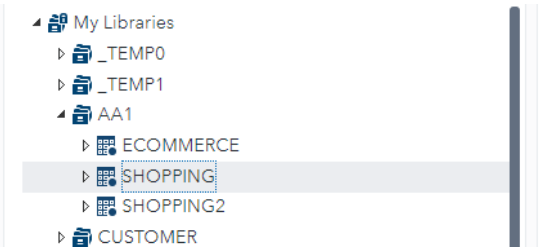
Open the csv files and run the code to read the files.



The output table shown as above.



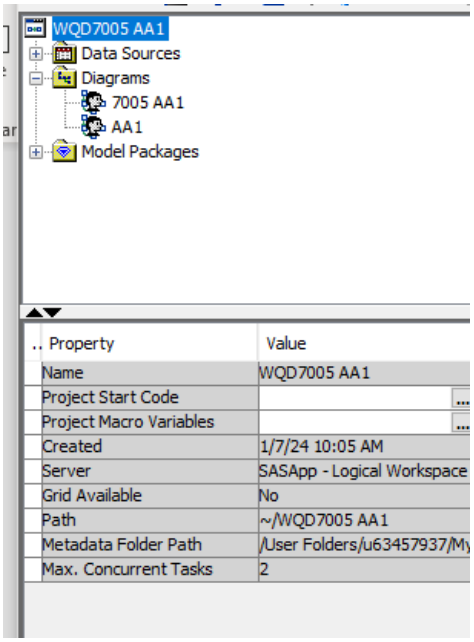
Then, wrote this code to create a library that linked with SAS EM and import the csv files into the library.



The metadata is created in SAS7bdat format.

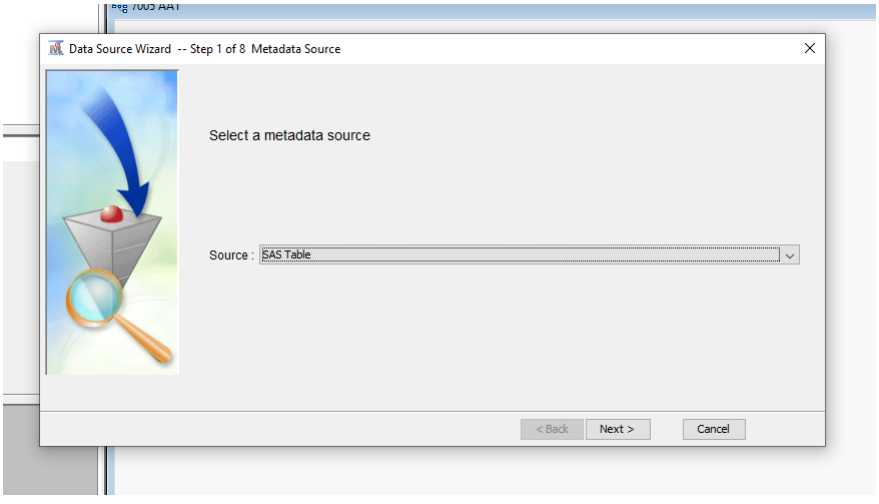
2) SAS Studio can also facilitate data exploration to see the correlations between variables and further analysis However, this steps was skip as not require in the assessment question.

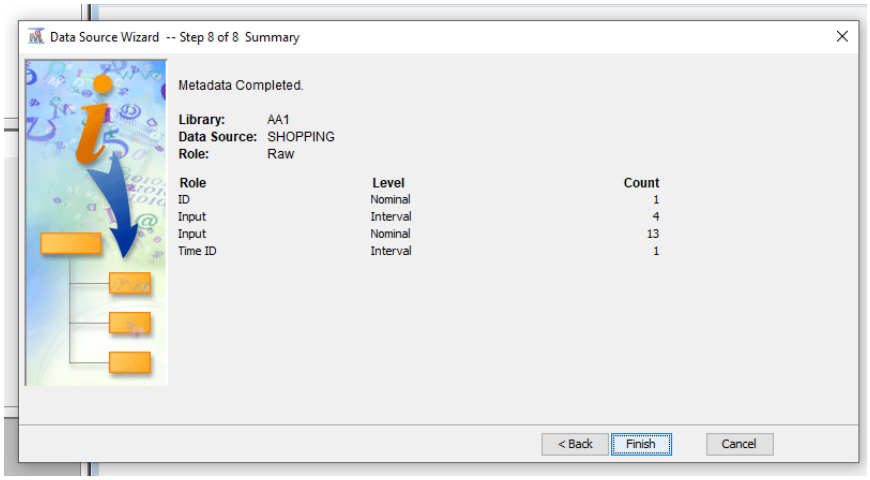
3) Next, open SAS EM and new project was created as WQD7005 AA1. Then, click on the project start code.



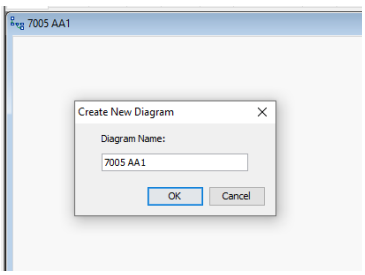
4) Wrote and run this code to link the created library into SAS EM.

5) Then, create a new Data Source and export the files that had uploaded before.

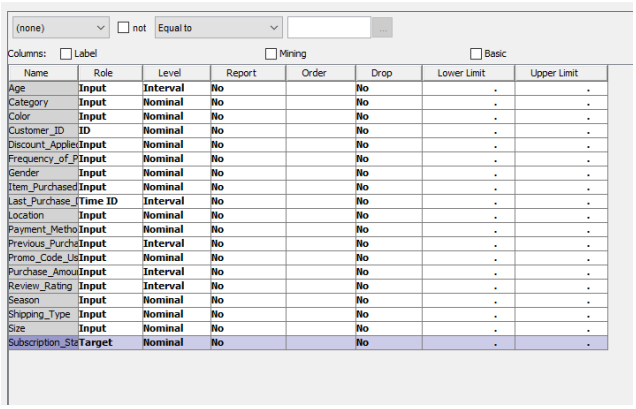




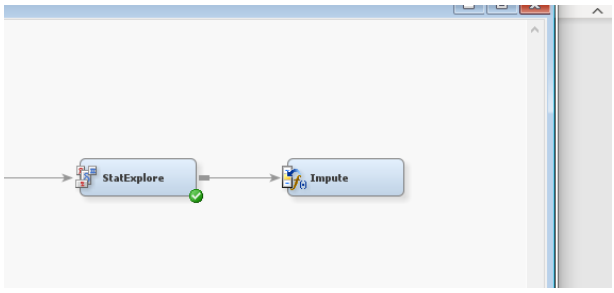
6) Then, create the new diagram and drag the data source into the diagram.



7) Choose subscription status as the target variable.



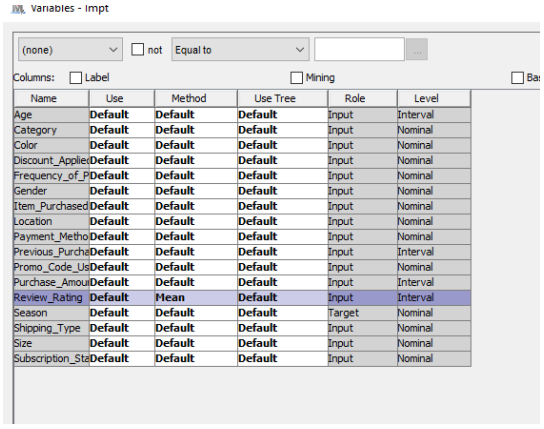
8) After that, node explore and impute were put into diagram to handle any missing data.

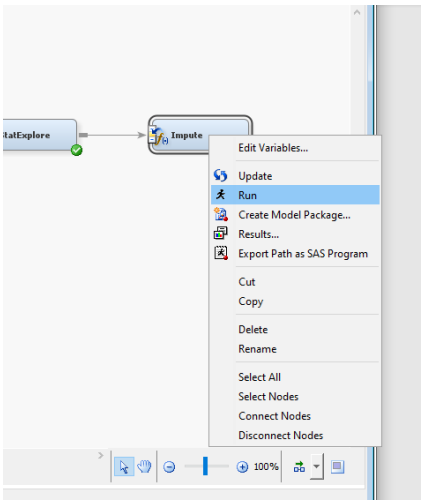


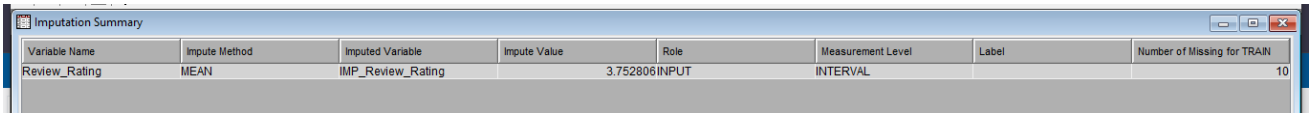
9) After running the explore node, it is found that review rating have missing value.

Variable	Role	Mean	Standard Deviation	Non Missing	Missing	Minimum	Median	Maximum	Skewness	Kurtosis
Age	INPUT	44.2074	15.28525	3110	0	18	44	70	-0.01191	-1.20917
Previous_Purchases	INPUT	25.49678	14.4425	3110	0	1	25	50	-0.0057	-1.18125
Purchase_Amount__USD	INPUT	60.01093	23.71652	3110	0	20	60	100	0.001704	-1.22917
Review_Rating	TARGET	3.755645	0.714893	3100	10	2.5	3.8	5	-0.00545	-1.17769

10) The missing value where then impute by the mean value of review rating and run. The result of impute value is 3.75.

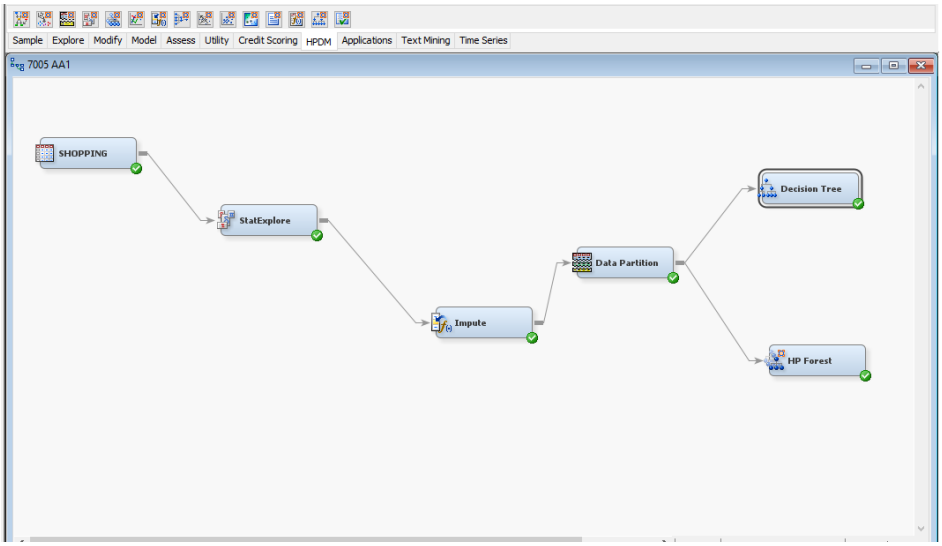




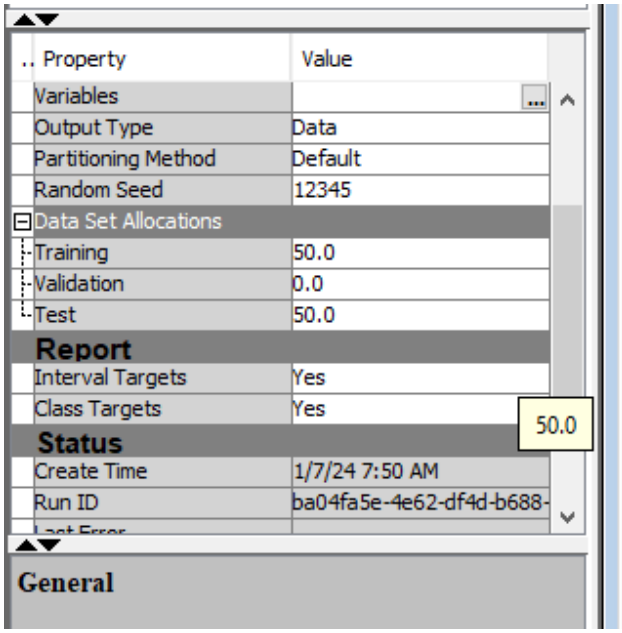


As for modelling, the decision tree and random forest is used.

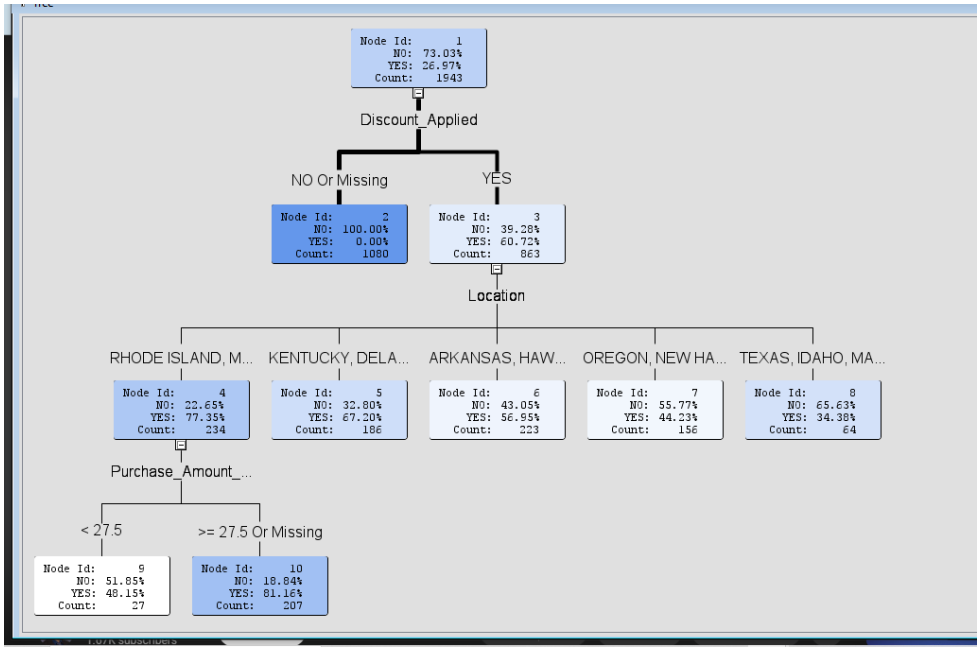
1) The node of Data partition, Decision Tree and Random Forest were dragged into diagram and linked with impute node as below.



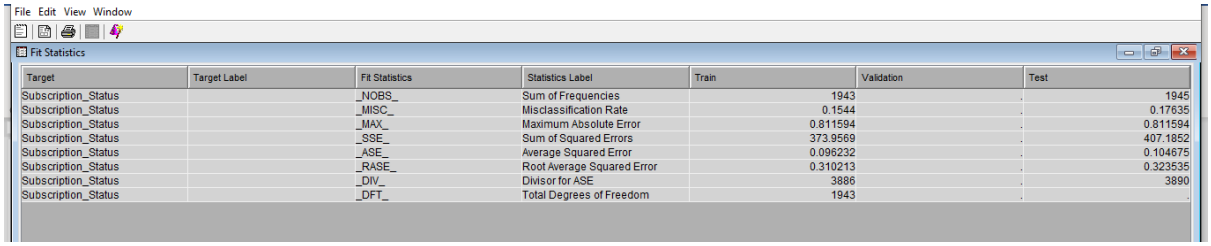
2) The data were split into 50 percent for both train and test data.



3) Decision Tree node was then run and got this output.



4) The misclassification rate for train is 0.15 and test is 0.17, while the Average Square Error for train is 0.096 and test is 0.104.



Target	Target Label	Fit Statistics	Statistics Label	Train	Validation	Test
Subscription_Status		_NOBS_	Sum of Frequencies	1943	.	1945
Subscription_Status		_MISC_	Misclassification Rate	0.1544	.	0.17635
Subscription_Status		_MAX_	Maximum Absolute Error	0.811594	.	0.811594
Subscription_Status		_SSE_	Sum of Squared Errors	373.9569	.	407.1852
Subscription_Status		_ASE_	Average Squared Error	0.096232	.	0.104675
Subscription_Status		_RASE_	Root Average Squared Error	0.310213	.	0.323535
Subscription_Status		_DIV_	Divisor for ASE	3886	.	3890
Subscription_Status		_DFT_	Total Degrees of Freedom	1943	.	.

5) Here is the classification table that shows True Positive as 420, False Positive as 196, True negative as 1223 and False Negative as 104.

Event Classification Table

Data Role=TRAIN Target=Subscription_Status Target Label=' '

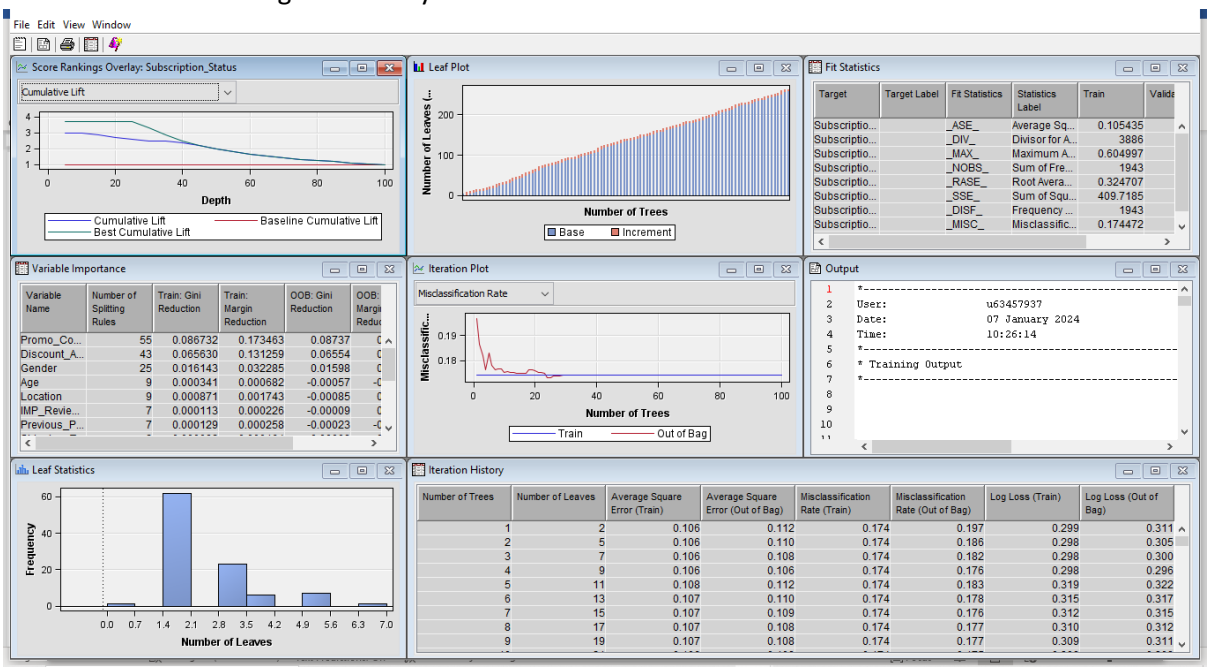
False Negative	True Negative	False Positive	True Positive
104	1223	196	420

6) The feature importance results from decision tree are discount applied, location and purchase amount USD.

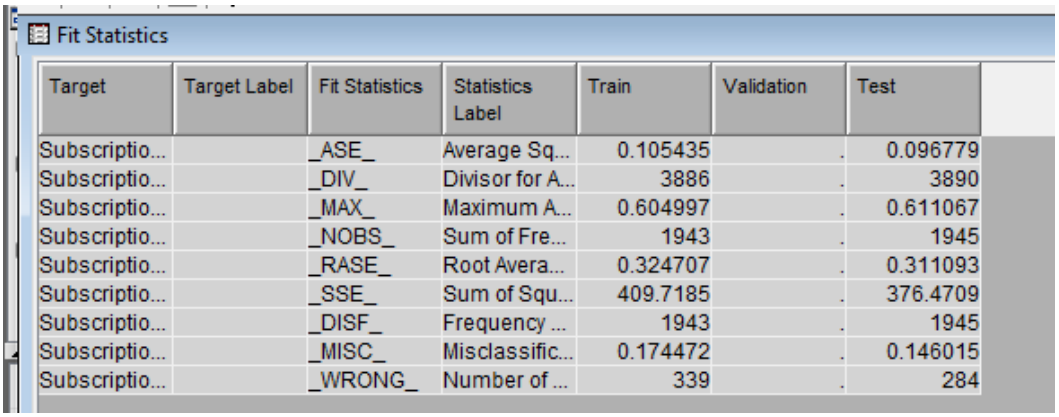
Variable Importance

Variable Name	Label	Number of Splitting Rules	Importance
Discount_Applied		1	1.0000
Location		1	0.3032
Purchase_Amount__USD		1	0.1213

7) Then Ensemble method; Random Forest is used for the modelling. The node for Random Forest was then run to get the analysis results.



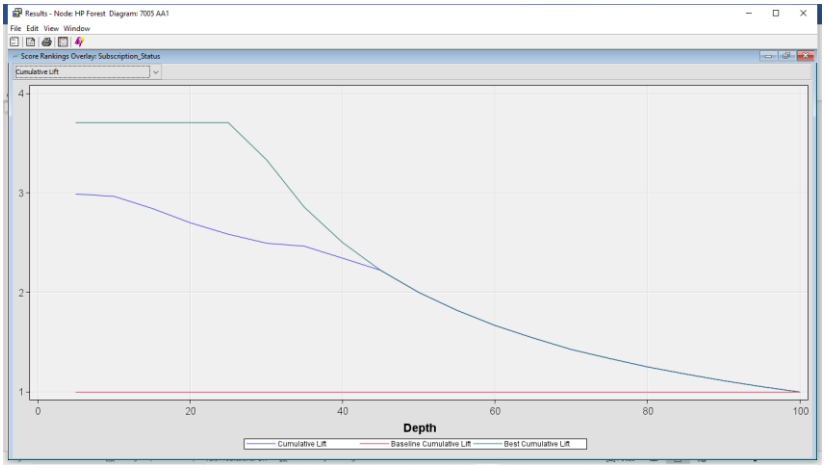
8) From the results, we know the misclassification rate for train is 0.17 and test is 0.14. The Average Square Error for train is 0.105 and test is 0.097.



Fit Statistics

Target	Target Label	Fit Statistics	Statistics Label	Train	Validation	Test
Subscriptio...		_ASE_	Average Sq...	0.105435	.	0.096779
Subscriptio...		_DIV_	Divisor for A...	3886	.	3890
Subscriptio...		_MAX_	Maximum A...	0.604997	.	0.611067
Subscriptio...		_NOBS_	Sum of Fre...	1943	.	1945
Subscriptio...		_RASE_	Root Avera...	0.324707	.	0.311093
Subscriptio...		_SSE_	Sum of Squ...	409.7185	.	376.4709
Subscriptio...		_DISF_	Frequency ...	1943	.	1945
Subscriptio...		_MISC_	Misclassific...	0.174472	.	0.146015
Subscriptio...		_WRONG_	Number of ...	339	.	284

9) The cumulative lift shows the performance almost fitted with the best cumulative lift.



10) The results also show the feature importance of the analysis.

Variable Importance

Variable Name	Number of Splitting Rules	Train: Gini Reduction	Train: Margin Reduction	OOB: Gini Reduction	OOB: Margin Reduction	Label
Promo_Co...	55	0.086732	0.173463	0.08737	0.17493	
Discount_A...	43	0.065630	0.131259	0.06554	0.13128	
Gender	25	0.016143	0.032285	0.01598	0.03146	
Age	9	0.000341	0.000682	-0.00057	-0.00024	
Location	9	0.000871	0.001743	-0.00085	0.00060	
IMP_Revie...	7	0.000113	0.000226	-0.00009	0.00003	Imputed Re...
Previous_P...	7	0.000129	0.000258	-0.00023	-0.00010	
Shipping_T...	2	0.000082	0.000164	-0.00008	-0.00001	
Category	1	0.000030	0.000060	-0.00007	-0.00002	
Item_Purch...	1	0.000085	0.000171	-0.00012	-0.00006	
Purchase_...	1	0.000022	0.000044	-0.00004	-0.00002	
Size	1	0.000035	0.000071	-0.00005	-0.00002	
Color	0	0.000000	0.000000	0.00000	0.00000	
Frequency_...	0	0.000000	0.000000	0.00000	0.00000	
Payment_M...	0	0.000000	0.000000	0.00000	0.00000	
Season	0	0.000000	0.000000	0.00000	0.00000	

11) The model was then compare and found that random forest is better than decision tree.