

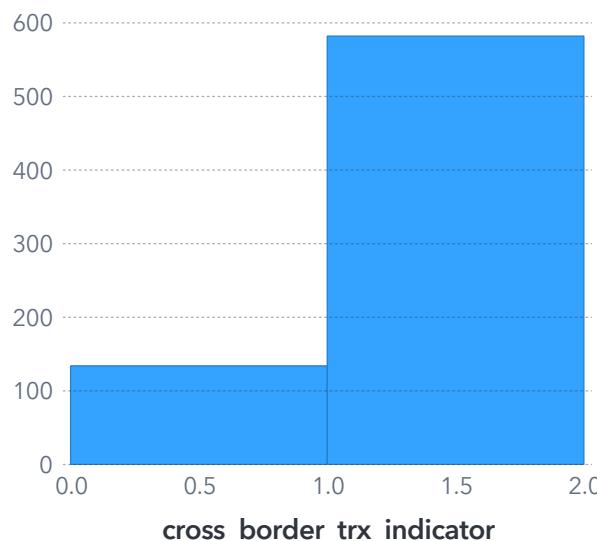
aml_bank

Creation Date: Thursday, October 30, 2025, 03:32:57 PM

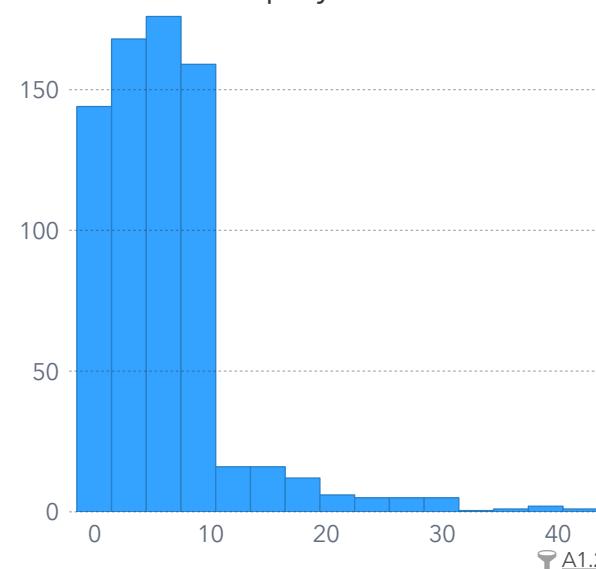
Author: chris.parrish@sas.com

money_launder_characterisitcs

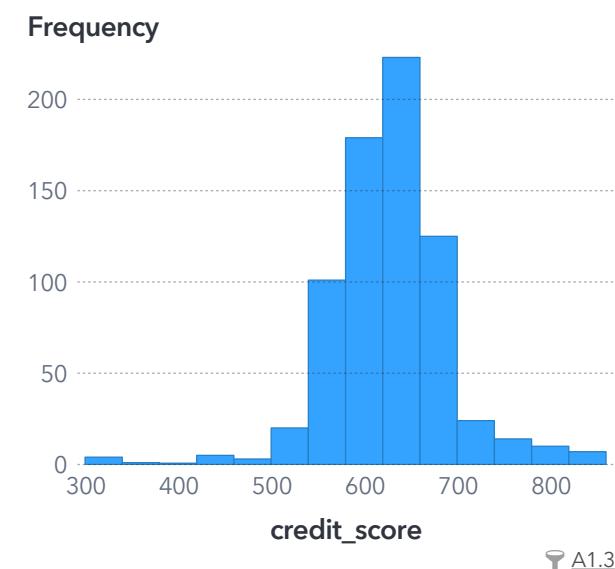
cross_border_trx_indicator



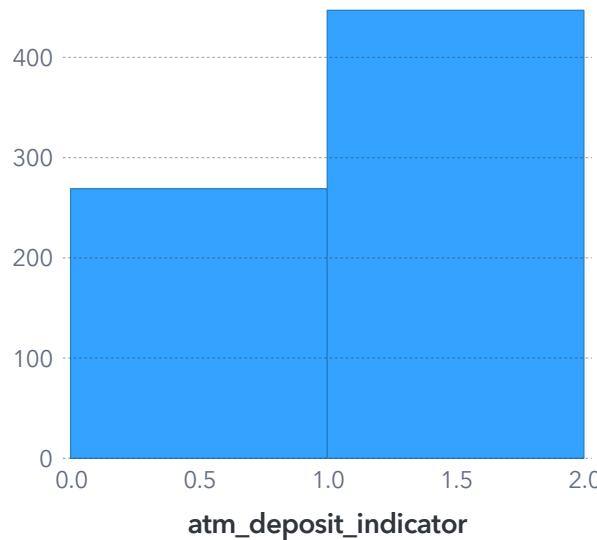
distance_to_employer



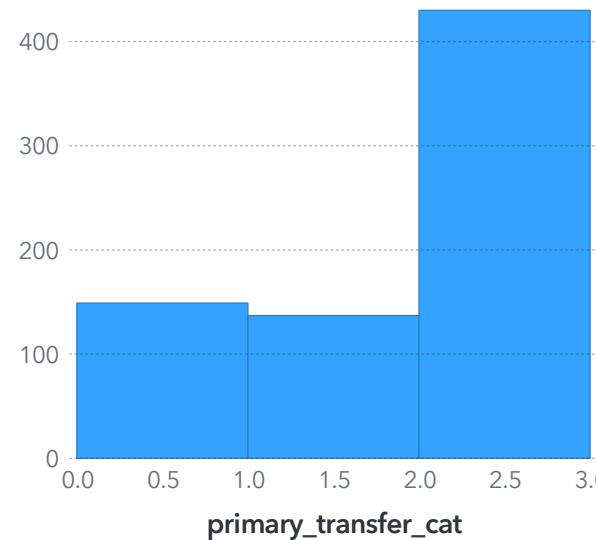
credit_score



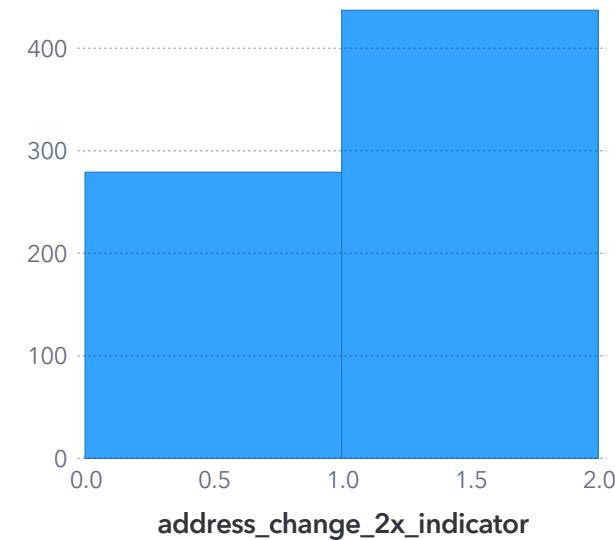
atm_deposit_indicator



primary_transfer_cat



address_change_2x_indicator

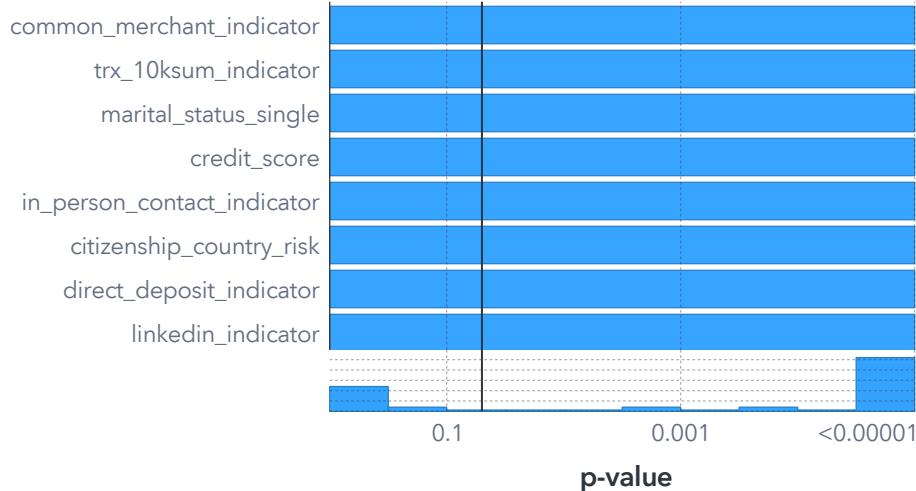


logistic_regression

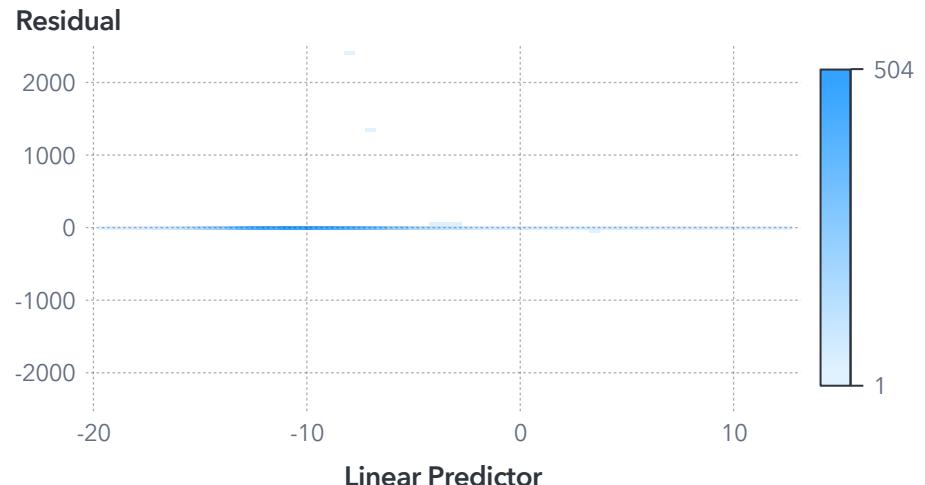
Logistic Regression of ml_indicator

Event: 1 Fit: Validation KS (Youden) 0.9521 Observations: 14K of 14K

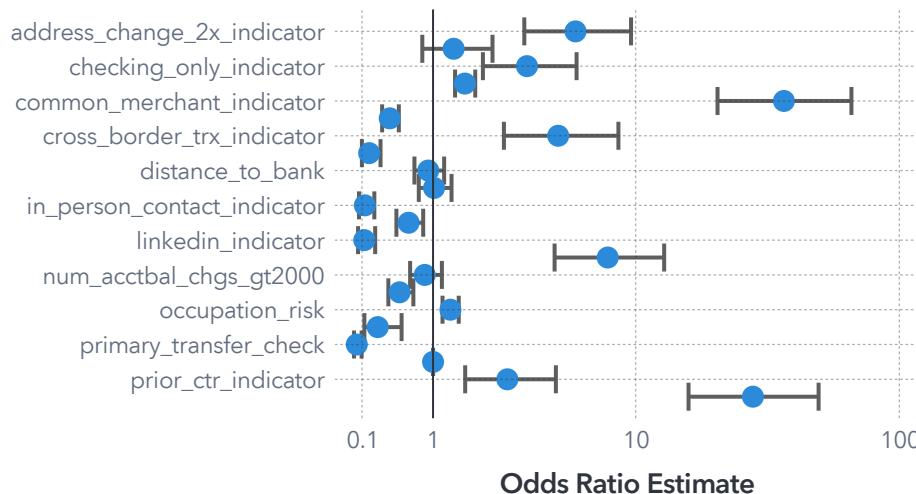
Fit Summary



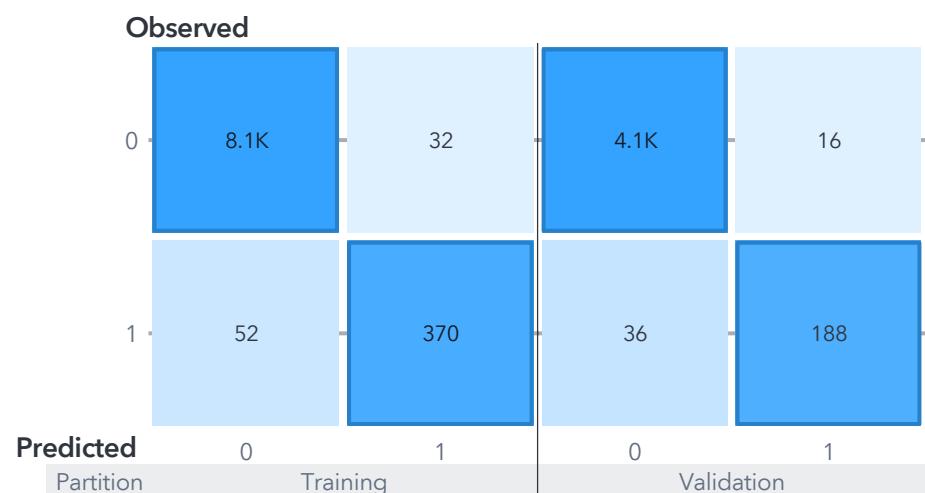
Residual Plot



Odds Ratio Plot



Confusion Matrix

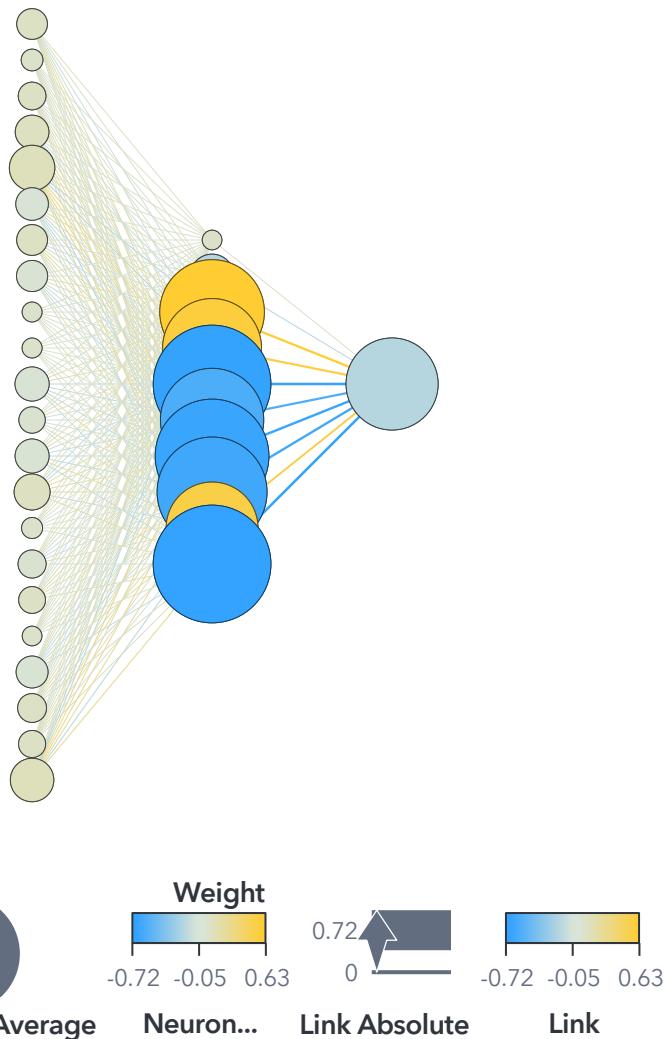


neural_network

Neural Network of ml_indicator

Event: 1 Fit: Validation KS (Youden) 0.9412 Observations: 14K of 14K

Network



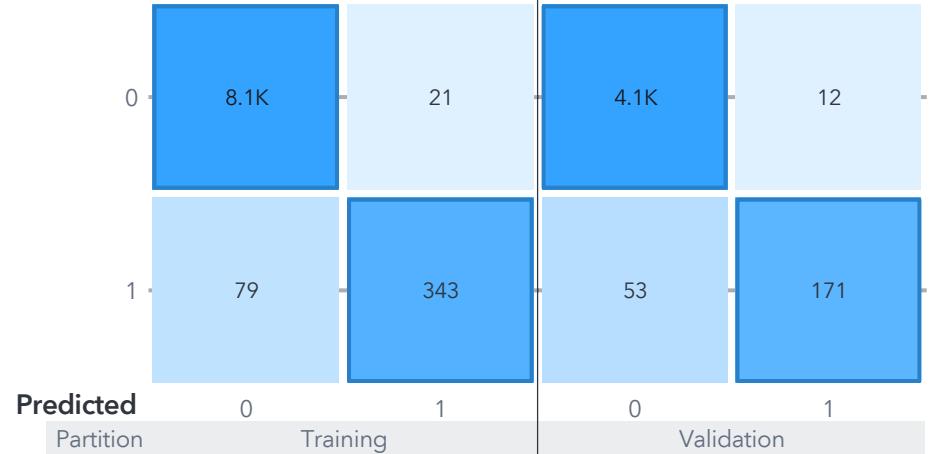
Iteration Plot

Objective / Loss



Confusion Matrix

Observed



model_comparison

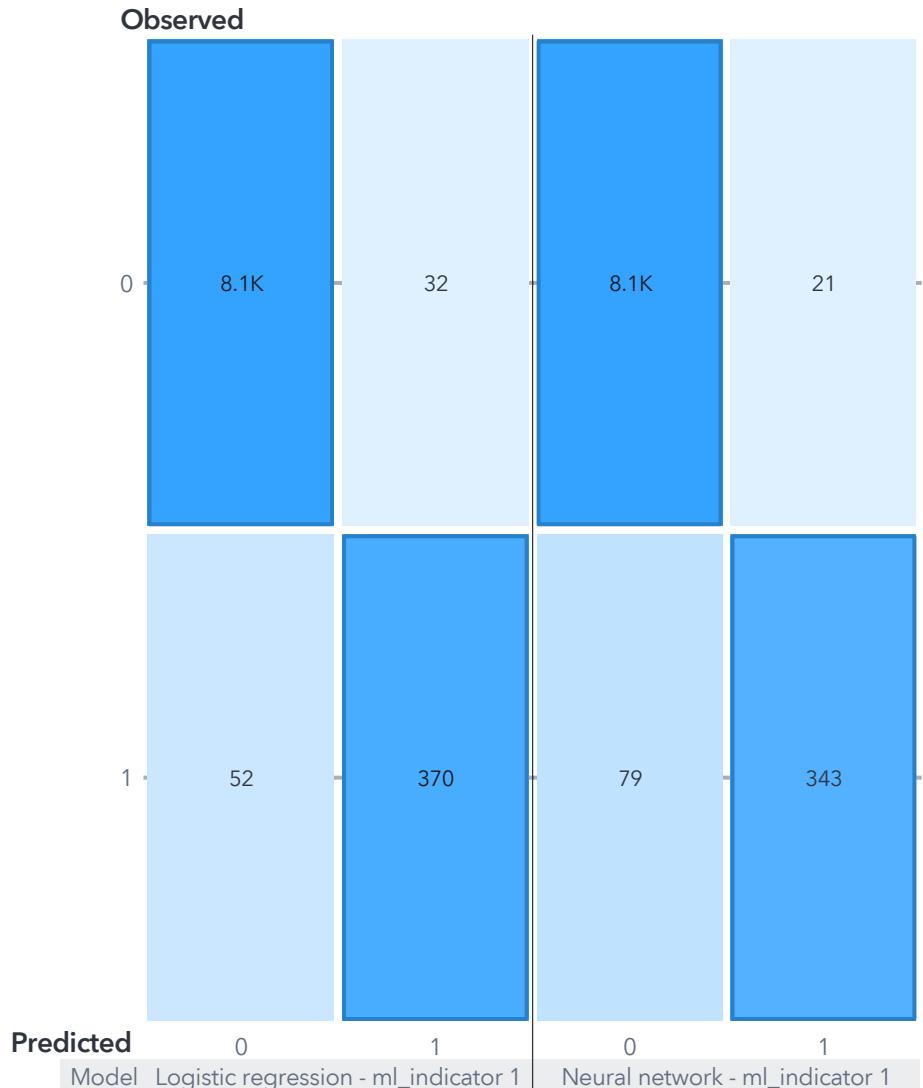
Model Comparison of ml_indicator

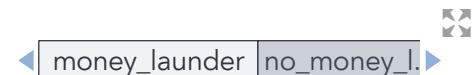


Event: 1

Fit Statistic

Confusion Matrix

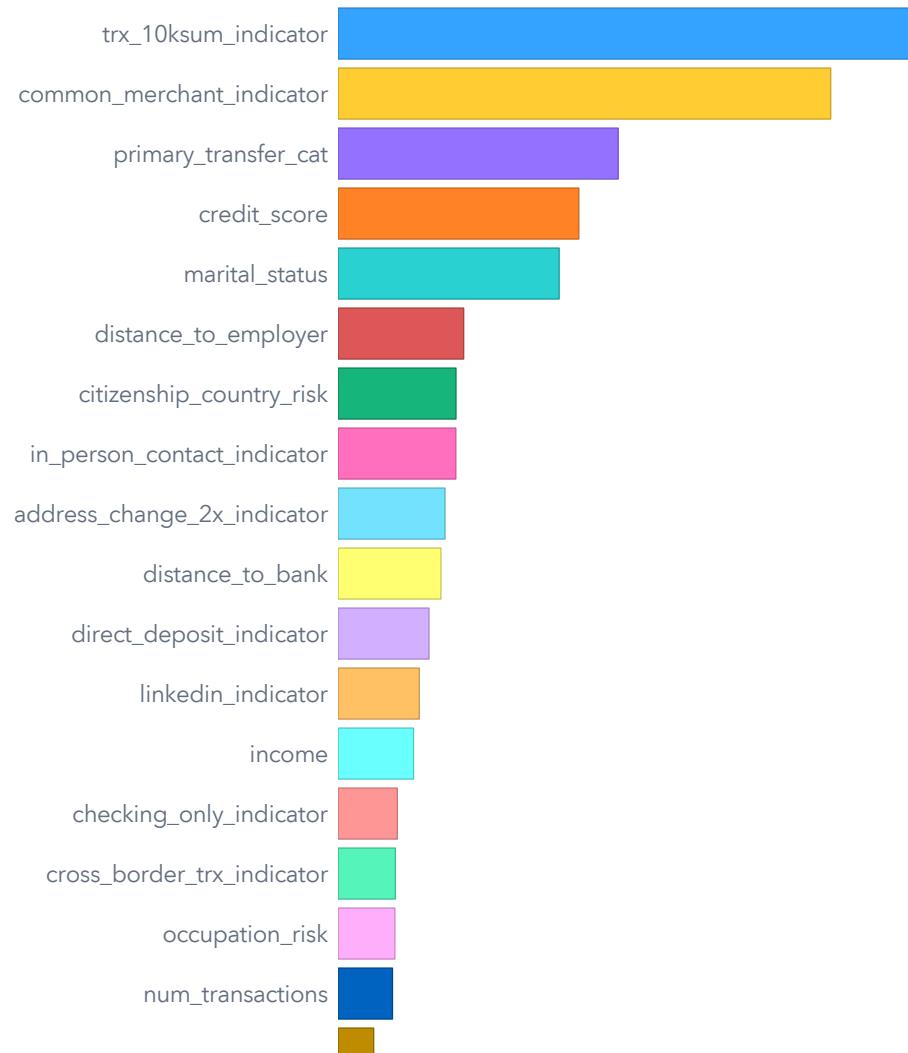




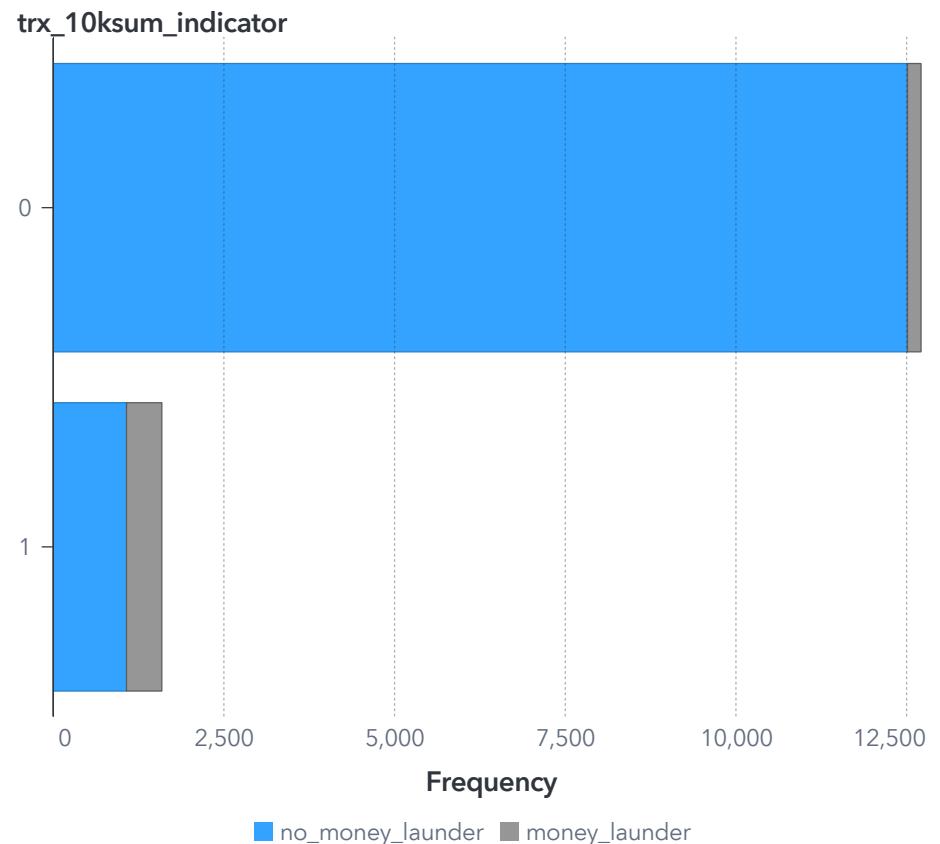
What are the characteristics of ml_indicator_type?

no_money_launder is more common at 94.99% (13.6K of 14.3K). money_launder is less common at 5.01%. The three most related factors are trx_10ksum_indicator, common_merchant_indicator, and primary_transfer_cat.

What factors are most related to ml_indicator_type?



What is the relationship between ml_indicator_type and trx_10ksum_indicator?



When trx_10ksum_indicator is 0, the total count of no_money_launder is 13K. When trx_10ksum_indicator is 1, the total count of no_money_launder is 1.1K. The most common trx_10ksum_indicator value is 0.

Appendix

A1.1 cross_border_trx_indicator

Filters: ml_indicator_type = 'money_launder'

A1.2 distance_to_employer

Filters: ml_indicator_type = 'money_launder'

A1.3 credit_score

Filters: ml_indicator_type = 'money_launder'

A1.4 atm_deposit_indicator

Filters: ml_indicator_type = 'money_launder'

A1.5 primary_transfer_cat

Filters: ml_indicator_type = 'money_launder'

A1.6 address_change_2x_indicator

Filters: ml_indicator_type = 'money_launder'

Histogram - cross_border_trx_indicator 1 Results

cross_border_trx_indicator (lower)	cross_border_trx_indicator (upper)	Frequency
0	1	134
1	2	582

Histogram - distance_to_employer 1 Results

distance_to_employer (lower)	distance_to_employer (upper)	Frequency
-1.5	1.5	144
1.5	4.5	168
4.5	7.5	176
7.5	10.5	159
10.5	13.5	16
13.5	16.5	16
16.5	19.5	12
19.5	22.5	6
22.5	25.5	5
25.5	28.5	5
28.5	31.5	5
31.5	34.5	0
34.5	37.5	1
37.5	40.5	2
40.5	43.5	1

Histogram - credit_score 1 Results

credit_score (lower)	credit_score (upper)	Frequency
300	340	4
340	380	1
380	420	0
420	460	5
460	500	3
500	540	20
540	580	101
580	620	179
620	660	223
660	700	125
700	740	24
740	780	14
780	820	10
820	860	7

Histogram - atm_deposit_indicator 1 Results

atm_deposit_indicator (lower)	atm_deposit_indicator (upper)	Frequency
0	1	269
1	2	447

Histogram - primary_transfer_cat 1 Results

primary_transfer_cat (lower)	primary_transfer_cat (upper)	Frequency
0	1	149
1	2	137
2	3	430

Histogram - address_change_2x_indicator 1 Results

address_change_2x_indicator (lower)	address_change_2x_indicator (upper)	Frequency
0	1	279
1	2	437

Logistic regression - ml_indicator 1 Model Information

Description	Value	xx
Data Source	Public.AML_BANK_PREP	
Response Variable	ml_indicator	
Distribution	Binary	
Link Function	Logit	
Optimization Technique	Newton-Raphson with Ridging	

Logistic regression - ml_indicator 1 Dimensions

Description	Value	
Number of Model Effects	23	
Number of Classification Effects	0	
Number of Columns in X	23	
Rank of Cross-product Matrix	22	
Observations Read	14,302	
Observations Used	14,302	
Observations Used for Training	8,581	
Observations Used for Validation	4,291	

Logistic regression - ml_indicator 1 Response Profile

Ordered Value	Count	ml_indicator
1	716	1
2	13586	0

Logistic regression - ml_indicator 1 Iteration History

Iteration	Evaluations	Objective	Change	Max Gradient
0	4	0.11263	.	0.056957
1	2	0.061871	0.050759	0.025553
2	2	0.040438	0.021433	0.010836
3	2	0.03121	0.009228	0.004591
4	2	0.027711	0.0035	0.001801
5	2	0.026818	0.000893	0.00052
6	2	0.026728	0.00009	0.000064
7	2	0.026727	1.291E-6	1.067E-6
8	2	0.026727	3.27E-10	2.8E-10

Logistic regression - ml_indicator 1 Convergence

Reason	Status
Convergence criterion (GCONV=1E-6) satisfied.	0

Logistic regression - ml_indicator 1 Fit Statistics



Statistic	Value
-2 Log Likelihood	458.6841
AIC	502.6841
AICC	502.8024
BIC	657.9448
Max-rescaled R-Square	0.885656
R-Square	0.287321

Logistic regression - ml_indicator 1 Parameter Estimates

Parameter	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-7.8604	0.593993	175.1164	<0.00001
credit_score	-0.94356	0.127199	55.02645	<0.00001
income	-0.46468	0.14868	9.768101	0.00178
distance_to_employer	0.01674	0.1394	0.014421	0.90442
distance_to_bank	-0.08185	0.132852	0.379553	0.53784
trx_10ksum_indicator	3.349303	0.289386	133.9536	<0.00001
address_change_2x_indicator	1.727987	0.271099	40.62806	<0.00001
cross_border_trx_indicator	1.553947	0.299582	26.90551	<0.00001
linkedin_indicator	-2.10931	0.324463	42.26214	<0.00001
in_person_contact_indicator	-2.06658	0.282501	53.51375	<0.00001
direct_deposit_indicator	-1.78181	0.269842	43.60154	<0.00001
atm_deposit_indicator	0.320866	0.260671	1.51517	0.21835
checking_only_indicator	1.226166	0.26133	22.01502	<0.00001
common_merchant_indicator	3.618237	0.295466	149.9609	<0.00001
prior_ctr_indicator	1.006478	0.267254	14.18279	0.00017
marital_status_single	2.039965	0.266799	58.46241	<0.00001
num_acctbal_chgs_gt2000	-0.14433	0.146917	0.965046	0.32592
num_transactions	-0.67489	0.15846	18.1393	0.00002
citizenship_country_risk	0.478745	0.070014	46.75593	<0.00001
occupation_risk	0.273399	0.061228	19.93857	<0.00001
primary_transfer_cash	-1.36349	0.376399	13.12216	0.00029
primary_transfer_check	-2.94175	0.307985	91.23286	<0.00001
primary_transfer_wire	0	.	.	.

Logistic regression - ml_indicator 1 Type III Test

Effect	DF	Chi-Square	Pr > ChiSq
credit_score	1	55.02645	<0.00001
income	1	9.768101	0.00178
distance_to_employer	1	0.014421	0.90442
distance_to_bank	1	0.379553	0.53784
trx_10ksum_indicator	1	133.9536	<0.00001
address_change_2x_indicator	1	40.62806	<0.00001
cross_border_trx_indicator	1	26.90551	<0.00001
linkedin_indicator	1	42.26214	<0.00001
in_person_contact_indicator	1	53.51375	<0.00001
direct_deposit_indicator	1	43.60154	<0.00001
atm_deposit_indicator	1	1.51517	0.21835
checking_only_indicator	1	22.01502	<0.00001
common_merchant_indicator	1	149.9609	<0.00001
prior_ctr_indicator	1	14.18279	0.00017
marital_status_single	1	58.46241	<0.00001
num_acctbal_chgs_gt2000	1	0.965046	0.32592
num_transactions	1	18.1393	0.00002
citizenship_country_risk	1	46.75593	<0.00001
occupation_risk	1	19.93857	<0.00001
primary_transfer_cash	0	.	.
primary_transfer_check	0	.	.
primary_transfer_wire	0	.	.

Logistic regression - ml_indicator 1 Odds Ratio

Description	Odds Ratio Estimate	Lower Confidence Level (95%) Value	Upper Confidence Level (95%) Value	p-value
address_change_2x_indicator	5.62931	3.308991	9.576676	<0.00001
atm_deposit_indicator	1.37832	0.826926	2.297384	0.21835
checking_only_indicator	3.408137	2.042078	5.688028	<0.00001
citizenship_country_risk	1.614047	1.407084	1.851452	<0.00001
common_merchant_indicator	37.27181	20.88715	66.50923	<0.00001
credit_score	0.389239	0.30335	0.499446	<0.00001
cross_border_trx_indicator	4.730104	2.629457	8.508937	<0.00001
direct_deposit_indicator	0.168333	0.099193	0.285667	<0.00001
distance_to_bank	0.921412	0.710183	1.195469	0.53784
distance_to_employer	1.016881	0.773771	1.336373	0.90442
in_person_contact_indicator	0.126618	0.072783	0.220272	<0.00001
income	0.628333	0.469497	0.840905	0.00178
linkedin_indicator	0.121321	0.064232	0.22915	<0.00001
marital_status_single	7.690344	4.558751	12.97315	<0.00001
num_acctbal_chgs_gt2000	0.865605	0.649029	1.154451	0.32592
num_transactions	0.509215	0.373267	0.694676	0.00002
occupation_risk	1.314425	1.165785	1.482017	<0.00001
primary_transfer_cash	0.255768	0.122308	0.534856	0.00029
primary_transfer_check	0.052773	0.028857	0.09651	<0.00001
primary_transfer_wire	1	1	1	.
prior_ctr_indicator	2.735948	1.620396	4.619495	0.00017
trx_10ksum_indicator	28.48287	16.15318	50.22378	<0.00001

Logistic regression - ml_indicator 1 Confusion Matrix

Predicted	Observed	Training Observations	Training Percentage	Validation Observations	Validation Percentage	Test Observations	Test Percentage
0	0	8,127	99.61%	4,051	99.61%	1,356	99.71%
1	0	32	0.39%	16	0.39%	4	0.29%
0	1	52	12.32%	36	16.07%	11	15.71%
1	1	370	87.68%	188	83.93%	59	84.29%

Logistic regression - ml_indicator 1 Lift		ML Model Performance Metrics																	
Percentile	Training Observations	Training Events	Training Lift	Training Lift Best	Training Cumulative Lift	Training Cumulative Lift Best	Validation Observations	Validation Events	Validation Lift	Validation Lift Best	Validation Cumulative Lift	Validation Cumulative Lift Best	Test Observations	Test Events	Test Lift	Test Lift Best	Test Cumulative Lift	Test Cumulative Lift Best	
5.00	430	382	18.1043	20.0000	18.1043	20.0000	215	193	17.2321	19.1964	17.2321	19.1964	72	64	18.2857	20.0000	18.2857	20.0000	
10.00	430	38	1.8009	0.0000	9.9526	10.0000	215	30	2.6786	0.8036	9.9554	10.0000	72	5	1.4286	0.0000	9.8571	10.0000	
15.00	430	0	0.0000	0.0000	6.6351	6.6667	215	0	0.0000	0.0000	6.6369	6.6667	72	1	0.2857	0.0000	6.6667	6.6667	
20.00	430	0	0.0000	0.0000	4.9763	5.0000	215	1	0.0893	0.0000	5.0000	5.0000	72	0	0.0000	0.0000	5.0000	5.0000	
25.00	430	1	0.0474	0.0000	3.9905	4.0000	215	0	0.0000	0.0000	4.0000	4.0000	72	0	0.0000	0.0000	4.0000	4.0000	
30.00	430	1	0.0474	0.0000	3.3333	3.3333	215	0	0.0000	0.0000	3.3333	3.3333	72	0	0.0000	0.0000	3.3333	3.3333	
35.00	430	0	0.0000	0.0000	2.8571	2.8571	215	0	0.0000	0.0000	2.8571	2.8571	72	0	0.0000	0.0000	2.8571	2.8571	
40.00	430	0	0.0000	0.0000	2.5000	2.5000	215	0	0.0000	0.0000	2.5000	2.5000	72	0	0.0000	0.0000	2.5000	2.5000	
45.00	430	0	0.0000	0.0000	2.2222	2.2222	215	0	0.0000	0.0000	2.2222	2.2222	72	0	0.0000	0.0000	2.2222	2.2222	
50.00	430	0	0.0000	0.0000	2.0000	2.0000	215	0	0.0000	0.0000	2.0000	2.0000	72	0	0.0000	0.0000	2.0000	2.0000	
55.00	430	0	0.0000	0.0000	1.8182	1.8182	215	0	0.0000	0.0000	1.8182	1.8182	72	0	0.0000	0.0000	1.8182	1.8182	
60.00	430	0	0.0000	0.0000	1.6667	1.6667	215	0	0.0000	0.0000	1.6667	1.6667	72	0	0.0000	0.0000	1.6667	1.6667	
65.00	430	0	0.0000	0.0000	1.5385	1.5385	215	0	0.0000	0.0000	1.5385	1.5385	72	0	0.0000	0.0000	1.5385	1.5385	
70.00	430	0	0.0000	0.0000	1.4286	1.4286	215	0	0.0000	0.0000	1.4286	1.4286	72	0	0.0000	0.0000	1.4286	1.4286	
75.00	430	0	0.0000	0.0000	1.3333	1.3333	215	0	0.0000	0.0000	1.3333	1.3333	72	0	0.0000	0.0000	1.3333	1.3333	
80.00	430	0	0.0000	0.0000	1.2500	1.2500	215	0	0.0000	0.0000	1.2500	1.2500	72	0	0.0000	0.0000	1.2500	1.2500	
85.00	430	0	0.0000	0.0000	1.1765	1.1765	215	0	0.0000	0.0000	1.1765	1.1765	72	0	0.0000	0.0000	1.1765	1.1765	
90.00	430	0	0.0000	0.0000	1.1111	1.1111	215	0	0.0000	0.0000	1.1111	1.1111	72	0	0.0000	0.0000	1.1111	1.1111	
95.00	430	0	0.0000	0.0000	1.0526	1.0526	215	0	0.0000	0.0000	1.0526	1.0526	72	0	0.0000	0.0000	1.0526	1.0526	
100.00	411	0	0.0000	0.0000	1.0000	1.0000	206	0	0.0000	0.0000	1.0000	1.0000	62	0	0.0000	0.0000	1.0000	1.0000	

Logistic regression - ml_indicator 1 ROC

Cutoff	Training Sensitivity	Training 1 - Specificity	Training KS (Youden)	Validation Sensitivity	Validation 1 - Specificity	Validation KS (Youden)	Test Sensitivity	Test 1 - Specificity	Test KS (Youden)
0.00	1.0000	1.000		1.0000	1.000		1.0000	1.000	
0.01	0.9953	0.066		0.9955	0.064		0.9857	0.060	
0.02	0.9953	0.047	Yes	0.9866	0.043		0.9857	0.042	Yes
0.03	0.9858	0.038		0.9866	0.035		0.9714	0.032	
0.04	0.9763	0.032		0.9821	0.030	Yes	0.9714	0.028	
0.05	0.9716	0.027		0.9688	0.025		0.9571	0.026	
0.06	0.9668	0.024		0.9598	0.023		0.9571	0.022	
0.07	0.9597	0.022		0.9554	0.021		0.9571	0.020	
0.08	0.9597	0.019		0.9554	0.018		0.9571	0.016	
0.09	0.9597	0.018		0.9375	0.016		0.9571	0.015	
0.10	0.9550	0.016		0.9375	0.014		0.9429	0.015	
0.11	0.9526	0.014		0.9375	0.014		0.9429	0.015	
0.12	0.9479	0.014		0.9375	0.014		0.9429	0.014	
0.13	0.9408	0.013		0.9375	0.013		0.9429	0.012	
0.14	0.9408	0.012		0.9196	0.013		0.9429	0.010	
0.15	0.9384	0.012		0.9152	0.012		0.9429	0.010	
0.16	0.9384	0.012		0.9152	0.011		0.9429	0.009	
0.17	0.9360	0.012		0.9107	0.011		0.9429	0.009	
0.18	0.9360	0.011		0.9018	0.010		0.9429	0.008	
0.19	0.9360	0.010		0.8973	0.010		0.9429	0.008	
0.20	0.9289	0.009		0.8929	0.010		0.9429	0.008	
0.21	0.9265	0.009		0.8929	0.010		0.9286	0.008	
0.22	0.9265	0.009		0.8839	0.009		0.9143	0.008	
0.23	0.9265	0.008		0.8839	0.009		0.9143	0.007	
0.24	0.9242	0.008		0.8795	0.008		0.9143	0.007	
0.25	0.9218	0.008		0.8795	0.008		0.9143	0.007	
0.26	0.9218	0.007		0.8795	0.007		0.9143	0.007	
0.27	0.9218	0.007		0.8795	0.007		0.9143	0.007	
0.28	0.9218	0.007		0.8750	0.007		0.9143	0.006	
0.29	0.9218	0.007		0.8750	0.007		0.9000	0.006	
0.30	0.9171	0.007		0.8705	0.007		0.9000	0.006	
0.31	0.9123	0.006		0.8705	0.007		0.9000	0.006	
0.32	0.9123	0.006		0.8705	0.006		0.9000	0.006	
0.33	0.9100	0.006		0.8705	0.006		0.8857	0.006	
0.34	0.9052	0.006		0.8661	0.006		0.8857	0.005	
0.35	0.9052	0.006		0.8661	0.006		0.8857	0.005	
0.36	0.9052	0.005		0.8661	0.006		0.8857	0.005	
0.37	0.9052	0.005		0.8661	0.006		0.8857	0.005	
0.38	0.9052	0.005		0.8616	0.006		0.8857	0.005	
0.39	0.9028	0.005		0.8616	0.006		0.8857	0.005	
0.40	0.9028	0.005		0.8616	0.006		0.8714	0.004	
0.41	0.9028	0.005		0.8616	0.006		0.8714	0.004	
0.42	0.9005	0.005		0.8571	0.005		0.8714	0.004	
0.43	0.8886	0.005		0.8482	0.005		0.8714	0.004	
0.44	0.8886	0.005		0.8482	0.005		0.8714	0.004	
0.45	0.8886	0.005		0.8482	0.005		0.8714	0.004	
0.46	0.8886	0.005		0.8438	0.005		0.8571	0.004	
0.47	0.8886	0.004		0.8438	0.005		0.8571	0.004	
0.48	0.8863	0.004		0.8438	0.004		0.8571	0.003	
0.49	0.8815	0.004		0.8438	0.004		0.8429	0.003	
0.50	0.8768	0.004		0.8393	0.004		0.8429	0.003	
0.51	0.8744	0.004		0.8348	0.004		0.8429	0.003	
0.52	0.8744	0.004		0.8304	0.004		0.8429	0.003	
0.53	0.8697	0.004		0.8259	0.004		0.8429	0.003	
0.54	0.8673	0.004		0.8259	0.004		0.8429	0.003	
0.55	0.8673	0.004		0.8259	0.004		0.8429	0.003	
0.56	0.8626	0.003		0.8214	0.004		0.8429	0.003	
0.57	0.8626	0.003		0.8170	0.004		0.8429	0.003	
0.58	0.8578	0.003		0.8170	0.003		0.8429	0.003	
0.59	0.8531	0.003		0.8170	0.003		0.8429	0.003	
0.60	0.8531	0.003		0.8170	0.003		0.8429	0.002	
0.61	0.8531	0.003		0.8170	0.003		0.8429	0.002	
0.62	0.8507	0.003		0.8125	0.003		0.8429	0.002	
0.63	0.8483	0.003		0.8125	0.003		0.8429	0.001	
0.64	0.8365	0.003		0.8125	0.003		0.8429	0.001	
0.65	0.8318	0.002		0.7991	0.003		0.8429	0.001	
0.66	0.8318	0.002		0.7991	0.003		0.8286	0.001	
0.67	0.8270	0.002		0.7902	0.003		0.8286	0.001	
0.68	0.8223	0.002		0.7902	0.002		0.8143	0.001	
0.69	0.8223	0.002		0.7902	0.002		0.8143	0.001	
0.70	0.8199	0.002		0.7857	0.002		0.8143	0.001	
0.71	0.8104	0.002		0.7813	0.002		0.8143	0.001	
0.72	0.8081	0.002		0.7813	0.002		0.8000	0.001	
0.73	0.8057	0.002		0.7768	0.002		0.8000	0.001	
0.74	0.8009	0.002		0.7768	0.002		0.7857	0.001	
0.75	0.7986	0.001		0.7679	0.002		0.7714	0.001	
0.76	0.7938	0.001		0.7634	0.002		0.7714	0.001	
0.77	0.7938	0.001		0.7634	0.002		0.7714	0.001	
0.78	0.7938	0.001		0.7634	0.001		0.7714	0.001	
0.79	0.7844	0.001		0.7634	0.001		0.7571	0.001	
0.80	0.7820	0.001		0.7545	0.001		0.7571	0.001	
0.81	0.7796	0.001		0.7545	0.001		0.7429	0.001	
0.82	0.7773	0.001		0.7411	0.001		0.7		

Logistic regression - ml_indicator 1 Cutoff Statistics																													
Cutoff	Training Accuracy	Training Sensitivity	Training Specificity	Training False Positive Rate	Training False Negative Rate	Training Kolmogorov-Smirnov (KS)	Training F0.5 Score	Training F1 Score	Training Misclassification Rate (Event)	Validation Accuracy	Validation Sensitivity	Validation Specificity	Validation False Positive Rate	Validation Kolmogorov-Smirnov (KS)	Validation F0.5 Score	Validation F1 Score	Validation Misclassification Rate (Event)	Test Accuracy	Test Sensitivity	Test Specificity	Test False Positive Rate	Test False Negative Rate	Test Kolmogorov-Smirnov (KS)	Test F0.5 Score	Test F1 Score	Test Misclassification Rate (Event)			
0.00	0.0492	1.0000	0.0000	1.0000	0.0000	0.9508	0.0607	0.0937	0.9508	0.0522	1.0000	0.0000	1.0000	0.0000	0.9478	0.0644	0.0992	0.9478	0.0490	1.0000	0.0000	1.0000	0.0000	0.9510	0.0604	0.0933	0.9510		
0.01	0.9367	0.9953	0.9337	0.0663	0.0047	0.9290	0.5630	0.4923	0.6074	0.0633	0.9392	0.9955	0.9361	0.0639	0.0045	0.9316	0.5383	0.5172	0.6308	0.0608	0.9427	0.9857	0.9404	0.0596	0.0143	0.9262	0.5400	0.5149	0.6273
0.02	0.9551	0.9953	0.9531	0.0469	0.0047	0.9483	0.4770	0.5779	0.6857	0.0449	0.9583	0.9866	0.9567	0.0433	0.0134	0.9433	0.4433	0.6098	0.7118	0.0417	0.9594	0.9857	0.9581	0.0419	0.0143	0.9438	0.4524	0.6010	0.7041
0.03	0.9632	0.9858	0.9620	0.0380	0.0142	0.9478	0.4270	0.6254	0.7247	0.0368	0.9664	0.9866	0.9653	0.0347	0.0134	0.9519	0.3895	0.6609	0.7543	0.0336	0.9678	0.9714	0.9676	0.0324	0.0286	0.9391	0.3929	0.6564	0.7473
0.04	0.9688	0.9763	0.9684	0.0316	0.0237	0.9447	0.3851	0.6641	0.7546	0.0312	0.9706	0.9821	0.9700	0.0300	0.0179	0.9521	0.3567	0.6910	0.7774	0.0294	0.9720	0.9714	0.9721	0.0279	0.0286	0.9435	0.3585	0.6883	0.7727
0.05	0.9730	0.9716	0.9730	0.0270	0.0284	0.9446	0.3492	0.6968	0.7795	0.0270	0.9744	0.9688	0.9747	0.0253	0.0133	0.9434	0.3219	0.7214	0.7978	0.0256	0.9734	0.9571	0.9743	0.0257	0.0429	0.9314	0.3431	0.7008	0.7971
0.06	0.9758	0.9668	0.9762	0.0238	0.0332	0.9430	0.3223	0.7208	0.7969	0.0242	0.9760	0.9598	0.9769	0.0231	0.0402	0.9367	0.3042	0.7363	0.8068	0.0240	0.9769	0.9571	0.9779	0.0221	0.0429	0.9351	0.3093	0.7314	0.8024
0.07	0.9774	0.9597	0.9783	0.0217	0.0403	0.9380	0.3041	0.7364	0.8068	0.0226	0.9776	0.9554	0.9789	0.0211	0.0446	0.9342	0.2867	0.7514	0.8168	0.0224	0.9790	0.9571	0.9801	0.0199	0.0429	0.9373	0.2872	0.7511	0.8171
0.08	0.9797	0.9597	0.9808	0.0192	0.0403	0.9405	0.2794	0.7584	0.8232	0.0203	0.9804	0.9554	0.9818	0.0182	0.0446	0.9372	0.2569	0.7776	0.8359	0.0196	0.9825	0.9571	0.9838	0.0162	0.0429	0.9410	0.2472	0.7864	0.8428
0.09	0.9814	0.9597	0.9825	0.0175	0.0403	0.9422	0.2609	0.7747	0.8351	0.0186	0.9814	0.9375	0.9838	0.0162	0.0625	0.9213	0.2391	0.7907	0.8400	0.0186	0.9832	0.9571	0.9846	0.0154	0.0429	0.9417	0.2386	0.7938	0.8481
0.10	0.9829	0.9550	0.9843	0.0157	0.0450	0.9393	0.2411	0.7914	0.8458	0.0171	0.9835	0.9860	0.0140	0.0625	0.9235	0.2135	0.8127	0.8554	0.0165	0.9825	0.9429	0.9846	0.0154	0.0571	0.9274	0.2414	0.7895	0.8408	
0.11	0.9842	0.9526	0.9858	0.0142	0.0474	0.9384	0.2239	0.8059	0.8553	0.0158	0.9835	0.9375	0.9860	0.0140	0.0625	0.9235	0.2135	0.8127	0.8554	0.0165	0.9832	0.9429	0.9853	0.0147	0.0571	0.9282	0.2326	0.7971	0.8462
0.12	0.9844	0.9479	0.9863	0.0137	0.0521	0.9341	0.2188	0.8097	0.8565	0.0156	0.9837	0.9375	0.9862	0.0138	0.0625	0.9237	0.2105	0.8152	0.8571	0.0163	0.9839	0.9429	0.9860	0.0140	0.0571	0.9289	0.2235	0.8049	0.8516
0.13	0.9847	0.9408	0.9870	0.0130	0.0592	0.9278	0.2107	0.8155	0.8584	0.0153	0.9842	0.9375	0.9867	0.0133	0.0625	0.9242	0.2045	0.8203	0.8607	0.0158	0.9860	0.9429	0.9882	0.0118	0.0571	0.9311	0.1951	0.8291	0.8684
0.14	0.9853	0.9408	0.9876	0.0124	0.0592	0.9284	0.2028	0.8223	0.8630	0.0147	0.9839	0.9196	0.9875	0.0125	0.0804	0.9071	0.1984	0.8227	0.8565	0.0161	0.9874	0.9429	0.9897	0.0103	0.0571	0.9326	0.1750	0.8462	0.8800
0.15	0.9855	0.9384	0.9880	0.0120	0.0616	0.9264	0.1984	0.8257	0.8646	0.0145	0.9846	0.9152	0.9884	0.0116	0.0848	0.9036	0.1865	0.8320	0.8613	0.0154	0.9881	0.9429	0.9904	0.0096	0.0571	0.9333	0.1646	0.8549	0.8859
0.16	0.9858	0.9384	0.9882	0.0118	0.0616	0.9266	0.1951	0.8285	0.8665	0.0142	0.9851	0.9152	0.9889	0.0111	0.0848	0.9041	0.1800	0.8374	0.8650	0.0149	0.9888	0.9429	0.9912	0.0088	0.0571	0.9340	0.1538	0.8639	0.8919
0.17	0.9859	0.9360	0.9885	0.0115	0.0640	0.9245	0.1922	0.8305	0.8672	0.0141	0.9853	0.9107	0.9894	0.0106	0.0893	0.9001													

Logistic regression - ml_indicator 1 Misclassification

Response	Event	Value	Training Observations	Validation Observations	Test Observations
Correct	1	True Positive	370	188	59
Incorrect	1	False Negative	52	36	11
Correct	0	True Negative	8,127	4,051	1,356
Incorrect	0	False Positive	32	16	4

Logistic regression - ml_indicator 1 Assessment Statistics																	
Partition	KS (Youden)	Misclassification Rate	Misclassification Rate (Event)	C Statistic	False Positive Rate	False Discovery Rate	F1 Score	Lift	Cumulative Lift	Cumulative % Events	Cumulative % Captured	Gain	Gini	Gamma	Tau	Observations Used	Unused
Training	0.9483	0.0098	0.0098	0.995	0.004	0.080	0.898	18.104	88.837	90.521	17.104	0.991	0.995	0.093	8,581	0	
Validation	0.9521	0.0121	0.0121	0.995	0.004	0.078	0.879	17.232	89.767	86.161	16.232	0.989	0.994	0.098	4,291	0	
Test	0.9438	0.0105	0.0105	0.990	0.003	0.063	0.887	18.286	88.889	91.429	17.286	0.981	0.994	0.091	1,430	0	



Plot	Summary
Confusion Matrix	The confusion matrix plot displays the number of observations predicting each response level. A greater number of observations where the observed level and predicted level are the same indicates a better model. For this data, the percentages of each observed value that are correctly predicted in the validation partition are as follows: 0 - 99.61% and 1 - 83.93%.
Lift	The lift plot measures the ratio of percent captured response to the baseline percent response. The validation partition has a lift of 17.2321 at the 5% quantile meaning there are about 17.23 times more events in that quantile than expected by random (5% of the total number of events).
Cumulative Lift	Cumulative lift measures the ratio of percent captured response to the baseline percent response, up to and including the specified quantile. The validation partition has a cumulative lift of 9.9554 in the 10% quantile meaning there are about 9.96 times more events in the first two quantiles than expected by random (10% of the total number of events). Because this value is greater than 1, it is better to use your model to identify responders than no model, based on the validation partition.
ROC	The receiver operator characteristic (ROC) is a plot of sensitivity (the true positive rate) against 1-specificity (the false positive rate), which are both measures of classification based on the confusion matrix. These measures are calculated at various cutoff values. To help identify the best cutoff to use when scoring your data, the KS cutoff reference line is drawn at the value of 1-specificity where the greatest difference between sensitivity and 1-specificity is observed for the validation partition. The KS cutoff line is drawn at the cutoff value 0.04 where the 1-specificity value is 0.03 and the sensitivity value is 0.982. Cutoff values range from 0 to 0.99, inclusive, in increments of 0.01. At each cutoff value, the predicted response classification is determined by whether the predicted probability of the response ml_indicator being 1 is greater than or equal to the cutoff value. When the predicted probability of the event is greater than or equal to the cutoff value, then the predicted classification is 1, otherwise it is NOT 1.
Cutoff	The cutoff plot shows how different model assessment statistics change as the prediction cutoff value changes. The model assessment statistics are based on the selected event for the model compared to non-events. You can interactively move the cutoff line to represent different prediction cutoff values. As you move the cutoff line, the model assessment statistics are updated. This allows you to choose a cutoff that best represents your particular problem and business objective. When the accuracy statistic is enabled, its value for the selected cutoff is always displayed.
Misclassification	The misclassification plot is a visual representation of the accuracy of the prediction at the specified cutoff value, 0.50. The plot displays the number of true positives for events that are correctly classified, false positives for NOT events that are classified as events, false negatives for events that are classified as NOT events, and true negatives for NOT events that are classified as NOT events. True negatives include NOT event classifications that predict a different level from observed, as long as both are NOT events. The predicted response classification is determined by whether the predicted probability of the level 1 for the response ml_indicator is greater than or equal to the cutoff value. When it is greater than or equal to the cutoff value, the predicted classification is an event, otherwise it is a NOT event. For this data, for the bar corresponding to the event level of ml_indicator, 1, the segment of the bar colored as "Correct" corresponds to true positives.

Neural network - ml_indicator 1 Model Information



Description	Value
Model	Neural Net
Observations Used for Training	8,581
Observations Read for Training	8,581
Target/Response Variable	ml_indicator
Number of Neurons	34
Number of Input Neurons	22
Number of Output Neurons	2
Number of Hidden Neurons	10
Number of Hidden Layers	1
Number of Weight Parameters	230
Number of Bias Parameters	12
Architecture	MLP
Seed for Initial Weight	1,234
Optimization Technique	LBFGS
Number of Neural Nets	1
Objective Value	0.391995
Misclassification Error for Validation (%)	1.5147984153

Neural network - ml_indicator 1 Iteration History

Iterations	Objective	Loss	Validation Error
1	3.6733	3.0997	0.5181
2	1.4890	0.9150	0.0571
3	1.1630	0.5886	0.0424
4	0.9522	0.3818	0.0336
5	0.8162	0.2565	0.0235
6	0.6816	0.1543	0.0170
7	0.5950	0.1343	0.0144
8	0.5285	0.1339	0.0149
9	0.4663	0.1370	0.0147
10	0.4258	0.1415	0.0149
11	0.4155	0.1445	0.0144
12	0.4093	0.1484	0.0144
13	0.3964	0.1591	0.0151
14	0.3939	0.1556	0.0158
15	0.3922	0.1528	0.0151
16	0.3920	0.1530	0.0151

Neural network - ml_indicator 1 Convergence

Reason

The optimization achieved the desired objective value.



Neural network - ml_indicator 1 Confusion Matrix

Predicted	Observed	Training Observations	Training Percentage	Validation Observations	Validation Percentage	Test Observations	Test Percentage
0	0	8,138	99.74%	4,055	99.70%	1,358	99.85%
1	0	21	0.26%	12	0.30%	2	0.15%
0	1	79	18.72%	53	23.66%	15	21.43%
1	1	343	81.28%	171	76.34%	55	78.57%

Neural network - ml_indicator 1 Lift		ML Model Performance Metrics																	
Percentile	Training Observations	Training Events	Training Lift	Training Lift Best	Training Cumulative Lift	Training Cumulative Lift Best	Validation Observations	Validation Events	Validation Lift	Validation Lift Best	Validation Cumulative Lift	Validation Cumulative Lift Best	Test Observations	Test Events	Test Lift	Test Lift Best	Test Cumulative Lift	Test Cumulative Lift Best	
5.00	430	379	17.9621	20.0000	17.9621	20.0000	215	190	16.9643	19.1964	16.9643	19.1964	72	62	17.7143	20.0000	17.7143	20.0000	
10.00	430	40	1.8957	0.0000	9.9289	10.0000	215	30	2.6786	0.8036	9.8214	10.0000	72	6	1.7143	0.0000	9.7143	10.0000	
15.00	430	1	0.0474	0.0000	6.6351	6.6667	215	3	0.2679	0.0000	6.6369	6.6667	72	1	0.2857	0.0000	6.5714	6.6667	
20.00	430	0	0.0000	0.0000	4.9763	5.0000	215	1	0.0893	0.0000	5.0000	5.0000	72	1	0.2857	0.0000	5.0000	5.0000	
25.00	430	1	0.0474	0.0000	3.9905	4.0000	215	0	0.0000	0.0000	4.0000	4.0000	72	0	0.0000	0.0000	4.0000	4.0000	
30.00	430	0	0.0000	0.0000	3.3254	3.3333	215	0	0.0000	0.0000	3.3333	3.3333	72	0	0.0000	0.0000	3.3333	3.3333	
35.00	430	1	0.0474	0.0000	2.8571	2.8571	215	0	0.0000	0.0000	2.8571	2.8571	72	0	0.0000	0.0000	2.8571	2.8571	
40.00	430	0	0.0000	0.0000	2.5000	2.5000	215	0	0.0000	0.0000	2.5000	2.5000	72	0	0.0000	0.0000	2.5000	2.5000	
45.00	430	0	0.0000	0.0000	2.2222	2.2222	215	0	0.0000	0.0000	2.2222	2.2222	72	0	0.0000	0.0000	2.2222	2.2222	
50.00	430	0	0.0000	0.0000	2.0000	2.0000	215	0	0.0000	0.0000	2.0000	2.0000	72	0	0.0000	0.0000	2.0000	2.0000	
55.00	430	0	0.0000	0.0000	1.8182	1.8182	215	0	0.0000	0.0000	1.8182	1.8182	72	0	0.0000	0.0000	1.8182	1.8182	
60.00	430	0	0.0000	0.0000	1.6667	1.6667	215	0	0.0000	0.0000	1.6667	1.6667	72	0	0.0000	0.0000	1.6667	1.6667	
65.00	430	0	0.0000	0.0000	1.5385	1.5385	215	0	0.0000	0.0000	1.5385	1.5385	72	0	0.0000	0.0000	1.5385	1.5385	
70.00	430	0	0.0000	0.0000	1.4286	1.4286	215	0	0.0000	0.0000	1.4286	1.4286	72	0	0.0000	0.0000	1.4286	1.4286	
75.00	430	0	0.0000	0.0000	1.3333	1.3333	215	0	0.0000	0.0000	1.3333	1.3333	72	0	0.0000	0.0000	1.3333	1.3333	
80.00	430	0	0.0000	0.0000	1.2500	1.2500	215	0	0.0000	0.0000	1.2500	1.2500	72	0	0.0000	0.0000	1.2500	1.2500	
85.00	430	0	0.0000	0.0000	1.1765	1.1765	215	0	0.0000	0.0000	1.1765	1.1765	72	0	0.0000	0.0000	1.1765	1.1765	
90.00	430	0	0.0000	0.0000	1.1111	1.1111	215	0	0.0000	0.0000	1.1111	1.1111	72	0	0.0000	0.0000	1.1111	1.1111	
95.00	430	0	0.0000	0.0000	1.0526	1.0526	215	0	0.0000	0.0000	1.0526	1.0526	72	0	0.0000	0.0000	1.0526	1.0526	
100.00	411	0	0.0000	0.0000	1.0000	1.0000	206	0	0.0000	0.0000	1.0000	1.0000	62	0	0.0000	0.0000	1.0000	1.0000	

Neural network - ml_indicator 1 ROC									
Cutoff	Training Sensitivity	Training 1 - Specificity	Training KS (Youden)	Validation Sensitivity	Validation 1 - Specificity	Validation KS (Youden)	Test Sensitivity	Test 1 - Specificity	Test KS (Youden)
0.00	1.0000	1.000		1.0000	1.000		1.0000	1.000	
0.01	0.9976	0.193		1.0000	0.193		1.0000	0.188	
0.02	0.9953	0.109		0.9955	0.109		0.9857	0.113	
0.03	0.9953	0.077		0.9866	0.077		0.9857	0.076	
0.04	0.9929	0.061		0.9821	0.061		0.9714	0.056	
0.05	0.9858	0.048		0.9821	0.049		0.9714	0.043	
0.06	0.9810	0.041		0.9777	0.043		0.9714	0.036	
0.07	0.9763	0.035		0.9777	0.038		0.9714	0.035	
0.08	0.9739	0.031	Yes	0.9732	0.032	Yes	0.9714	0.029	
0.09	0.9668	0.029		0.9598	0.029		0.9714	0.026	
0.10	0.9597	0.025		0.9509	0.025		0.9714	0.023	Yes
0.11	0.9550	0.023		0.9420	0.021		0.9571	0.023	
0.12	0.9526	0.021		0.9420	0.018		0.9571	0.020	
0.13	0.9479	0.020		0.9420	0.017		0.9571	0.018	
0.14	0.9431	0.018		0.9375	0.015		0.9571	0.015	
0.15	0.9360	0.016		0.9196	0.014		0.9571	0.014	
0.16	0.9360	0.016		0.9152	0.013		0.9429	0.013	
0.17	0.9336	0.015		0.9063	0.012		0.9286	0.013	
0.18	0.9313	0.013		0.9063	0.012		0.9000	0.012	
0.19	0.9289	0.013		0.9018	0.011		0.9000	0.011	
0.20	0.9265	0.012		0.9018	0.010		0.9000	0.010	
0.21	0.9242	0.011		0.9018	0.009		0.9000	0.010	
0.22	0.9218	0.010		0.8973	0.009		0.9000	0.009	
0.23	0.9171	0.009		0.8929	0.009		0.9000	0.007	
0.24	0.9147	0.008		0.8929	0.009		0.8857	0.007	
0.25	0.9123	0.008		0.8884	0.009		0.8857	0.006	
0.26	0.9076	0.007		0.8839	0.008		0.8857	0.006	
0.27	0.9076	0.007		0.8795	0.008		0.8857	0.005	
0.28	0.8981	0.006		0.8750	0.008		0.8857	0.005	
0.29	0.8910	0.006		0.8661	0.007		0.8714	0.005	
0.30	0.8863	0.006		0.8661	0.007		0.8714	0.005	
0.31	0.8839	0.006		0.8527	0.006		0.8714	0.005	
0.32	0.8815	0.006		0.8527	0.006		0.8714	0.004	
0.33	0.8815	0.005		0.8482	0.006		0.8714	0.004	
0.34	0.8791	0.005		0.8482	0.005		0.8714	0.004	
0.35	0.8768	0.005		0.8393	0.005		0.8714	0.004	
0.36	0.8744	0.005		0.8259	0.005		0.8571	0.004	
0.37	0.8649	0.004		0.8259	0.005		0.8571	0.004	
0.38	0.8555	0.004		0.8170	0.005		0.8571	0.004	
0.39	0.8531	0.004		0.8170	0.004		0.8571	0.004	
0.40	0.8531	0.004		0.8170	0.004		0.8571	0.004	
0.41	0.8318	0.003		0.8125	0.003		0.8429	0.004	
0.42	0.8294	0.003		0.8125	0.003		0.8429	0.003	
0.43	0.8294	0.003		0.8080	0.003		0.8429	0.003	
0.44	0.8294	0.003		0.8036	0.003		0.8429	0.003	
0.45	0.8294	0.003		0.7857	0.003		0.8286	0.003	
0.46	0.8270	0.003		0.7857	0.003		0.8286	0.003	
0.47	0.8223	0.003		0.7857	0.003		0.8000	0.003	
0.48	0.8175	0.003		0.7813	0.003		0.8000	0.002	
0.49	0.8128	0.003		0.7679	0.003		0.8000	0.001	
0.50	0.8128	0.003		0.7634	0.003		0.7857	0.001	
0.51	0.8057	0.002		0.7589	0.003		0.7857	0.001	
0.52	0.8033	0.002		0.7545	0.002		0.7714	0.001	
0.53	0.8009	0.002		0.7545	0.002		0.7714	0.001	
0.54	0.7962	0.002		0.7411	0.002		0.7714	0.001	
0.55	0.7891	0.002		0.7321	0.002		0.7571	0.001	
0.56	0.7820	0.002		0.7321	0.002		0.7571	0.001	
0.57	0.7725	0.002		0.7321	0.002		0.7571	0.001	
0.58	0.7701	0.002		0.7321	0.002		0.7571	0.001	
0.59	0.7654	0.001		0.7232	0.002		0.7571	0.001	
0.60	0.7559	0.001		0.7188	0.002		0.7571	0.001	
0.61	0.7559	0.001		0.7098	0.002		0.7429	0.001	
0.62	0.7536	0.001		0.7009	0.002		0.7429	0.001	
0.63	0.7417	0.001		0.6875	0.002		0.7286	0.001	
0.64	0.7299	0.001		0.6741	0.002		0.7286	0.001	
0.65	0.7275	0.001		0.6696	0.002		0.7000	0.001	
0.66	0.7251	0.001		0.6607	0.002		0.6857	0.001	
0.67	0.7156	0.001		0.6563	0.002		0.6857	0.001	
0.68	0.7062	0.001		0.6518	0.002		0.6571	0.001	
0.69	0.6896	0.001		0.6518	0.001		0.6286	0.001	
0.70	0.6730	0.001		0.6473	0.001		0.6286	0.001	
0.71	0.6493	0.001		0.6429	0.001		0.6286	0.001	
0.72	0.6374	0.001		0.6295	0.001		0.6143	0.001	
0.73	0.6185	0.000		0.6161	0.001		0.6000	0.001	
0.74	0.6137	0.000		0.6071	0.001		0.5714	0.001	
0.75	0.6019	0.000		0.6027	0.001		0.5714	0.001	
0.76	0.5829	0.000		0.5982	0.001		0.5571	0.001	
0.77	0.5592	0.000		0.5938	0.001		0.5286	0.001	
0.78	0.5450	0.000		0.5804	0.001		0.5286	0.001	
0.79	0.5284	0.000		0.5625	0.001		0.5286	0.001	
0.80	0.5166	0.000		0.5446	0.001		0.5000	0.001	
0.81	0.5024	0.000		0.5268	0.001		0.5000</		

Neural network - ml_indicator 1 Cutoff Statistics																														
Cutoff	Training Accuracy	Training Sensitivity	Training Specificity	Training False Positive Rate	Training False Negative Rate	Training Kolmogorov-Smirnov (KS)	Training F0.5 Score	Training F1 Score	Training Misclassification Rate (Event)	Validation Accuracy	Validation Sensitivity	Validation Specificity	Validation False Positive Rate	Validation Kolmogorov-Smirnov (KS)	Validation F0.5 Score	Validation F1 Score	Validation Misclassification Rate (Event)	Test Accuracy	Test Sensitivity	Test Specificity	Test False Positive Rate	Test False Negative Rate	Test Kolmogorov-Smirnov (KS)	Test F0.5 Score	Test F1 Score	Test Misclassification Rate (Event)	Y%			
										Training	False	Positive	Rate	False	Discovery	Rate	False	Rate	Event	False	Rate	Event	False	Rate	Event	False	Rate	Event		
0.00	0.0492	1.0000	0.0000	1.0000	0.0000	0.9508	0.0607	0.0937	0.9508	0.0522	1.0000	0.0000	1.0000	0.0000	0.9478	0.0644	0.0992	0.9478	0.0490	1.0000	0.0000	1.0000	0.0000	0.9510	0.0604	0.0933	0.9510			
0.01	0.8163	0.9976	0.8070	0.1930	0.0024	0.8046	0.7891	0.2504	0.3482	0.1837	0.8168	0.0000	0.8067	0.1933	0.0867	0.7782	0.2627	0.3630	0.1832	0.8210	1.0000	0.0000	0.1882	0.0000	0.8118	0.2547	0.3535	0.1790		
0.02	0.8958	0.9953	0.8907	0.1093	0.0047	0.8859	0.6799	0.3704	0.4844	0.1042	0.8961	0.9955	0.8906	0.1094	0.0045	0.8861	0.6662	0.3850	0.5000	0.1039	0.8916	0.9857	0.8868	0.1132	0.0143	0.8725	0.6906	0.3586	0.4710	0.1084
0.03	0.9268	0.9953	0.9233	0.0767	0.0047	0.9185	0.5985	0.4559	0.5722	0.0732	0.9259	0.9866	0.9225	0.0775	0.0134	0.9092	0.5877	0.4666	0.5816	0.0741	0.9273	0.9857	0.9243	0.0757	0.0143	0.9100	0.5986	0.4551	0.5702	0.0727
0.04	0.9421	0.9929	0.9395	0.0605	0.0071	0.9323	0.5411	0.5142	0.6277	0.0579	0.9410	0.9821	0.9388	0.0612	0.0179	0.9209	0.5309	0.5288	0.6349	0.0590	0.9455	0.9714	0.9441	0.0559	0.0286	0.9155	0.5278	0.5263	0.6355	0.0545
0.05	0.9539	0.9858	0.9522	0.0478	0.0142	0.9380	0.4839	0.5705	0.6775	0.0461	0.9527	0.9821	0.9511	0.0489	0.0179	0.9332	0.4749	0.5789	0.6843	0.0473	0.9573	0.9714	0.9566	0.0434	0.0286	0.9280	0.4646	0.5882	0.6904	0.0427
0.06	0.9603	0.9810	0.9592	0.0408	0.0190	0.9402	0.4458	0.6070	0.7083	0.0397	0.9585	0.9777	0.9575	0.0425	0.0223	0.9351	0.4413	0.6110	0.7110	0.0415	0.9643	0.9714	0.9640	0.0360	0.0286	0.9354	0.4188	0.6320	0.7273	0.0357
0.07	0.9655	0.9763	0.9649	0.0351	0.0237	0.9413	0.4097	0.6409	0.7357	0.0345	0.9629	0.9777	0.9621	0.0379	0.0223	0.9398	0.4129	0.6381	0.7337	0.0371	0.9567	0.9714	0.9654	0.0346	0.0286	0.9369	0.4087	0.6415	0.7351	0.0343
0.08	0.9688	0.9739	0.9685	0.0315	0.0261	0.9424	0.3847	0.6642	0.7541	0.0312	0.9683	0.9732	0.9680	0.0320	0.0268	0.9412	0.3736	0.6745	0.7622	0.0317	0.9706	0.9714	0.9706	0.0294	0.0286	0.9420	0.3704	0.6773	0.7640	0.0294
0.09	0.9709	0.9668	0.9711	0.0289	0.0332	0.9379	0.3665	0.6805	0.7655	0.0291	0.9706	0.9598	0.9712	0.0268	0.0402	0.9311	0.3524	0.6927	0.7734	0.0294	0.9741	0.9714	0.9743	0.0257	0.0286	0.9457	0.3398	0.7054	0.8761	0.0259
0.10	0.9746	0.9597	0.9754	0.0246	0.0403	0.9351	0.3171	0.7115	0.7879	0.0254	0.9734	0.9509	0.9747	0.0253	0.0491	0.9256	0.3259	0.7157	0.7889	0.0266	0.9769	0.9714	0.9772	0.0228	0.0286	0.9486	0.3131	0.7296	0.8047	0.0231
0.11	0.9763	0.9550	0.9774	0.0226	0.0450	0.9324	0.3135	0.7274	0.7988	0.0237	0.9767	0.9420	0.9786	0.0214	0.0580	0.9206	0.2919	0.7451	0.8084	0.0233	0.9762	0.9751	0.9772	0.0228	0.0429	0.9343	0.3163	0.7251	0.7976	0.0238
0.12	0.9777	0.9526	0.9790	0.0210	0.0474	0.9316	0.2984	0.7406	0.8080	0.0223	0.9795	0.9420	0.9816	0.0184	0.0580	0.9235	0.2622	0.7712	0.8275	0.0205	0.9790	0.9571	0.9801	0.0199	0.0429	0.9373	0.2872	0.7511	0.8171	0.0210
0.13	0.9784	0.9479	0.9800	0.0200	0.0521	0.9279	0.2895	0.7479	0.8122	0.0216	0.9809	0.9420	0.9830	0.0170	0.0580	0.9250	0.2464	0.7850	0.8373	0.0191	0.9811	0.9571	0.9824	0.0176	0.0429	0.9395	0.2637	0.7719	0.8323	0.0189
0.14	0.9798	0.9431	0.9817	0.0183	0.0569	0.9249	0.2724	0.7625	0.8215	0.0202	0.9821	0.9375	0.9845	0.0155	0.0625	0.9220	0.2308	0.7979	0.8451	0.0179	0.9832	0.9571	0.9846	0.0154	0.0429	0.9417	0.2386	0.7938	0.8481	0.0168
0.15	0.9814	0.9360	0.9837	0.0163	0.0640	0.9197	0.2519	0.7794	0.8316	0.0186	0.9823	0.9196	0.9857	0.0143	0.0804	0.9054	0.2197	0.8047	0.8443	0.0177	0.9846	0.9571	0.9860	0.0140	0.0429	0.9432	0.2209	0.8092	0.8590	0.0154
0.16	0.9821	0.9360	0.9844	0.0156	0.0640	0.9205	0.2433	0.7869	0.8369	0.0179	0.9830	0.9152	0.9867	0.0133	0.0848	0.9019	0.2085	0.8135	0.8489	0.0170	0.9846	0.9429	0.9868	0.0132	0.0571	0.9296	0.2143	0.8128	0.8571	0.0154
0.17	0.9825	0.9336	0.9850	0.0150	0.0664	0.9187	0.2364	0.7924	0.8401	0.0175	0.9835	0.9063	0.9877	0.0123	0.0938	0.8940	0.1976	0.8212												

Neural network - ml_indicator 1 Misclassification

Response	Event	Value	Training Observations	Validation Observations	Test Observations
Correct	1	True Positive	343	171	55
Incorrect	1	False Negative	79	53	15
Correct	0	True Negative	8,138	4,055	1,358
Incorrect	0	False Positive	21	12	2

Neural network - ml_indicator 1 Assessment Statistics																	
Partition	KS (Youden)	Misclassification Rate	Misclassification Rate (Event)	C Statistic	False Positive Rate	False Discovery Rate	F1 Score	Lift	Cumulative Lift	Cumulative % Events	Cumulative % Captured	Gain	Gini	Gamma	Tau	Observations Used	Unused
Training	0.9424	0.0117	0.0117	0.995	0.003	0.058	0.873	17.962	88.140	89.810	16.962	0.991	0.993	0.093	8,581	0	
Validation	0.9412	0.0151	0.0151	0.995	0.003	0.066	0.840	16.964	88.372	84.821	15.964	0.990	0.991	0.098	4,291	0	
Test	0.9486	0.0119	0.0119	0.995	0.001	0.035	0.866	17.714	86.111	88.571	16.714	0.990	0.991	0.092	1,430	0	



Plot	Summary
Confusion Matrix	The confusion matrix plot displays the number of observations predicting each response level. A greater number of observations where the observed level and predicted level are the same indicates a better model. For this data, the percentages of each observed value that are correctly predicted in the validation partition are as follows: 0 - 99.70% and 1 - 76.34%.
Lift	The lift plot measures the ratio of percent captured response to the baseline percent response. The validation partition has a lift of 16.9643 at the 5% quantile meaning there are about 16.96 times more events in that quantile than expected by random (5% of the total number of events).
Cumulative Lift	Cumulative lift measures the ratio of percent captured response to the baseline percent response, up to and including the specified quantile. The validation partition has a cumulative lift of 9.8214 in the 10% quantile meaning there are about 9.82 times more events in the first two quantiles than expected by random (10% of the total number of events). Because this value is greater than 1, it is better to use your model to identify responders than no model, based on the validation partition.
ROC	The receiver operator characteristic (ROC) is a plot of sensitivity (the true positive rate) against 1-specificity (the false positive rate), which are both measures of classification based on the confusion matrix. These measures are calculated at various cutoff values. To help identify the best cutoff to use when scoring your data, the KS cutoff reference line is drawn at the value of 1-specificity where the greatest difference between sensitivity and 1-specificity is observed for the validation partition. The KS cutoff line is drawn at the cutoff value 0.08 where the 1-specificity value is 0.032 and the sensitivity value is 0.973. Cutoff values range from 0 to 0.99, inclusive, in increments of 0.01. At each cutoff value, the predicted response classification is determined by whether the predicted probability of the response ml_indicator being 1 is greater than or equal to the cutoff value. When the predicted probability of the event is greater than or equal to the cutoff value, then the predicted classification is 1, otherwise it is NOT 1.
Cutoff	The cutoff plot shows how different model assessment statistics change as the prediction cutoff value changes. The model assessment statistics are based on the selected event for the model compared to non-events. You can interactively move the cutoff line to represent different prediction cutoff values. As you move the cutoff line, the model assessment statistics are updated. This allows you to choose a cutoff that best represents your particular problem and business objective. When the accuracy statistic is enabled, its value for the selected cutoff is always displayed.
Misclassification	The misclassification plot is a visual representation of the accuracy of the prediction at the specified cutoff value, 0.50. The plot displays the number of true positives for events that are correctly classified, false positives for NOT events that are classified as events, false negatives for events that are classified as NOT events, and true negatives for NOT events that are classified as NOT events. True negatives include NOT event classifications that predict a different level from observed, as long as both are NOT events. The predicted response classification is determined by whether the predicted probability of the level 1 for the response ml_indicator is greater than or equal to the cutoff value. When it is greater than or equal to the cutoff value, the predicted classification is an event, otherwise it is a NOT event. For this data, for the bar corresponding to the event level of ml_indicator, 1, the segment of the bar colored as "Correct" corresponds to true positives.

Model comparison 1 Statistics																			
Selected	Model	Visualization Type	Observations	Percentile	Prediction cutoff	C Statistic	Cumulative % Captured	Cumulative % Events	Cumulative Lift	F1 Score	False Discovery Rate	False Positive Rate	Gain	Gamma	Gini	KS (Youden)	Lift	Misclassification Rate (Event)	Tau
Yes	Logistic regression - ml_indicator 1	Logistic Regression	8,581	5	0.5	0.995	90.521	88.837	18.1043	0.898	0.080	0.004	17.104	0.995	0.991	0.948	18.1043	0.010	0.093
Yes	Validation Logistic regression - ml_indicator 1	Logistic Regression	4,291	5	0.5	0.995	86.161	89.767	17.2321	0.879	0.078	0.004	16.232	0.994	0.989	0.952	17.2321	0.012	0.098
Yes	Test Logistic regression - ml_indicator 1	Logistic Regression	1,430	5	0.5	0.990	91.429	88.889	18.2857	0.887	0.063	0.003	17.286	0.994	0.981	0.944	18.2857	0.010	0.091
No	Neural network - ml_indicator 1	Neural Network	8,581	5	0.5	0.995	89.810	88.140	17.9621	0.873	0.058	0.003	16.962	0.993	0.991	0.942	17.9621	0.012	0.093
No	Validation Neural network - ml_indicator 1	Neural Network	4,291	5	0.5	0.995	84.821	88.372	16.9643	0.840	0.066	0.003	15.964	0.991	0.990	0.941	16.9643	0.015	0.098
No	Test Neural network - ml_indicator 1	Neural Network	1,430	5	0.5	0.995	88.571	86.111	17.7143	0.866	0.035	0.001	16.714	0.991	0.990	0.949	17.7143	0.012	0.092

Model comparison 1 Variable Importance

Variable	Logistic regression - ml_indicator 1 Rank	Neural network - ml_indicator 1 Rank	Logistic regression - ml_indicator 1 Importance	Neural network ml_indicator 1 Importance
common_merchant_indicator	1		0.000000	
trx_10ksum_indicator	2		0.000000	
marital_status_single	3		0.000000	
credit_score	4		0.000000	
in_person_contact_indicator	5		0.000000	
citizenship_country_risk	6		0.000000	
direct_deposit_indicator	7		0.000000	
linkedin_indicator	8		0.000000	
address_change_2x_indicator	9		0.000000	
cross_border_trx_indicator	10		0.000000	
checking_only_indicator	11		0.000003	
occupation_risk	12		0.000008	
num_transactions	13		0.000021	
prior_ctr_indicator	14		0.000166	
income	15		0.001776	
atm_deposit_indicator	16		0.218352	
num_acctbal_chgs_gt2000	17		0.325919	
distance_to_bank	18		0.537842	
distance_to_employer	19		0.904415	
primary_transfer_cash	20		0.000000	
primary_transfer_check	21		0.000000	
primary_transfer_wire	22		0.000000	

Model comparison 1 Champion Model Summary

Champion Model Summary



The champion model is Logistic regression - ml_indicator 1. The model was chosen based on KS (Youden) (0.95) for the validation partition. 98.79% of the validation partition was correctly classified using the Logistic regression - ml_indicator 1 model with a prediction cutoff value of 0.5. The eighteen most important factors with greater than 10% relative importance are trx_10ksum_indicator, common_merchant_indicator, primary_transfer_wire, credit_score, primary_transfer_check, marital_status_single, citizenship_country_risk, distance_to_employer, in_person_contact_indicator, distance_to_bank, address_change_2x_indicator, direct_deposit_indicator, linkedin_indicator, income, num_transactions, cross_border_trx_indicator, checking_only_indicator, and occupation_risk.

Automated explanation - ml_indicator_type 1 Explanation Description

1. Select response for Automated Explanation	A report author selected ml_indicator_type as the response.
2. Screen factors	Automated Explanation modified or removed 14 of 20 factors. See the Screening Results tab for details.
3. Determine most related factors	Automated Explanation used a one-level decision tree for each factor to determine its relative importance to ml_indicator_type. For example, the input common_merchant_indicator has a relative importance of 0.85 which means it is 0.85 times as important as trx_10ksum_indicator.

Automated explanation - ml_indicator_type 1 Screening Results



Factor	Action Taken
address_change_2x_indicator	The measure was converted to category because relatively few distinct levels were detected.
atm_deposit_indicator	The measure was converted to category because relatively few distinct levels were detected.
checking_only_indicator	The measure was converted to category because relatively few distinct levels were detected.
citizenship_country_risk	The measure was converted to category because relatively few distinct levels were detected.
common_merchant_indicator	The measure was converted to category because relatively few distinct levels were detected.
credit_score	
cross_border_trx_indicator	The measure was converted to category because relatively few distinct levels were detected.
direct_deposit_indicator	The measure was converted to category because relatively few distinct levels were detected.
distance_to_bank	
distance_to_employer	
in_person_contact_indicator	The measure was converted to category because relatively few distinct levels were detected.
income	
linkedin_indicator	The measure was converted to category because relatively few distinct levels were detected.
marital_status	The measure was converted to category because relatively few distinct levels were detected.
num_acctbal_chgs_gt2000	
num_transactions	
occupation_risk	The measure was converted to category because relatively few distinct levels were detected.
primary_transfer_cat	The measure was converted to category because relatively few distinct levels were detected.
prior_ctr_indicator	The measure was converted to category because relatively few distinct levels were detected.
trx_10ksum_indicator	The measure was converted to category because relatively few distinct levels were detected.

Automated explanation - ml_indicator_type 1 Relative Importance

Factor	Importance
trx_10ksum_indicator	1.0000
common_merchant_indicator	0.8533
primary_transfer_cat	0.4852
credit_score	0.4169
marital_status	0.3829
distance_to_employer	0.2175
citizenship_country_risk	0.2042
in_person_contact_indicator	0.2039
address_change_2x_indicator	0.1851
distance_to_bank	0.1781
direct_deposit_indicator	0.1574
linkedin_indicator	0.1406
income	0.1307
checking_only_indicator	0.1025
cross_border_trx_indicator	0.0992
occupation_risk	0.0983
num_transactions	0.0943
prior_ctr_indicator	0.0616
num_acctbal_chgs_gt2000	0.0499
atm_deposit_indicator	0.0205

Automated explanation - ml_indicator_type 1 Anomalies

ml_indicator_type	Frequency of Values	Location
No anomalies detected		