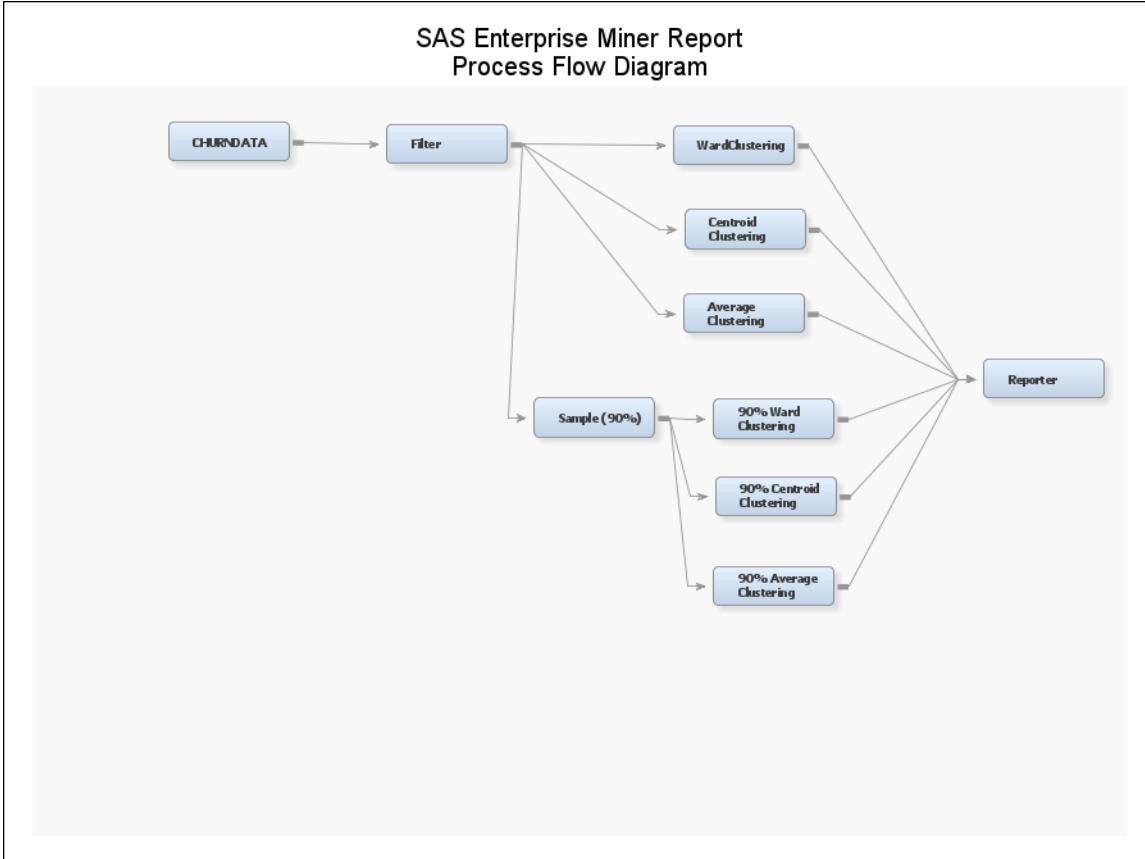


SAS Enterprise Miner Report

User = rbale2
Date = 21:37:53 October 14
Project = RB.ExploratoryAnalysis
Diagram = RB.ClusterAnalysis

Start Node = Report
Node label = Reporter
Nodes = PATH
Showall = N

Format = PDF
Style = LISTING



SAS Enterprise Miner Report

Node=CHURNDATA Summary

Node id = lds
 Node label = CHURNDATA
 Meta path = lds
 Notes =

Node=CHURNDATA Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DataSource		DsCreatedBy	rbale2		NBytes	1770496	.
ApplyIntervalLevelLowerLimit	Y		DsId	churndata		NCols	21	.
ApplyMaxClassLevels	Y		DsModifiedBy	rbale2		NObs	7043	.
ApplyMaxPercentMissing	Y		DsModifyDate	2012934770.1		NewTable		
CMeta	WORK.M0ZSX1WX		DsSampleName			NewVariableRole	REJECT	
ComputeStatistics	N		DsSampleSize			OutputType	VIEW	
DBPassThrough	Y		DsSampleSizeType			Role	RAW	TRAIN
Data	SASUSER.CHURNDATA		DsScope	LOCAL		Sample	D	
DataSelection	DATASOURCE		IdentifyEmptyColumns	Y		SampleSizeObs	10000	
DataSource	churndata		IntervalLowerLimit	20		SampleSizePercent	20	
DataSourceRole	RAW		Library	SASUSER		SampleSizeType	PERCENT	
Description			MaxClassLevels	20		Scope	LOCAL	
DropMapVariables	Y		MaxPercentMissing	50		Segment		
DsCreateDate	2012934769.8		MetaAdvisor	BASIC		Table	CHURNDATA	

Node=CHURNDATA Data Attributes

Attribute	Value	Attribute	Value	Attribute	Value
Data Name	CHURNDATA	Date Created	14Oct2023:16:52:11	Data Size	1770496
Data Type	DATA	Date Modified	14Oct2023:16:52:11	Role	RAW
Data Label		Number Rows	7043	Segment	
Engine	V9	Number Columns	21	Data Library	SASUSER

Node=CHURNDATA Variables List

Name	Label	Role	Level	Type	Length	Format	Creator
Churn		TARGET	BINARY	C	3	\$3.	
Contract		INPUT	NOMINAL	C	14	\$14.	
Dependents		INPUT	BINARY	C	3	\$3.	
DeviceProtection		INPUT	NOMINAL	C	19	\$19.	
InternetService		INPUT	NOMINAL	C	11	\$11.	
MonthlyCharges		INPUT	INTERVAL	N	8	BEST12.0	
MultipleLines		INPUT	NOMINAL	C	16	\$16.	
OnlineBackup		INPUT	NOMINAL	C	19	\$19.	
OnlineSecurity		INPUT	NOMINAL	C	19	\$19.	
PaperlessBilling		INPUT	BINARY	C	3	\$3.	
Partner		INPUT	BINARY	C	3	\$3.	

Name	Label	Role	Level	Type	Length	Format	Creator
PaymentMethod		INPUT	NOMINAL	C	25	\$25.	
PhoneService		INPUT	BINARY	C	3	\$3.	
SeniorCitizen		INPUT	BINARY	N	8	BEST12.0	
StreamingMovies		INPUT	NOMINAL	C	19	\$19.	
StreamingTV		INPUT	NOMINAL	C	19	\$19.	
TechSupport		INPUT	NOMINAL	C	19	\$19.	
TotalCharges		INPUT	INTERVAL	N	8	BEST12.0	
customerID		REJECTED	NOMINAL	C	10	\$10.	
gender		INPUT	BINARY	C	6	\$6.	
tenure		INPUT	INTERVAL	N	8	BEST12.0	

SAS Enterprise Miner Report

Node=Filter Summary

Node id = Filter
 Node label = Filter
 Meta path = Ids => Filter
 Notes =

Node=Filter Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Filter		KeepMissingInterval	Y		PercentsCutoff	0.5	
ClassFilterMethod	MINPCT		MADSCutoff	9		PublishScoreCode	Y	
CreateDistributionData	Y	N	MaxValues	25		SpacingsCutoff	9	
ExportTable	FILTERED		MinFreq	1		StddevCutoff	3	
IntervalFilterMethod	STDDEV		MinPercent	0.01		TabletoFilter	TRAIN	
KeepMissingClass	Y		NormalizeClassValue	Y		UpdateClassLevel	N	

Node=Filter Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
REJECTED	NOMINAL	1	customerID
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Filter Excluded Class Values

Node=Filter Limits for Interval Variables

Variable	Role	Minimum	Maximum	Filter Method	Keep Missing Values	Label
MonthlyCharges	INPUT	-25.51	155.03	STDDEV	Y	
TotalCharges	INPUT	-4517.01	9083.61	STDDEV	Y	
tenure	INPUT	-41.31	106.05	STDDEV	Y	

SAS Enterprise Miner Report

Node=Sample (90%) Summary

Node id = Smpl
 Node label = Sample (90%)
 Meta path = Ids => Filter => Smpl
 Notes =

Node=Sample (90%) Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Sample		IgnoreSmallStrata	N		OutputType	DATA	
AdjustFreq	N		IntervalDistribution	Y		Pvalue	0.01	
Alpha	0.01		LevelProportion	100		RandomSeed	12345	
ClassDistribution	Y		LevelSampleProportion	50		SizeObs	.	
ClusterMethod	RANDOM		LevelSelection	EVENT		SizePercent	90	10
FreqCount	N		Method	DEFAULT		SizeType	PERCENT	
FreqMiss	N		MinStrataSize	5		StratifyCriterion	PROPORTIONAL	

Node=Sample (90%) Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
REJECTED	NOMINAL	1	customerID
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

SAS Enterprise Miner Report

Node=90% Average Clustering Summary

Node id = Clus6
 Node label = 90% Average Clustering
 Meta path = Ids => Filter => Smpl => Clus6
 Notes =

Node=90% Average Clustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	AVERAGE	WARD	ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	AUTOMATIC	
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	10		TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=90% Average Clustering Variable Summary

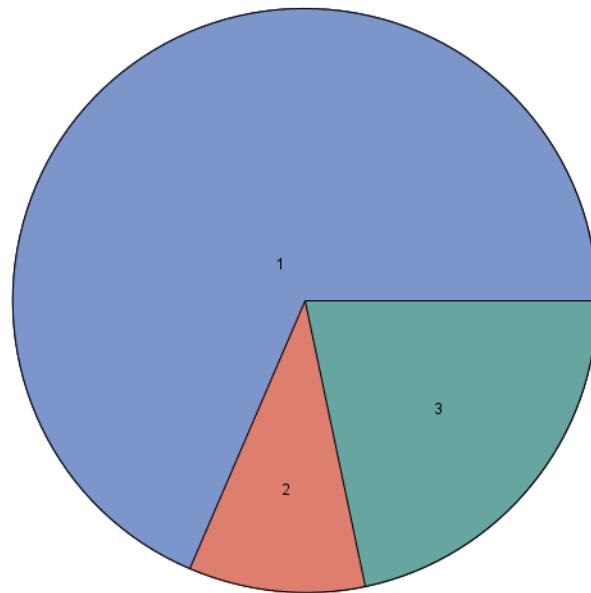
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

Node=90% Average Clustering Mean Statistics

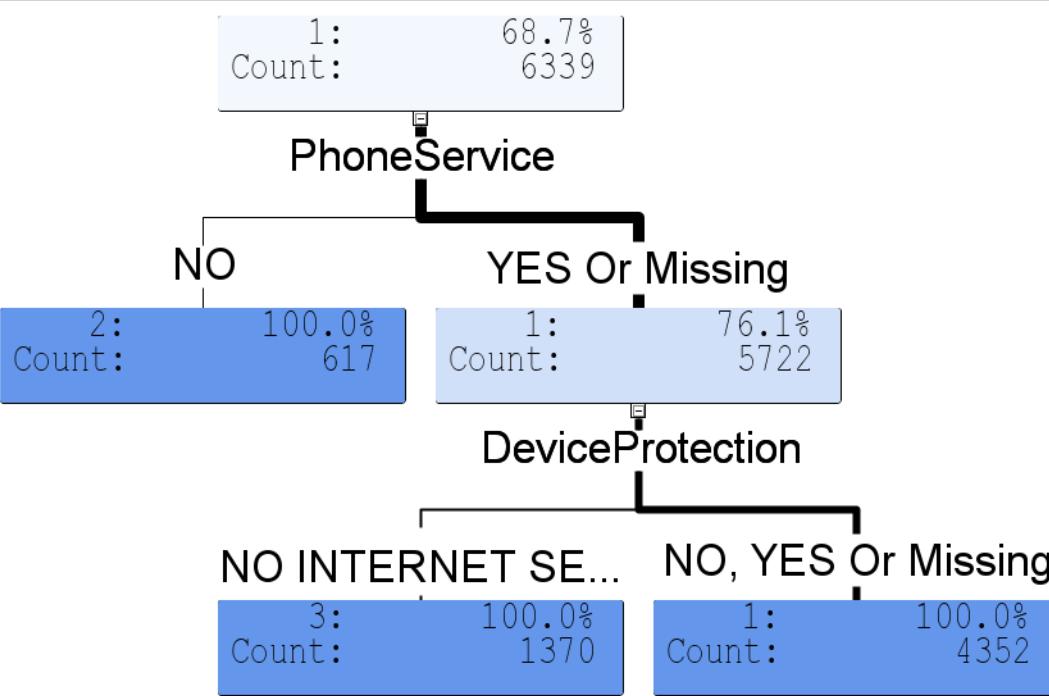
Variable	Segment 1	Segment 2	Segment 3
Clustering Criterion	0.53	0.53	0.53
Maximum Relative Change in Cluster Seeds	0.00	0.00	0.00
Improvement in Clustering Criterion	0.00	0.00	0.00
Frequency of Cluster	4352.00	617.00	1370.00
Root-Mean-Square Standard Deviation	0.57	0.52	0.41
Maximum Distance from Cluster Seed	5.39	4.96	4.37
Nearest Cluster	2.00	1.00	1.00
Distance to Nearest Cluster	4.40	4.40	5.07
MonthlyCharges	81.72	41.75	21.06
TotalCharges	2882.46	1456.05	657.24
tenure	32.81	31.02	30.23
Contract=Month-to-month	0.62	0.56	0.35

Variable	Segment 1	Segment 2	Segment 3
Contract=One year	0.20	0.21	0.24
Contract=Two year	0.18	0.23	0.42
Dependents>No	0.74	0.69	0.57
Dependents=Yes	0.26	0.31	0.43
DeviceProtection>No	0.56	0.56	-0.00
DeviceProtection>No internet service	-0.00	0.00	1.00
DeviceProtection=Yes	0.44	0.44	-0.00
InternetService=DSL	0.36	1.00	0.00
InternetService=Fiber optic	0.64	-0.00	-0.00
InternetService>No	-0.00	0.00	1.00
MultipleLines>No	0.46	0.00	0.78
MultipleLines>No phone service	-0.00	1.00	-0.00
MultipleLines=Yes	0.54	-0.00	0.22
OnlineBackup>No	0.55	0.59	0.00
OnlineBackup>No internet service	-0.00	0.00	1.00
OnlineBackup=Yes	0.45	0.41	0.00
OnlineSecurity>No	0.64	0.59	-0.00
OnlineSecurity>No internet service	-0.00	0.00	1.00
OnlineSecurity=Yes	0.36	0.41	-0.00
PaperlessBilling>No	0.31	0.44	0.71
PaperlessBilling=Yes	0.69	0.56	0.29
Partner>No	0.51	0.53	0.52
Partner=Yes	0.49	0.47	0.48
PaymentMethod=Bank transfer (automatic)	0.22	0.20	0.21
PaymentMethod=Credit card (automatic)	0.22	0.22	0.22
PaymentMethod=Electronic check	0.41	0.33	0.08
PaymentMethod=Mailed check	0.15	0.24	0.49
PhoneService>No	0.00	1.00	0.00
PhoneService=Yes	1.00	-0.00	1.00
SeniorCitizen=0	0.80	0.85	0.97
SeniorCitizen=1	0.20	0.15	0.03
StreamingMovies>No	0.50	0.57	-0.00
StreamingMovies>No internet service	-0.00	0.00	1.00
StreamingMovies=Yes	0.50	0.43	-0.00
StreamingTV>No	0.50	0.59	-0.00
StreamingTV>No internet service	-0.00	0.00	1.00
StreamingTV=Yes	0.50	0.41	-0.00
TechSupport>No	0.64	0.58	-0.00
TechSupport>No internet service	-0.00	0.00	1.00
TechSupport=Yes	0.36	0.42	-0.00
gender=Female	0.50	0.49	0.49
gender=Male	0.50	0.51	0.51

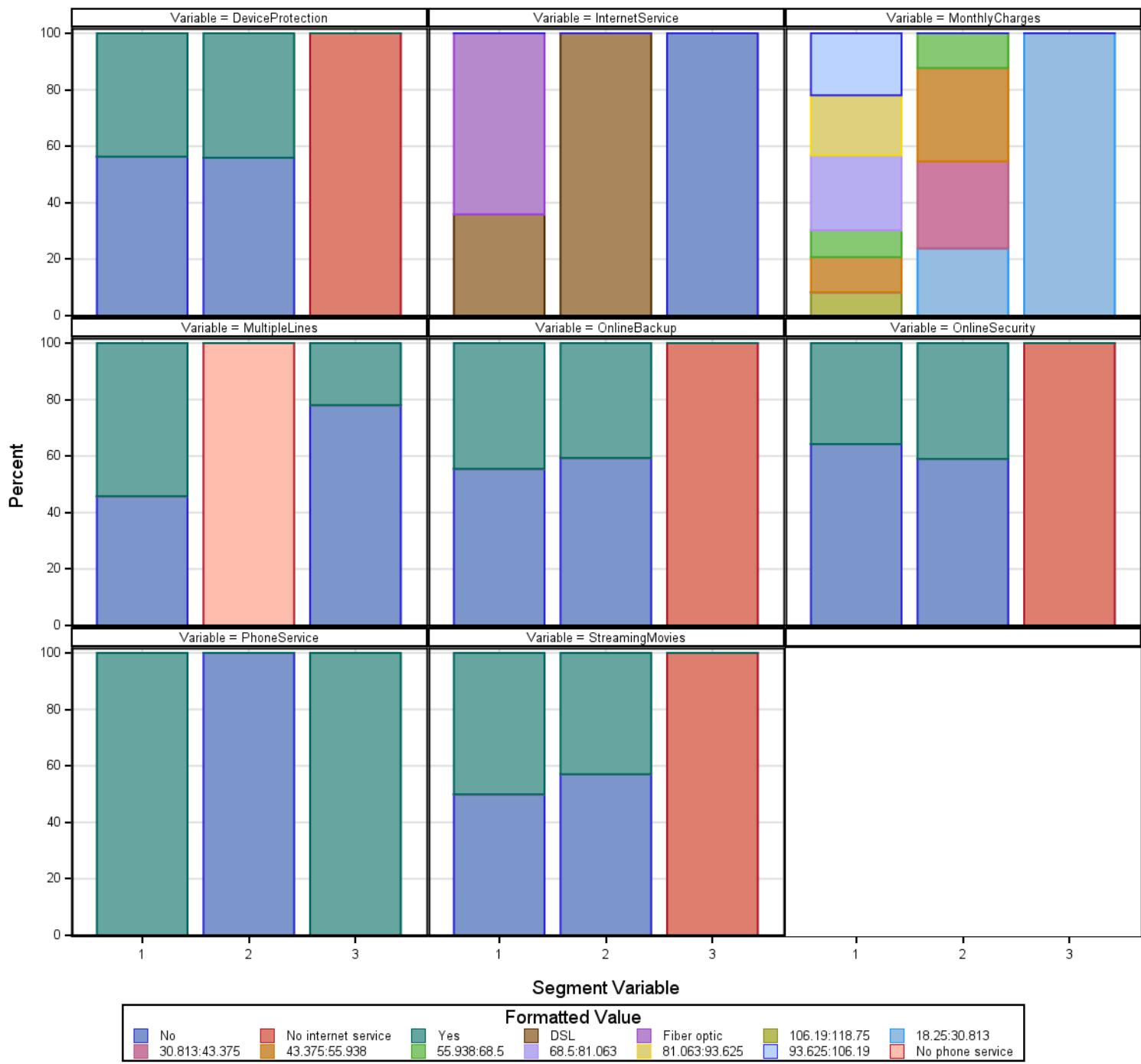
SAS Enterprise Miner Report
Node=90% Average Clustering
Segment Size



SAS Enterprise Miner Report
Node=90% Average Clustering
Tree Diagram



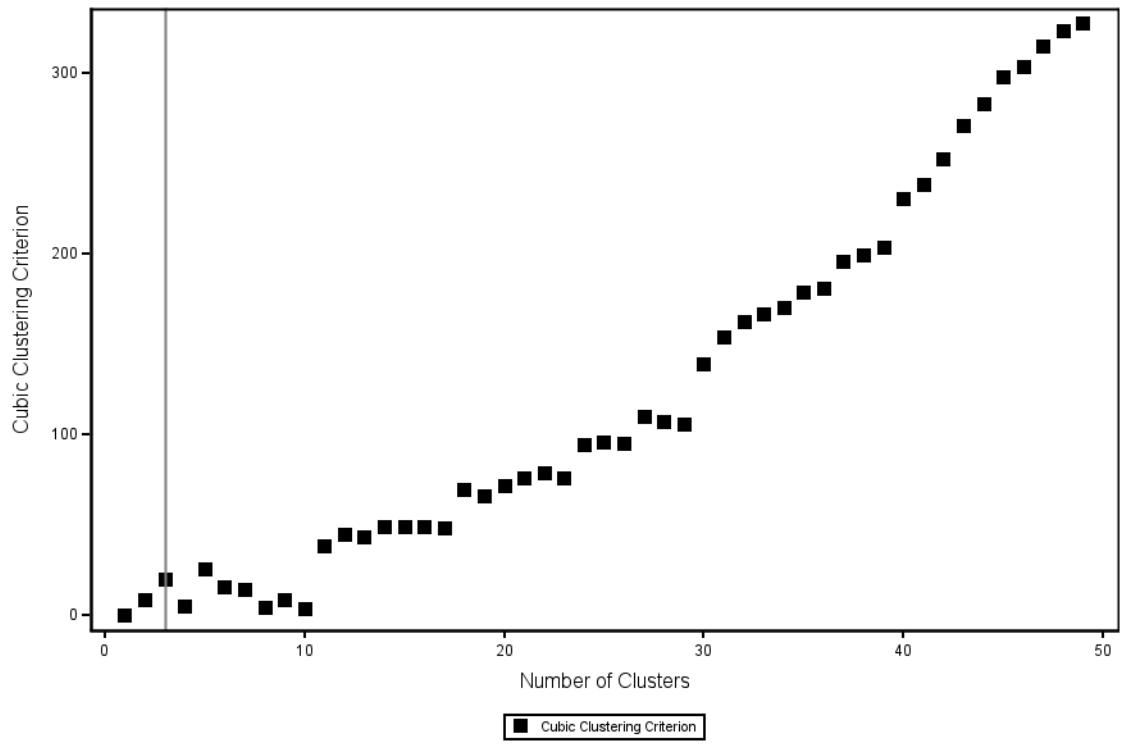
SAS Enterprise Miner Report
Node=90% Average Clustering
Segment Plot



SAS Enterprise Miner Report

Node=90% Average Clustering

CCC Plot



SAS Enterprise Miner Report

Node=90% Centroid Clustering Summary

Node id = Clus5
 Node label = 90% Centroid Clustering
 Meta path = Ids => Filter => Smpl => Clus5
 Notes =

Node=90% Centroid Clustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	CENTROID	WARD	ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	USER	AUTOMATIC
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	6	10	TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=90% Centroid Clustering Variable Summary

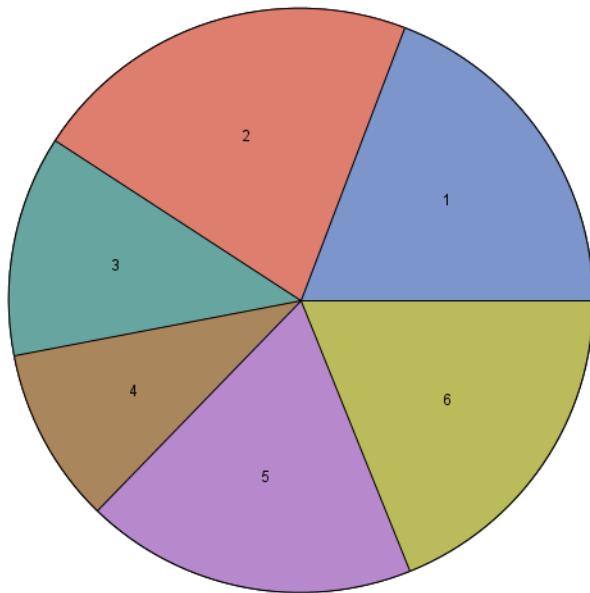
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

Node=90% Centroid Clustering Mean Statistics

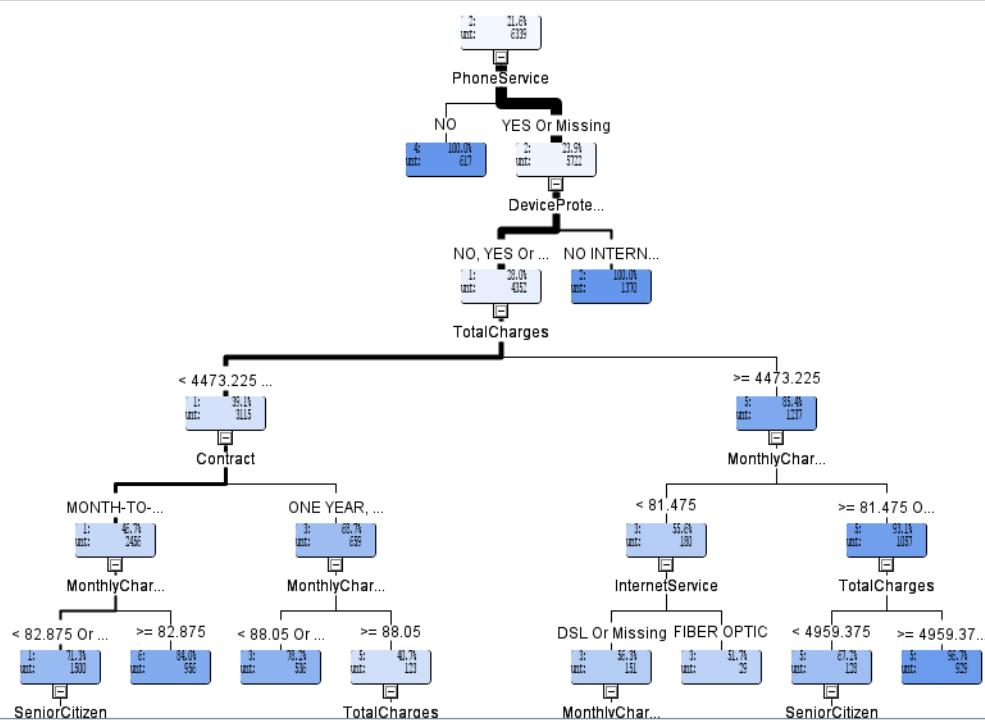
Variable	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
Clustering Criterion	0.47	0.47	0.47	0.47	0.47	0.47
Maximum Relative Change in Cluster Seeds	0.02	0.02	0.02	0.02	0.02	0.02
Improvement in Clustering Criterion
Frequency of Cluster	1219.00	1370.00	778.00	617.00	1161.00	1194.00
Root-Mean-Square Standard Deviation	0.44	0.41	0.52	0.52	0.50	0.48
Maximum Distance from Cluster Seed	4.41	4.37	4.52	4.96	4.68	4.44
Nearest Cluster	6.00	3.00	5.00	3.00	3.00	1.00
Distance to Nearest Cluster	2.35	4.94	2.74	4.39	2.74	2.35
MonthlyCharges	64.44	21.06	71.35	41.75	99.19	89.11
TotalCharges	664.32	657.24	3055.19	1456.05	6110.55	1896.05
tenure	10.31	30.23	42.93	31.02	61.65	21.15
Contract=Month-to-month	0.94	0.35	0.27	0.56	0.18	0.95

Variable	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
Contract=One year	0.05	0.24	0.46	0.21	0.32	0.05
Contract=Two year	0.01	0.42	0.28	0.23	0.50	0.00
Dependents>No	0.86	0.57	0.40	0.69	0.69	0.89
Dependents>Yes	0.14	0.43	0.60	0.31	0.31	0.11
DeviceProtection>No	0.84	-0.00	0.48	0.56	0.24	0.65
DeviceProtection>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
DeviceProtection>Yes	0.16	-0.00	0.52	0.44	0.76	0.35
InternetService>DSL	0.54	0.00	0.80	1.00	0.21	0.03
InternetService>Fiber optic	0.46	-0.00	0.20	-0.00	0.79	0.97
InternetService>No	0.00	1.00	0.00	0.00	0.00	0.00
MultipleLines>No	0.76	0.78	0.59	0.00	0.16	0.35
MultipleLines>No phone service	-0.00	-0.00	-0.00	1.00	-0.00	-0.00
MultipleLines>Yes	0.24	0.22	0.41	-0.00	0.84	0.65
OnlineBackup>No	0.80	0.00	0.45	0.59	0.25	0.67
OnlineBackup>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
OnlineBackup>Yes	0.20	0.00	0.55	0.41	0.75	0.33
OnlineSecurity>No	0.79	-0.00	0.36	0.59	0.45	0.87
OnlineSecurity>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
OnlineSecurity>Yes	0.21	-0.00	0.64	0.41	0.55	0.13
PaperlessBilling>No	0.38	0.71	0.58	0.44	0.24	0.13
PaperlessBilling>Yes	0.62	0.29	0.42	0.56	0.76	0.87
Partner>No	0.84	0.52	0.22	0.53	0.30	0.58
Partner>Yes	0.16	0.48	0.78	0.47	0.70	0.42
PaymentMethod>Bank transfer (automatic)	0.14	0.21	0.31	0.20	0.33	0.14
PaymentMethod>Credit card (automatic)	0.13	0.22	0.30	0.22	0.34	0.14
PaymentMethod>Electronic check	0.46	0.08	0.17	0.33	0.28	0.66
PaymentMethod>Mailed check	0.27	0.49	0.22	0.24	0.05	0.06
PhoneService>No	0.00	0.00	-0.00	1.00	0.00	0.00
PhoneService>Yes	1.00	1.00	1.00	-0.00	1.00	1.00
SeniorCitizen>0	0.95	0.97	0.96	0.85	0.80	0.54
SeniorCitizen>1	0.05	0.03	0.04	0.15	0.20	0.46
StreamingMovies>No	0.86	-0.00	0.62	0.57	0.15	0.39
StreamingMovies>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
StreamingMovies>Yes	0.14	-0.00	0.38	0.43	0.85	0.61
StreamingTV>No	0.85	-0.00	0.61	0.59	0.16	0.41
StreamingTV>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
StreamingTV>Yes	0.15	-0.00	0.39	0.41	0.84	0.59
TechSupport>No	0.81	-0.00	0.40	0.58	0.39	0.86
TechSupport>No internet service	0.00	1.00	0.00	0.00	0.00	0.00
TechSupport>Yes	0.19	-0.00	0.60	0.42	0.61	0.14
gender=Female	0.50	0.49	0.48	0.49	0.52	0.48
gender=Male	0.50	0.51	0.52	0.51	0.48	0.52

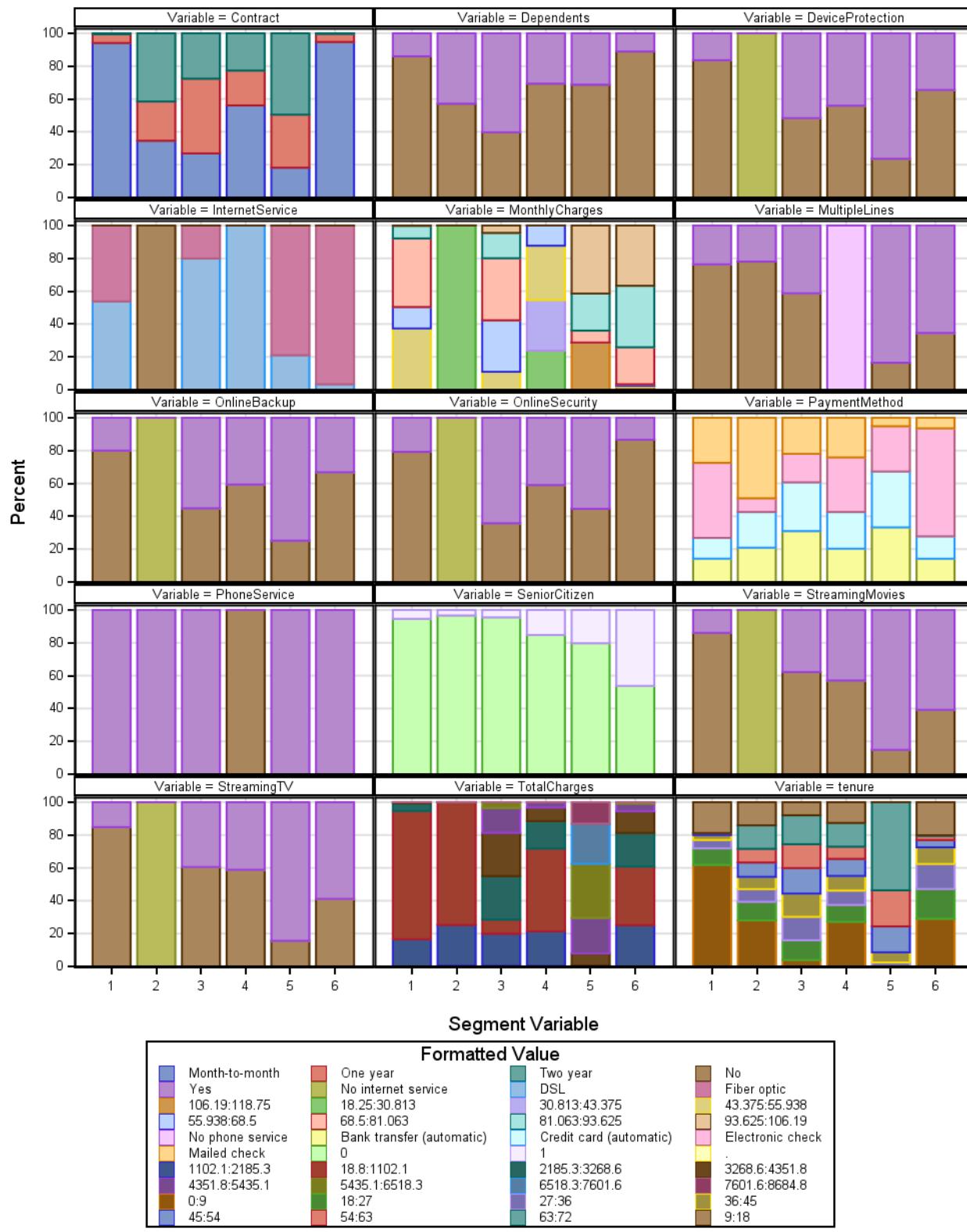
SAS Enterprise Miner Report
Node=90% Centroid Clustering
Segment Size



SAS Enterprise Miner Report
Node=90% Centroid Clustering
Tree Diagram



SAS Enterprise Miner Report Node=90% Centroid Clustering Segment Plot



SAS Enterprise Miner Report

Node=90% Ward Clustering Summary

Node id = Clus2
 Node label = 90% Ward Clustering
 Meta path = Ids => Filter => Smpl => Clus2
 Notes =

Node=90% Ward Clustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	WARD		ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	AUTOMATIC	
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	10		TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=90% Ward Clustering Variable Summary

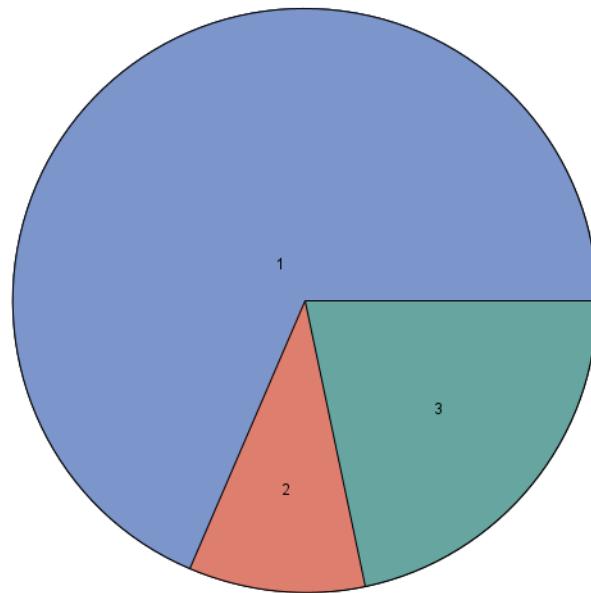
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

Node=90% Ward Clustering Mean Statistics

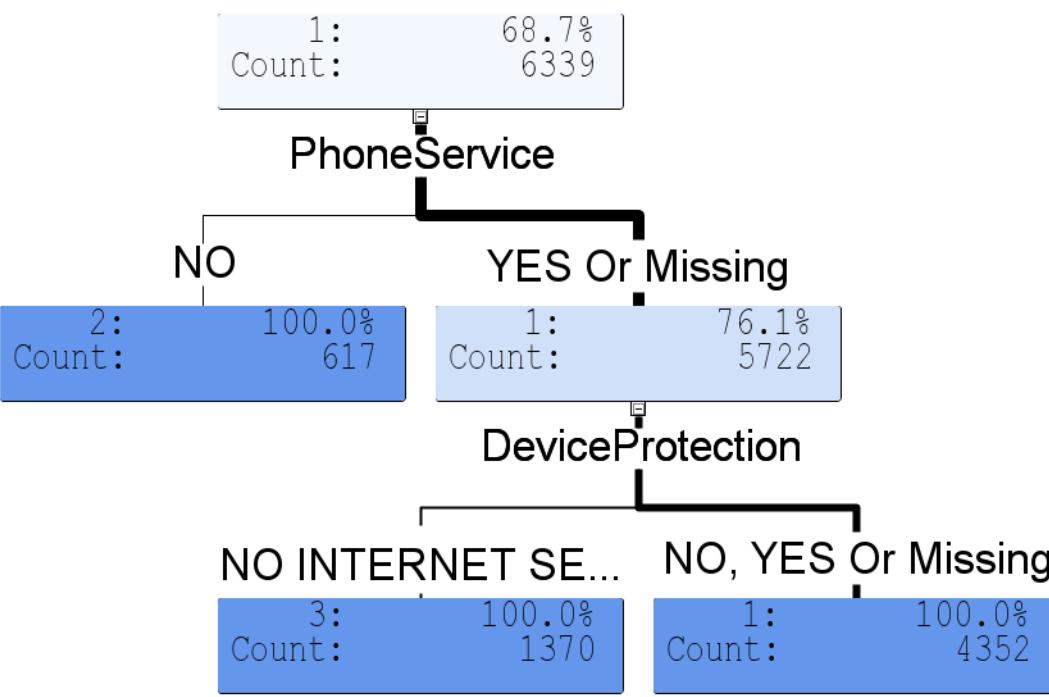
Variable	Segment 1	Segment 2	Segment 3
Clustering Criterion	0.53	0.53	0.53
Maximum Relative Change in Cluster Seeds	0.00	0.00	0.00
Improvement in Clustering Criterion	0.00	0.00	0.00
Frequency of Cluster	4352.00	617.00	1370.00
Root-Mean-Square Standard Deviation	0.57	0.52	0.41
Maximum Distance from Cluster Seed	5.39	4.96	4.37
Nearest Cluster	2.00	1.00	1.00
Distance to Nearest Cluster	4.40	4.40	5.07
MonthlyCharges	81.72	41.75	21.06
TotalCharges	2882.46	1456.05	657.24
tenure	32.81	31.02	30.23
Contract=Month-to-month	0.62	0.56	0.35

Variable	Segment 1	Segment 2	Segment 3
Contract=One year	0.20	0.21	0.24
Contract=Two year	0.18	0.23	0.42
Dependents>No	0.74	0.69	0.57
Dependents=Yes	0.26	0.31	0.43
DeviceProtection>No	0.56	0.56	-0.00
DeviceProtection>No internet service	-0.00	0.00	1.00
DeviceProtection=Yes	0.44	0.44	-0.00
InternetService=DSL	0.36	1.00	0.00
InternetService=Fiber optic	0.64	-0.00	-0.00
InternetService>No	-0.00	0.00	1.00
MultipleLines>No	0.46	0.00	0.78
MultipleLines>No phone service	-0.00	1.00	-0.00
MultipleLines=Yes	0.54	-0.00	0.22
OnlineBackup>No	0.55	0.59	0.00
OnlineBackup>No internet service	-0.00	0.00	1.00
OnlineBackup=Yes	0.45	0.41	0.00
OnlineSecurity>No	0.64	0.59	-0.00
OnlineSecurity>No internet service	-0.00	0.00	1.00
OnlineSecurity=Yes	0.36	0.41	-0.00
PaperlessBilling>No	0.31	0.44	0.71
PaperlessBilling=Yes	0.69	0.56	0.29
Partner>No	0.51	0.53	0.52
Partner=Yes	0.49	0.47	0.48
PaymentMethod=Bank transfer (automatic)	0.22	0.20	0.21
PaymentMethod=Credit card (automatic)	0.22	0.22	0.22
PaymentMethod=Electronic check	0.41	0.33	0.08
PaymentMethod=Mailed check	0.15	0.24	0.49
PhoneService>No	0.00	1.00	0.00
PhoneService=Yes	1.00	-0.00	1.00
SeniorCitizen=0	0.80	0.85	0.97
SeniorCitizen=1	0.20	0.15	0.03
StreamingMovies>No	0.50	0.57	-0.00
StreamingMovies>No internet service	-0.00	0.00	1.00
StreamingMovies=Yes	0.50	0.43	-0.00
StreamingTV>No	0.50	0.59	-0.00
StreamingTV>No internet service	-0.00	0.00	1.00
StreamingTV=Yes	0.50	0.41	-0.00
TechSupport>No	0.64	0.58	-0.00
TechSupport>No internet service	-0.00	0.00	1.00
TechSupport=Yes	0.36	0.42	-0.00
gender=Female	0.50	0.49	0.49
gender=Male	0.50	0.51	0.51

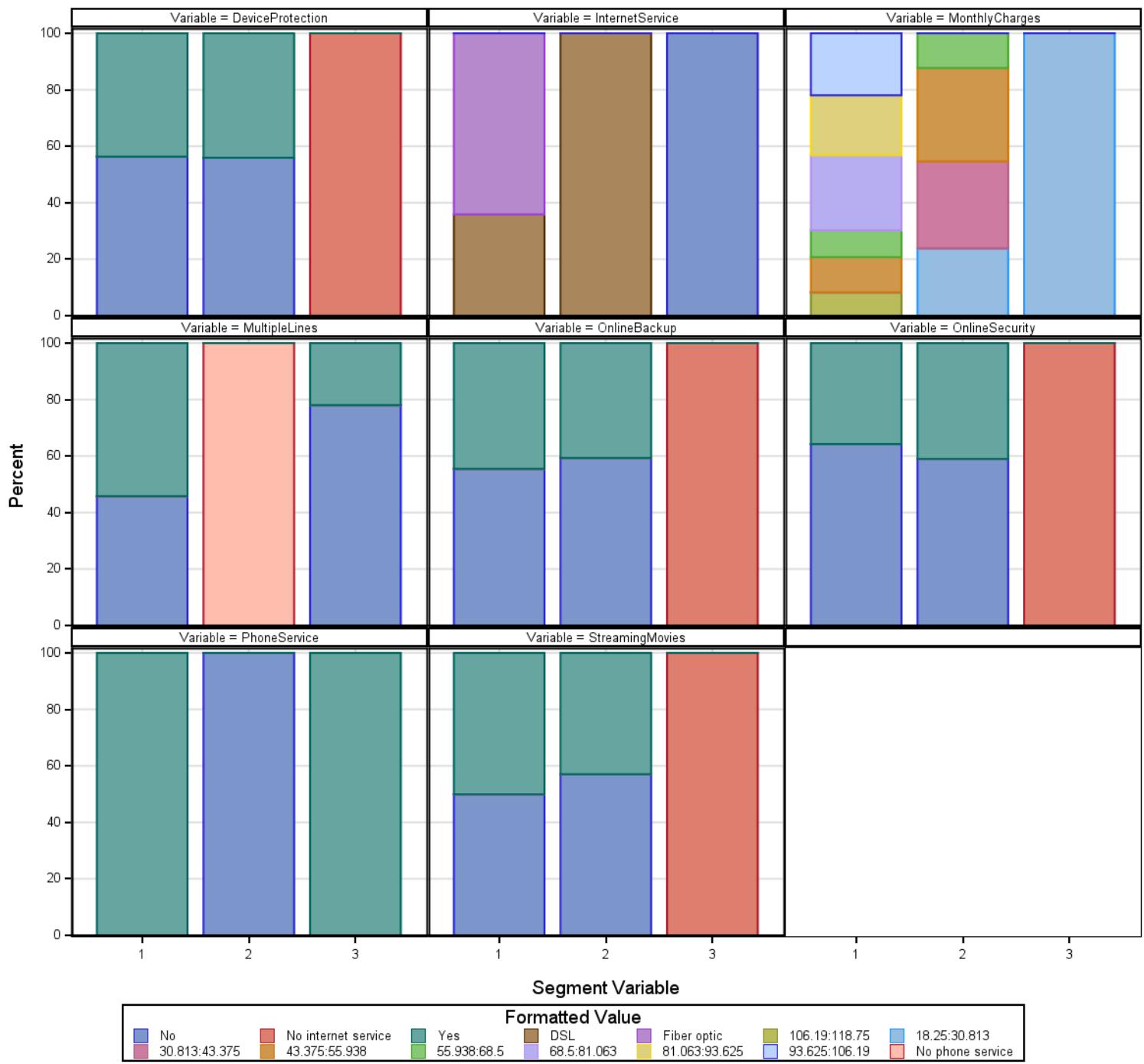
SAS Enterprise Miner Report
Node=90% Ward Clustering
Segment Size



SAS Enterprise Miner Report
Node=90% Ward Clustering
Tree Diagram



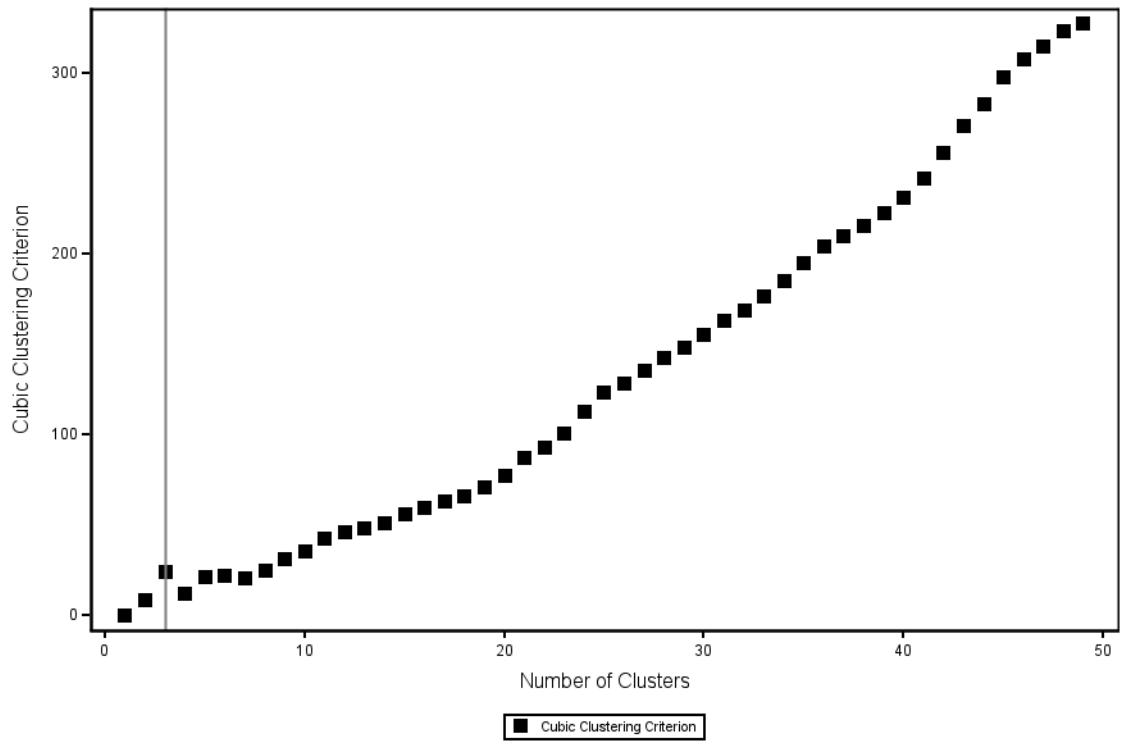
SAS Enterprise Miner Report
Node=90% Ward Clustering
Segment Plot



SAS Enterprise Miner Report

Node=90% Ward Clustering

CCC Plot



SAS Enterprise Miner Report

Node=Average Clustering Summary

Node id = Clus4
 Node label = Average Clustering
 Meta path = Ids => Filter => Clus4
 Notes =

Node=Average Clustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	AVERAGE	WARD	ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	AUTOMATIC	
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	10		TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=Average Clustering Variable Summary

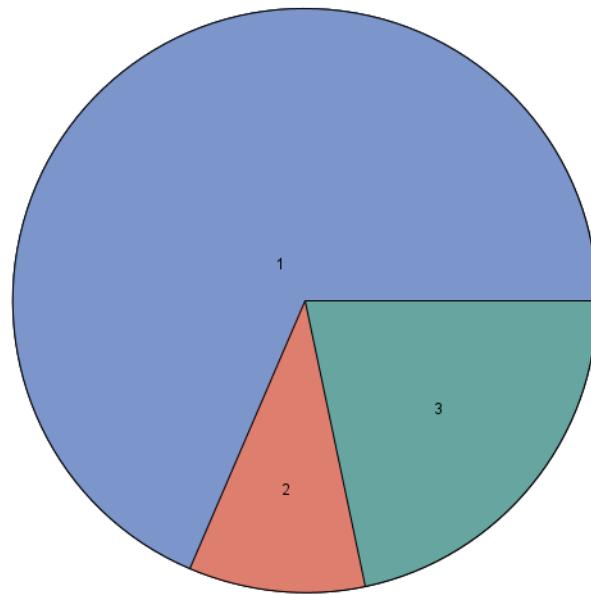
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Average Clustering Mean Statistics

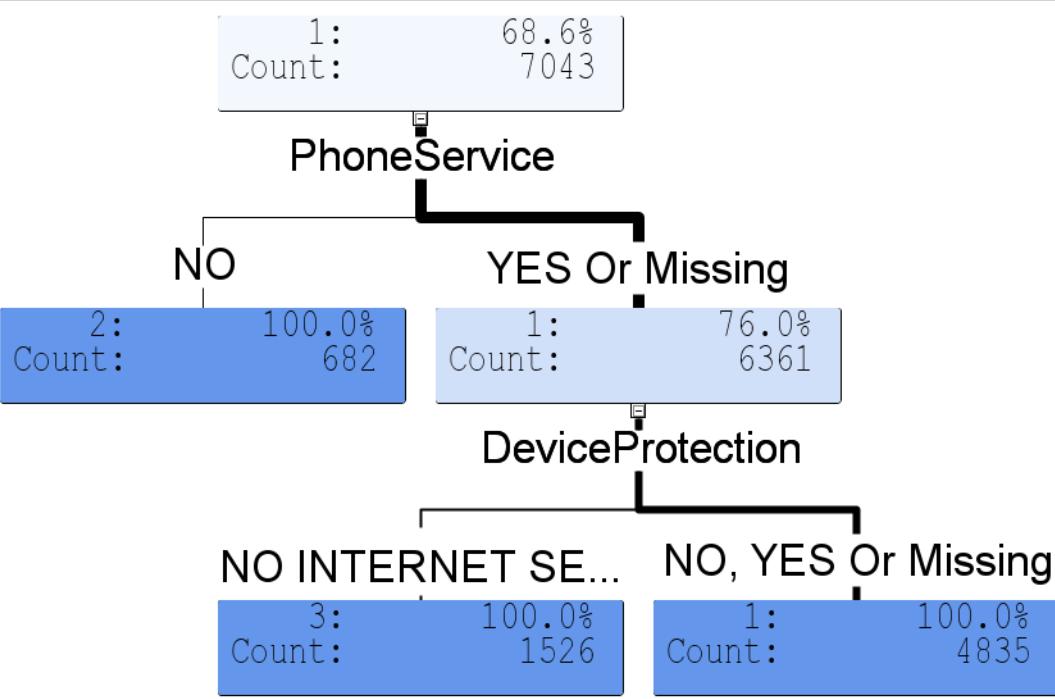
Variable	Segment 1	Segment 2	Segment 3
Clustering Criterion	0.53	0.53	0.53
Maximum Relative Change in Cluster Seeds	0.00	0.00	0.00
Improvement in Clustering Criterion	0.00	0.00	0.00
Frequency of Cluster	4835.00	682.00	1526.00
Root-Mean-Square Standard Deviation	0.57	0.52	0.41
Maximum Distance from Cluster Seed	5.38	4.92	4.35
Nearest Cluster	2.00	1.00	1.00
Distance to Nearest Cluster	4.40	4.40	5.06
MonthlyCharges	81.76	42.03	21.08
TotalCharges	2902.47	1500.43	665.22
tenure	33.04	31.74	30.55
Contract=Month-to-month	0.62	0.55	0.34
Contract=One year	0.20	0.21	0.24

Variable	Segment 1	Segment 2	Segment 3
Contract=Two year	0.19	0.24	0.42
Dependents>No	0.74	0.70	0.58
Dependents>Yes	0.26	0.30	0.42
DeviceProtection>No	0.56	0.55	0.00
DeviceProtection>No internet service	0.00	-0.00	1.00
DeviceProtection>Yes	0.44	0.45	0.00
InternetService=DSL	0.36	1.00	0.00
InternetService=Fiber optic	0.64	0.00	-0.00
InternetService>No	0.00	-0.00	1.00
MultipleLines>No	0.46	-0.00	0.78
MultipleLines>No phone service	-0.00	1.00	0.00
MultipleLines>Yes	0.54	0.00	0.22
OnlineBackup>No	0.56	0.58	-0.00
OnlineBackup>No internet service	0.00	-0.00	1.00
OnlineBackup>Yes	0.44	0.42	0.00
OnlineSecurity>No	0.64	0.59	0.00
OnlineSecurity>No internet service	0.00	-0.00	1.00
OnlineSecurity>Yes	0.36	0.41	0.00
PaperlessBilling>No	0.31	0.43	0.71
PaperlessBilling>Yes	0.69	0.57	0.29
Partner>No	0.51	0.54	0.52
Partner>Yes	0.49	0.46	0.48
PaymentMethod=Bank transfer (automatic)	0.22	0.21	0.22
PaymentMethod=Credit card (automatic)	0.21	0.23	0.22
PaymentMethod=Electronic check	0.42	0.33	0.08
PaymentMethod=Mailed check	0.15	0.23	0.49
PhoneService>No	-0.00	1.00	0.00
PhoneService>Yes	1.00	-0.00	1.00
SeniorCitizen=0	0.80	0.85	0.97
SeniorCitizen=1	0.20	0.15	0.03
StreamingMovies>No	0.50	0.56	-0.00
StreamingMovies>No internet service	0.00	-0.00	1.00
StreamingMovies>Yes	0.50	0.44	0.00
StreamingTV>No	0.50	0.58	0.00
StreamingTV>No internet service	0.00	-0.00	1.00
StreamingTV>Yes	0.50	0.42	-0.00
TechSupport>No	0.64	0.58	0.00
TechSupport>No internet service	0.00	-0.00	1.00
TechSupport>Yes	0.36	0.42	0.00
gender=Female	0.50	0.49	0.49
gender=Male	0.50	0.51	0.51

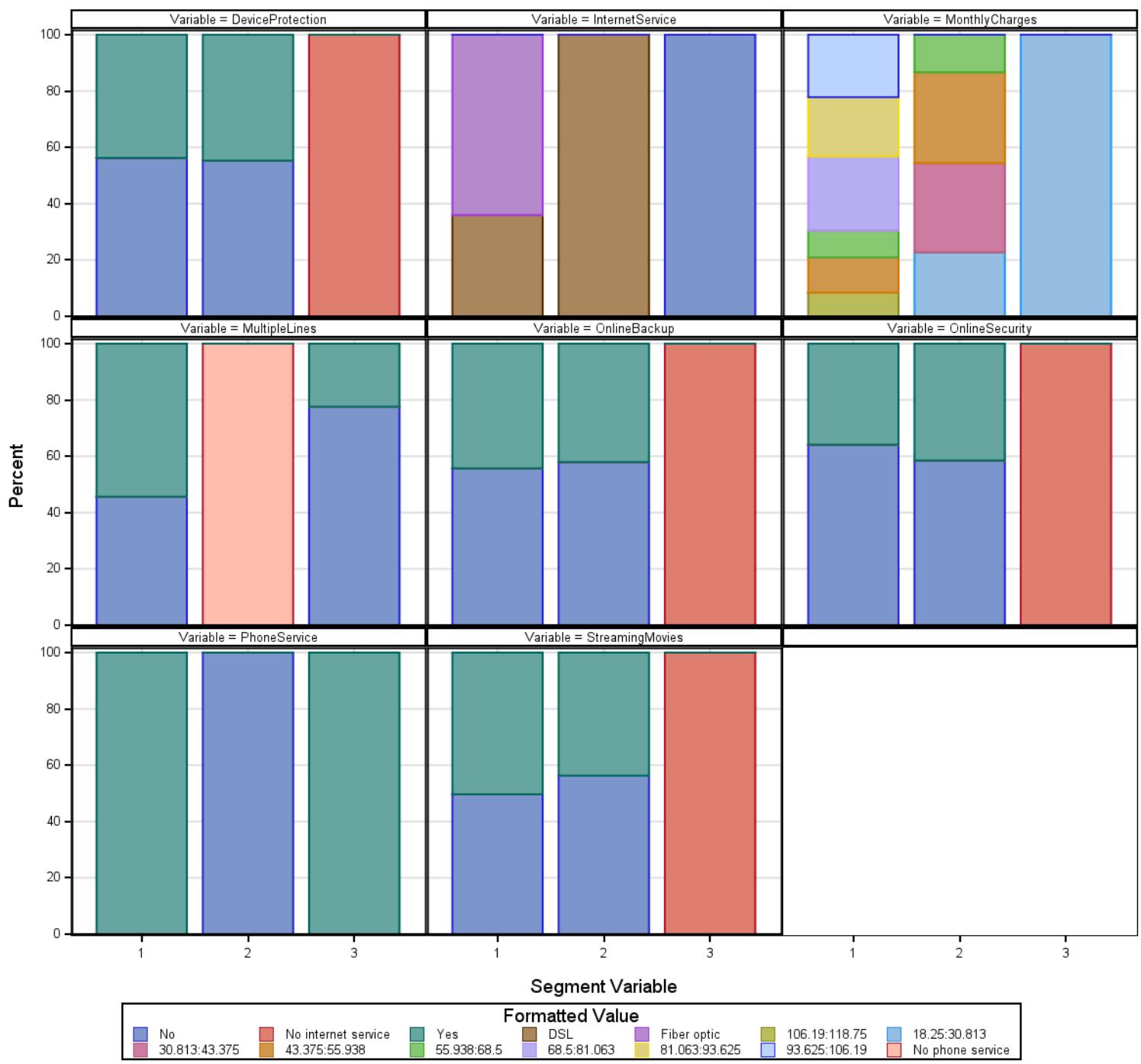
SAS Enterprise Miner Report
Node=Average Clustering
Segment Size



SAS Enterprise Miner Report
Node=Average Clustering
Tree Diagram



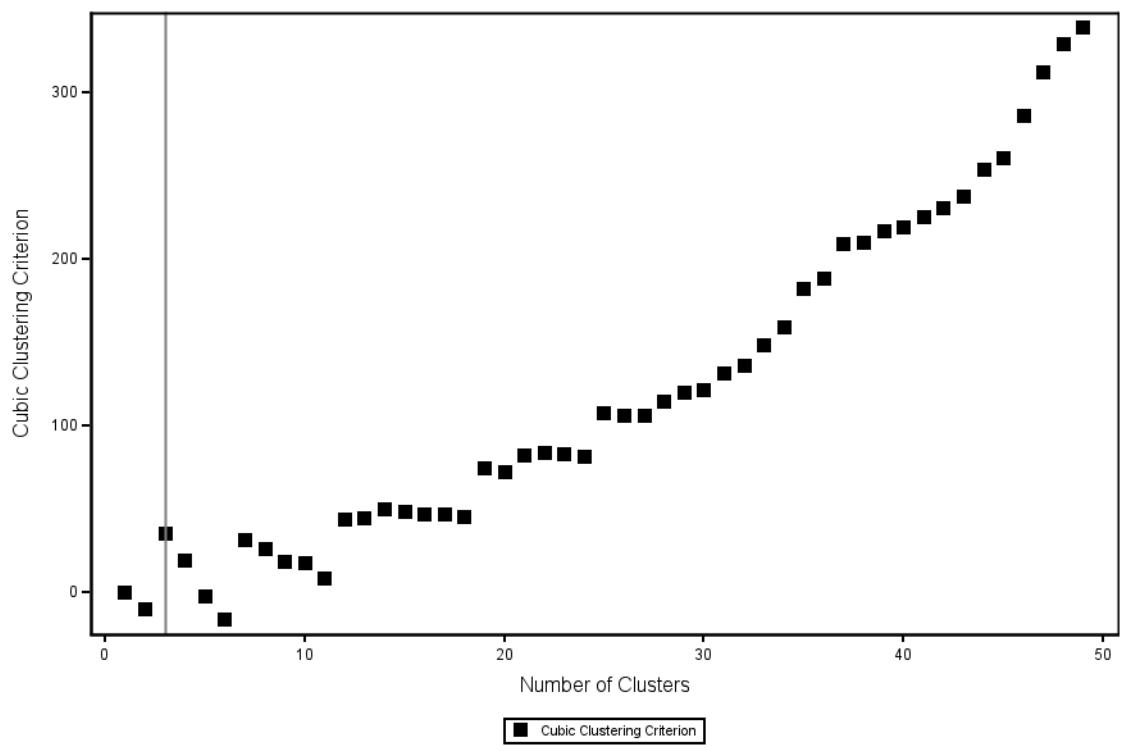
SAS Enterprise Miner Report
Node=Average Clustering
Segment Plot



SAS Enterprise Miner Report

Node=Average Clustering

CCC Plot



SAS Enterprise Miner Report

Node=Centroid Clustering Summary

Node id = Clus3
 Node label = Centroid Clustering
 Meta path = Ids => Filter => Clus3
 Notes =

Node=Centroid Clustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	CENTROID	WARD	ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	USER	AUTOMATIC
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	6	10	TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=Centroid Clustering Variable Summary

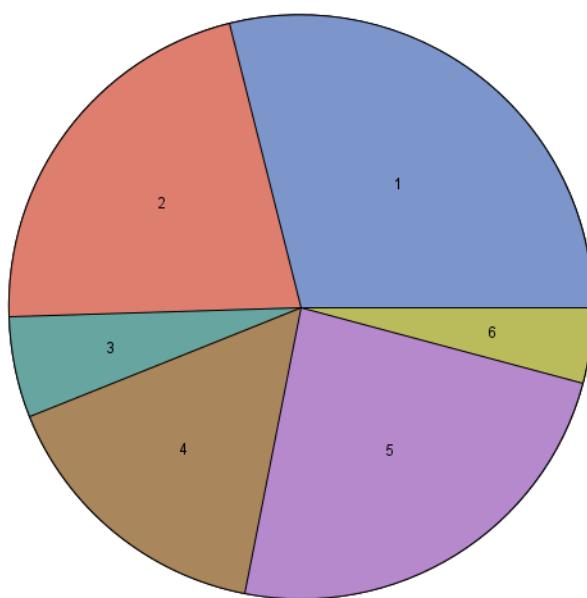
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Centroid Clustering Mean Statistics

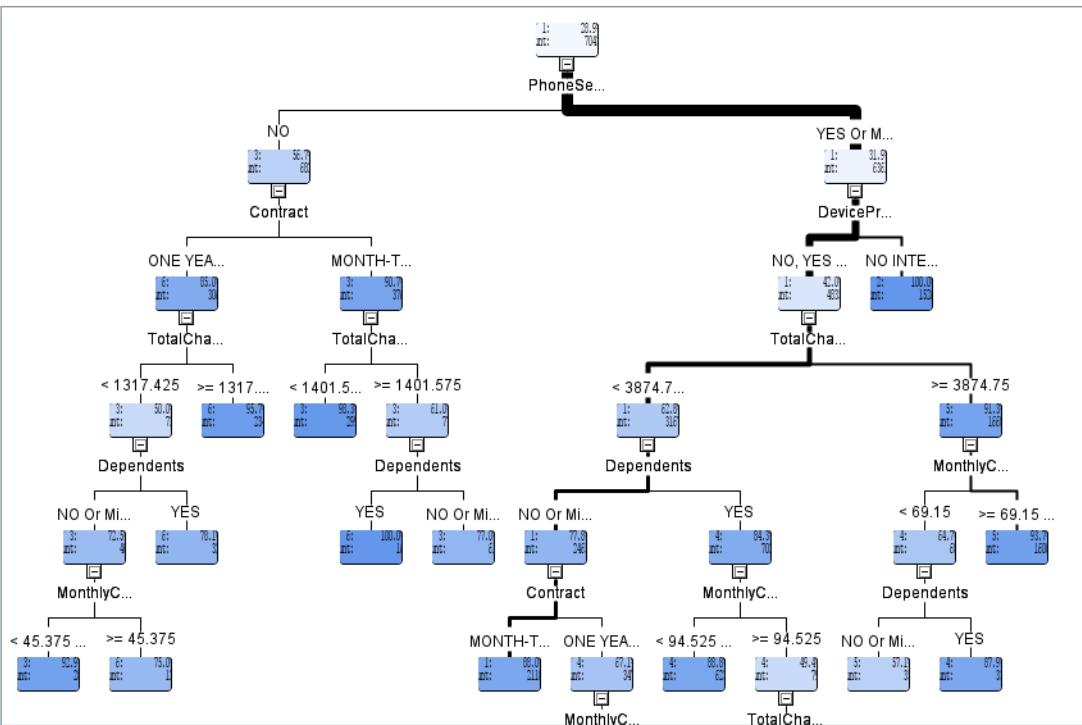
Variable	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
Clustering Criterion	0.48	0.48	0.477	0.48	0.48	0.48
Maximum Relative Change in Cluster Seeds	0.01	0.01	0.005	0.01	0.01	0.01
Improvement in Clustering Criterion
Frequency of Cluster	2032.00	1526.00	387.000	1124.00	1679.00	295.00
Root-Mean-Square Standard Deviation	0.46	0.41	0.463	0.52	0.52	0.50
Maximum Distance from Cluster Seed	4.55	4.35	4.374	4.66	4.61	4.41
Nearest Cluster	4.00	4.00	6.000	1.00	4.00	3.00
Distance to Nearest Cluster	2.53	4.78	2.902	2.53	3.07	2.90
MonthlyCharges	76.74	21.08	35.970	68.66	96.59	49.98
TotalCharges	1059.40	665.22	658.581	2061.48	5694.53	2612.37
tenure	13.15	30.55	17.034	30.11	59.06	51.03
Contract=Month-to-month	0.97	0.34	0.881	0.53	0.24	0.12
Contract=One year	0.03	0.24	0.098	0.34	0.32	0.36

Variable	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6
Contract=Two year	0.00	0.42	0.021	0.13	0.44	0.52
Dependents>No	0.96	0.58	0.835	0.40	0.69	0.52
Dependents>Yes	0.04	0.42	0.165	0.60	0.31	0.48
DeviceProtection>No	0.78	0.00	0.760	0.61	0.26	0.28
DeviceProtection>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
DeviceProtection>Yes	0.22	0.00	0.240	0.39	0.74	0.72
InternetService>DSL	0.25	0.00	1.000	0.72	0.26	1.00
InternetService>Fiber optic	0.75	-0.00	0.000	0.28	0.74	-0.00
InternetService>No	0.00	1.00	0.000	-0.00	-0.00	0.00
MultipleLines>No	0.56	0.78	0.000	0.66	0.19	0.00
MultipleLines>No phone service	0.00	0.00	1.000	0.00	0.00	1.00
MultipleLines>Yes	0.44	0.22	-0.000	0.34	0.81	0.00
OnlineBackup>No	0.77	-0.00	0.703	0.58	0.28	0.42
OnlineBackup>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
OnlineBackup>Yes	0.23	0.00	0.297	0.42	0.72	0.58
OnlineSecurity>No	0.86	0.00	0.791	0.50	0.47	0.32
OnlineSecurity>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
OnlineSecurity>Yes	0.14	0.00	0.209	0.50	0.53	0.68
PaperlessBilling>No	0.22	0.71	0.354	0.54	0.26	0.54
PaperlessBilling>Yes	0.78	0.29	0.646	0.46	0.74	0.46
Partner>No	0.82	0.52	0.713	0.29	0.29	0.32
Partner>Yes	0.18	0.48	0.287	0.71	0.71	0.68
PaymentMethod>Bank transfer (automatic)	0.12	0.22	0.111	0.26	0.32	0.34
PaymentMethod>Credit card (automatic)	0.13	0.22	0.152	0.22	0.32	0.32
PaymentMethod>Electronic check	0.59	0.08	0.452	0.26	0.31	0.17
PaymentMethod>Mailed check	0.16	0.49	0.284	0.26	0.06	0.17
PhoneService>No	0.00	0.00	1.000	0.00	0.00	1.00
PhoneService>Yes	1.00	1.00	-0.000	1.00	1.00	-0.00
SeniorCitizen=0	0.72	0.97	0.791	0.97	0.77	0.92
SeniorCitizen=1	0.28	0.03	0.209	0.03	0.23	0.08
StreamingMovies>No	0.64	-0.00	0.677	0.70	0.19	0.41
StreamingMovies>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
StreamingMovies>Yes	0.36	0.00	0.323	0.30	0.81	0.59
StreamingTV>No	0.64	0.00	0.705	0.69	0.20	0.42
StreamingTV>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
StreamingTV>Yes	0.36	-0.00	0.295	0.31	0.80	0.58
TechSupport>No	0.86	0.00	0.775	0.55	0.42	0.32
TechSupport>No internet service	0.00	1.00	0.000	-0.00	-0.00	0.00
TechSupport>Yes	0.14	0.00	0.225	0.45	0.58	0.68
gender=Female	0.49	0.49	0.483	0.51	0.51	0.49
gender=Male	0.51	0.51	0.517	0.49	0.49	0.51

SAS Enterprise Miner Report
Node=Centroid Clustering
Segment Size



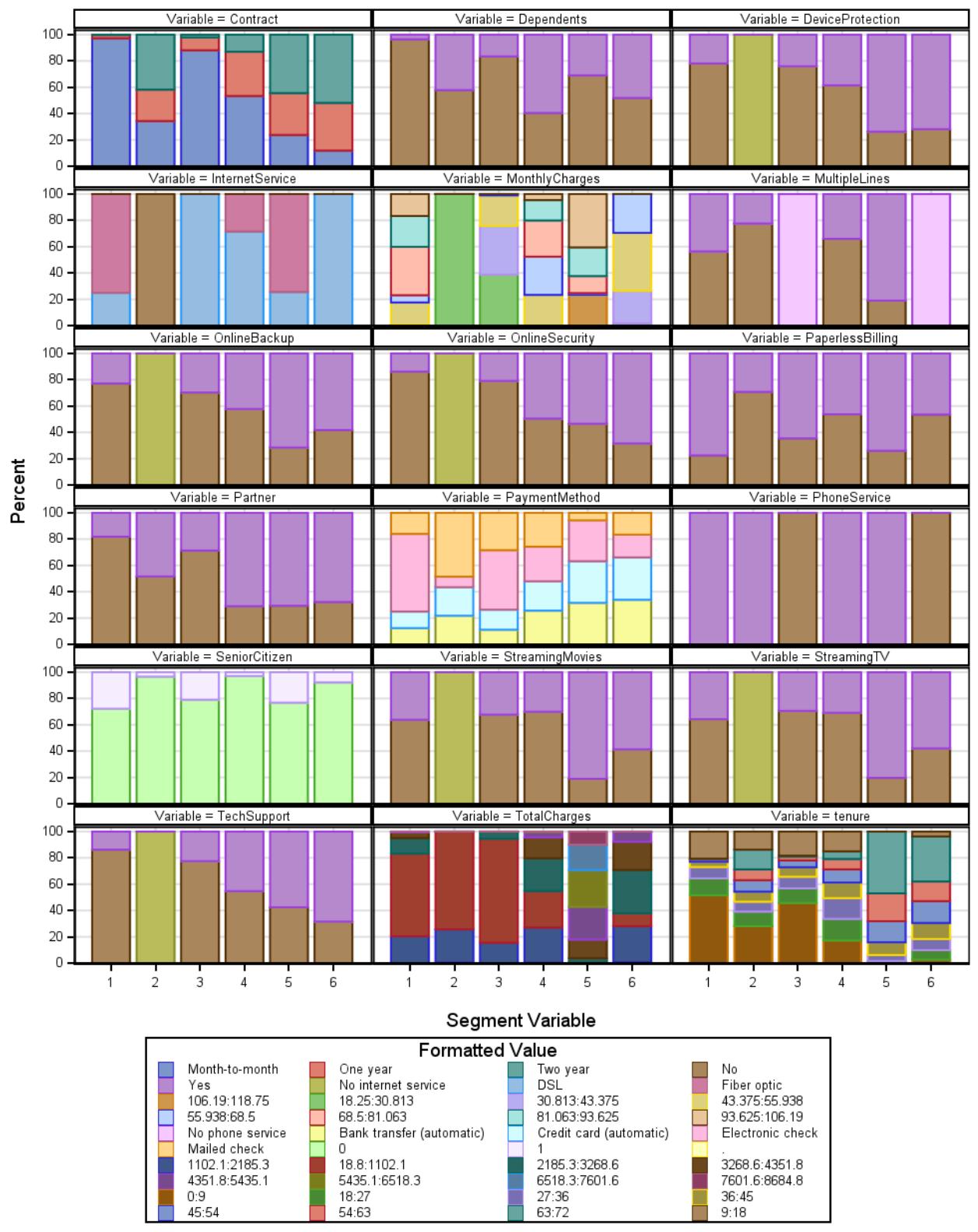
SAS Enterprise Miner Report
Node=Centroid Clustering
Tree Diagram



SAS Enterprise Miner Report

Node=Centroid Clustering

Segment Plot



SAS Enterprise Miner Report

Node=WardClustering Summary

Node id = Clus
 Node label = WardClustering
 Meta path = Ids => Filter => Clus
 Notes =

Node=WardClustering Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Cluster		FinalMaxNum	20		MissingNominal	DEFAULT	
AutomaticMaxNum	50		HideVariable	Y		MissingOrdinal	DEFAULT	
AutomaticMethod	WARD		ImputationMethod	NONE		NominalEncoding	GLM	
AutomaticMinNum	2		Initial	DEFAULT		NumberClusterMethod	AUTOMATIC	
Bins	100		Learn	.		OrdinalEncoding	RANK	
CCCCutOff	3		LearnFinal	0.02		Radius	0	
ClusterGraphs	Y		LearnInitial	0.5		Stdize	STD	
Clusvar	_SEGMENT_		LearnSteps	1000		Summary	N	
ClusvarLabel	Segment Variable		MaxC	10		TrainDefaults	Y	
ClusvarRole	SEGMENT		MaxIter	10		TreeProfile	Y	
DistancePlot	Y		MaxSteps	1200		XConv	0.0001	
Drift	N		MissingInterval	DEFAULT				

Node=WardClustering Variable Summary

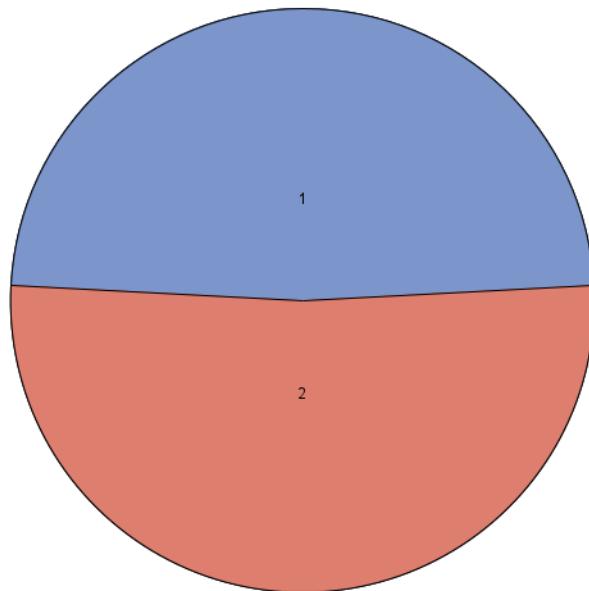
Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=WardClustering Mean Statistics

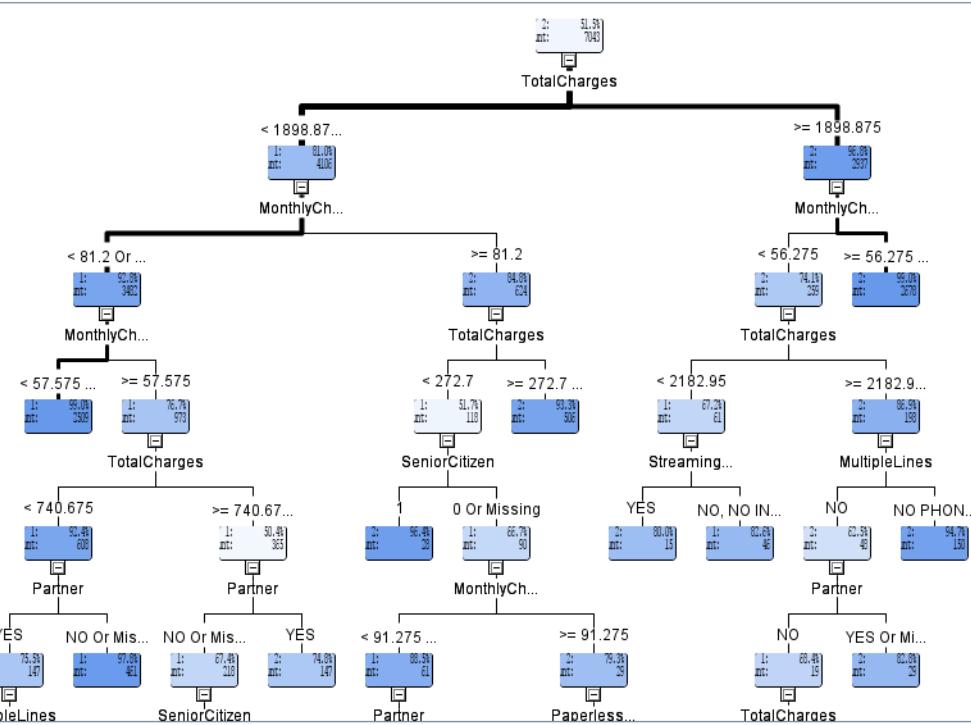
Variable	Segment 1	Segment 2
Clustering Criterion	0.59	0.59
Maximum Relative Change in Cluster Seeds	0.01	0.01
Improvement in Clustering Criterion	.	.
Frequency of Cluster	3418.00	3625.00
Root-Mean-Square Standard Deviation	0.60	0.58
Maximum Distance from Cluster Seed	6.02	6.03
Nearest Cluster	2.00	1.00
Distance to Nearest Cluster	3.44	3.44
MonthlyCharges	41.23	86.95
TotalCharges	621.42	3849.69
tenure	19.90	44.13
Contract=Month-to-month	0.64	0.47
Contract=One year	0.16	0.26

Variable	Segment 1	Segment 2
Contract=Two year	0.20	0.28
Dependents>No	0.70	0.70
Dependents>Yes	0.30	0.30
DeviceProtection>No	0.46	0.42
DeviceProtection>No internet service	0.45	0.00
DeviceProtection>Yes	0.10	0.58
InternetService=DSL	0.36	0.33
InternetService=Fiber optic	0.19	0.67
InternetService>No	0.45	0.00
MultipleLines>No	0.68	0.29
MultipleLines>No phone service	0.13	0.07
MultipleLines>Yes	0.19	0.64
OnlineBackup>No	0.43	0.44
OnlineBackup>No internet service	0.45	0.00
OnlineBackup>Yes	0.12	0.56
OnlineSecurity>No	0.42	0.57
OnlineSecurity>No internet service	0.45	0.00
OnlineSecurity>Yes	0.13	0.43
PaperlessBilling>No	0.55	0.27
PaperlessBilling>Yes	0.45	0.73
Partner>No	0.65	0.39
Partner>Yes	0.35	0.61
PaymentMethod=Bank transfer (automatic)	0.17	0.27
PaymentMethod=Credit card (automatic)	0.17	0.26
PaymentMethod=Electronic check	0.28	0.39
PaymentMethod=Mailed check	0.38	0.09
PhoneService>No	0.13	0.07
PhoneService>Yes	0.87	0.93
SeniorCitizen=0	0.92	0.76
SeniorCitizen=1	0.08	0.24
StreamingMovies>No	0.46	0.33
StreamingMovies>No internet service	0.45	0.00
StreamingMovies>Yes	0.09	0.67
StreamingTV>No	0.46	0.35
StreamingTV>No internet service	0.45	0.00
StreamingTV>Yes	0.10	0.65
TechSupport>No	0.44	0.55
TechSupport>No internet service	0.45	0.00
TechSupport>Yes	0.12	0.45
gender=Female	0.50	0.50
gender=Male	0.50	0.50

SAS Enterprise Miner Report
Node=WardClustering
Segment Size



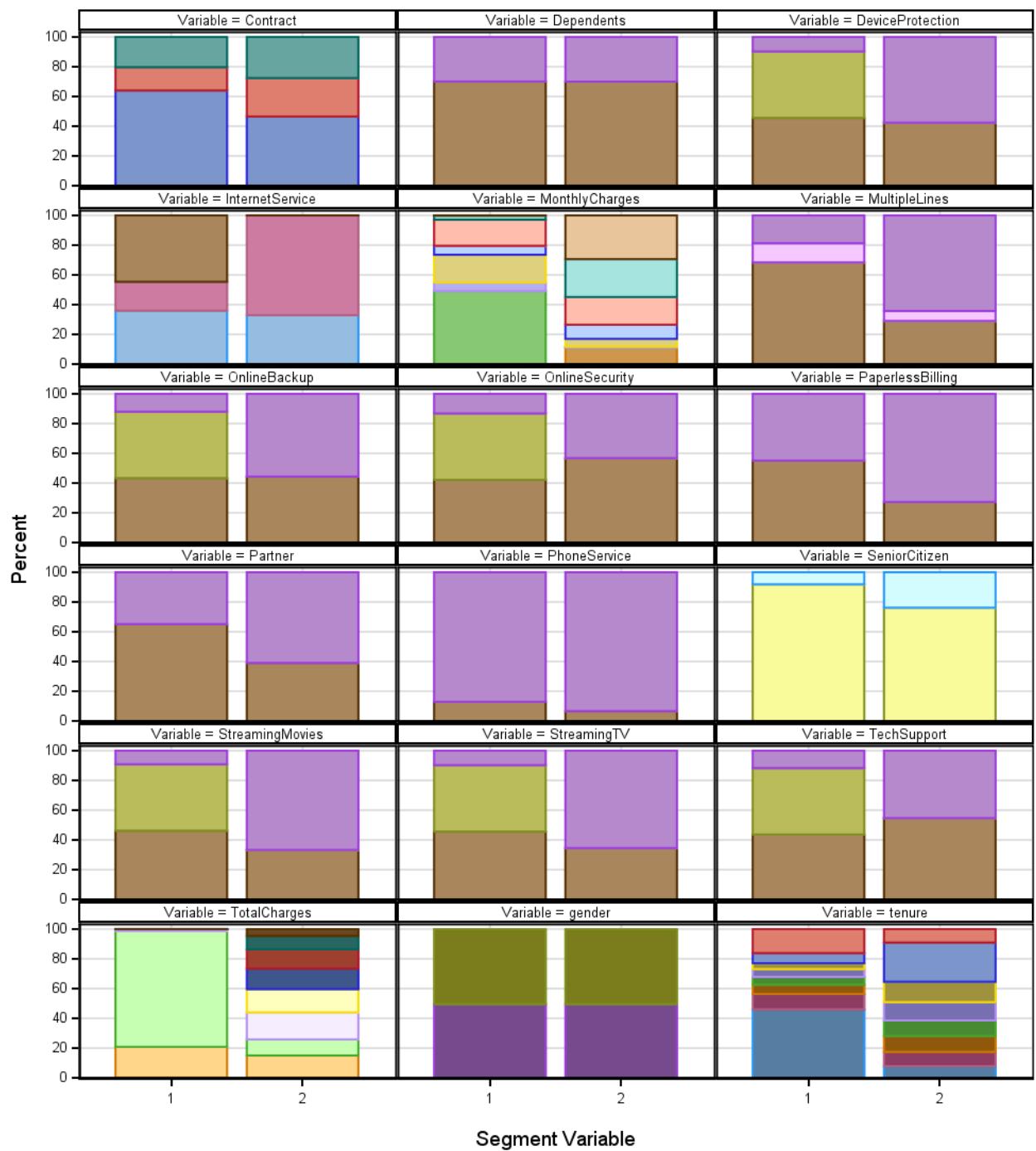
SAS Enterprise Miner Report
Node=WardClustering
Tree Diagram



SAS Enterprise Miner Report

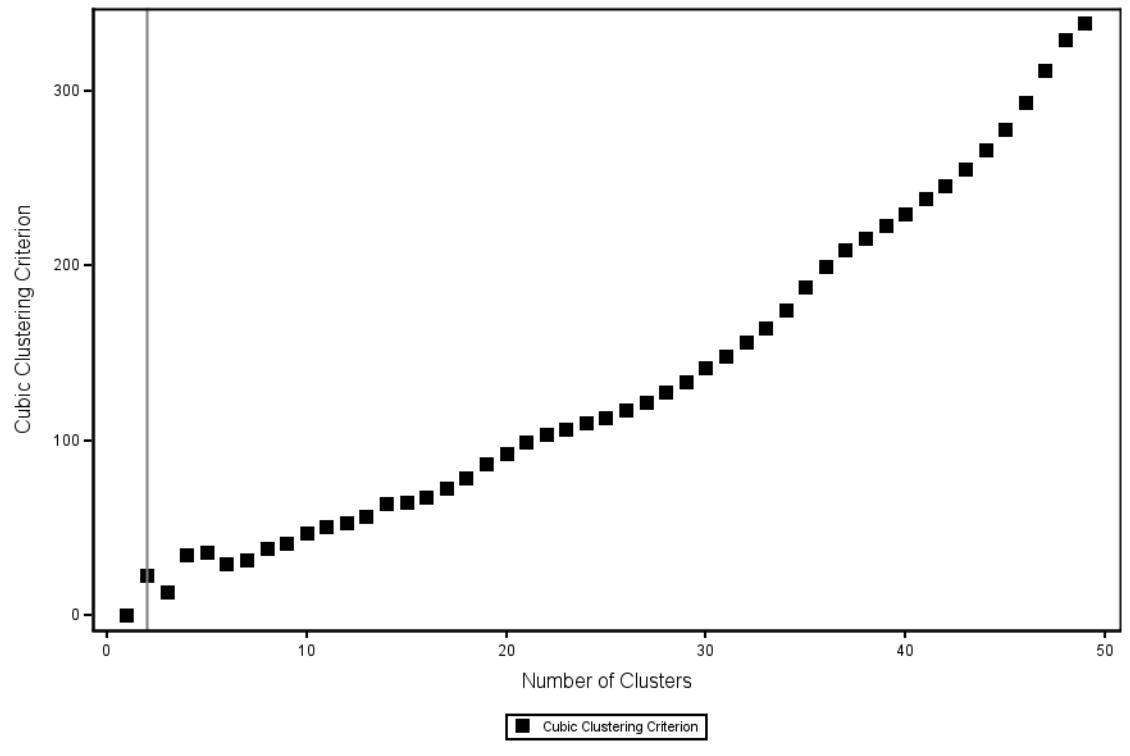
Node=WardClustering

Segment Plot



Segment Variable

Formatted Value											
Month-to-month	One year	Two year	No	Yes	No internet service						
DSL	Fiber optic	106.19:118.75	18.25:30.813	30.813:43.375	43.375:55.938						
55.938:68.5	68.5:81.063	81.063:93.625	93.625:106.19	0	0						
1	.	1102.1:2185.3	18.8:1102.1	2185.3:3268.6	3268.6:4351.8						
4351.8:5435.1	5435.1:6518.3	6518.3:7601.6	7601.6:8684.8	Female	Male						
0:9	18:27	27:36	36:45	45:54	54:63						
63:72	9:18										

SAS Enterprise Miner ReportNode=WardClustering
CCC Plot

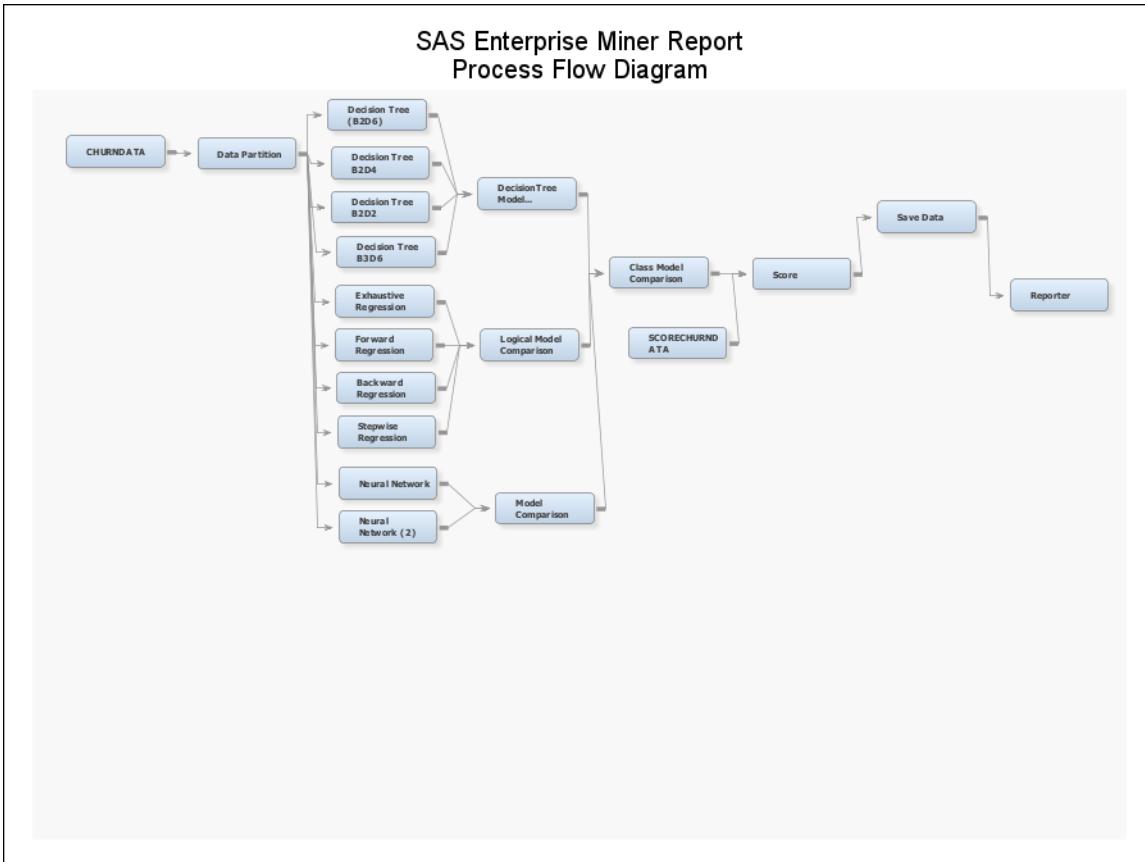
End of Report

SAS Enterprise Miner Report

User = vvish2
 Date = 21:24:47 October 14
 Project = DataMiningProject
 Diagram = Churn.Predictive

Start Node = Report
 Node label = Reporter
 Nodes = PATH
 Showall = N

Format = PDF
 Style = LISTING



SAS Enterprise Miner Report

Node=CHURNDATA Summary

Node id = lds
 Node label = CHURNDATA
 Meta path = lds
 Notes =

Node=CHURNDATA Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DataSource		DsCreatedBy	vvish2		NBytes	1770496	.
ApplyIntervalLevelLowerLimit	Y		DsId	churndata		NCols	21	.
ApplyMaxClassLevels	Y		DsModifiedBy	vvish2		NObs	7043	.
ApplyMaxPercentMissing	Y		DsModifyDate	2012922895.9		NewTable		
CMeta	WORK.M1DEHGR4		DsSampleName			NewVariableRole	REJECT	
ComputeStatistics	N		DsSampleSize			OutputType	VIEW	
DBPassThrough	Y		DsSampleSizeType			Role	RAW	TRAIN
Data	SASUSER.CHURNDATA		DsScope	LOCAL		Sample	D	
DataSelection	DATASOURCE		IdentifyEmptyColumns	Y		SampleSizeObs	10000	
DataSource	churndata		IntervalLowerLimit	20		SampleSizePercent	20	
DataSourceRole	RAW		Library	SASUSER		SampleSizeType	PERCENT	
Description			MaxClassLevels	20		Scope	LOCAL	
DropMapVariables	Y		MaxPercentMissing	50		Segment		
DsCreateDate	2012922895.6		MetaAdvisor	BASIC		Table	CHURNDATA	

Node=CHURNDATA Data Attributes

Attribute	Value	Attribute	Value	Attribute	Value
Data Name	CHURNDATA	Date Created	14Oct2023:16:52:11	Data Size	1770496
Data Type	DATA	Date Modified	14Oct2023:16:52:11	Role	RAW
Data Label		Number Rows	7043	Segment	
Engine	V9	Number Columns	21	Data Library	SASUSER

Node=CHURNDATA Variables List

Name	Label	Role	Level	Type	Length	Format	Creator
Churn		TARGET	BINARY	C	3	\$3.	
Contract		INPUT	NOMINAL	C	14	\$14.	
Dependents		INPUT	BINARY	C	3	\$3.	
DeviceProtection		INPUT	NOMINAL	C	19	\$19.	
InternetService		INPUT	NOMINAL	C	11	\$11.	
MonthlyCharges		INPUT	INTERVAL	N	8	BEST12.0	
MultipleLines		INPUT	NOMINAL	C	16	\$16.	
OnlineBackup		INPUT	NOMINAL	C	19	\$19.	
OnlineSecurity		INPUT	NOMINAL	C	19	\$19.	
PaperlessBilling		INPUT	BINARY	C	3	\$3.	
Partner		INPUT	BINARY	C	3	\$3.	

Name	Label	Role	Level	Type	Length	Format	Creator
PaymentMethod		INPUT	NOMINAL	C	25	\$25.	
PhoneService		INPUT	BINARY	C	3	\$3.	
SeniorCitizen		INPUT	BINARY	N	8	BEST12.0	
StreamingMovies		INPUT	NOMINAL	C	19	\$19.	
StreamingTV		INPUT	NOMINAL	C	19	\$19.	
TechSupport		INPUT	NOMINAL	C	19	\$19.	
TotalCharges		INPUT	INTERVAL	N	8	BEST12.0	
customerID		REJECTED	NOMINAL	C	10	\$10.	
gender		INPUT	BINARY	C	6	\$6.	
tenure		INPUT	INTERVAL	N	8	BEST12.0	

SAS Enterprise Miner Report

Node=Data Partition Summary

Node id = Part
 Node label = Data Partition
 Meta path = Ids => Part
 Notes =

Node=Data Partition Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Partition		Method	DEFAULT		TestPct	30	
ClassDistribution	Y		OutputType	DATA		TrainPct	40	
IntervalDistribution	Y		RandomSeed	12345		ValidatePct	30	

Node=Data Partition Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
REJECTED	NOMINAL	1	customerID
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

SAS Enterprise Miner Report

Node=Neural Network (2) Summary

Node id = Neural2
 Node label = Neural Network (2)
 Meta path = Ids => Part => Neural2
 Notes =

Node=Neural Network (2) Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	NeuralNetwork		Hidden	3		Prelim	Y	
AbsConvValue	-1.34078E154	-7.237006E75	HiddenActivation	DEFAULT		PrelimMaxTime	1 HOUR	
AbsFTime	1		HiddenBias	Y		PrelimMaxiter	10	
AbsFValue	0		HiddenCombFunction	DEFAULT		PrelimOutest		
AbsGTime	1		HiddenUnits	N		PreliminaryRuns	5	
AbsGValue	0.00001		InitialDs			RandDist	NORMAL	
AbsXTime	1		InitialSeed	12345		RandLoc	0	
AbsXValue	1E-8		InputStandardization	STD		RandScale	0.1	
Accelerate	1.2		Learn	0.1		Residuals	Y	
AddHidden	Y		MaxLearn	50		Standardizations	N	
CodefileNoRes			MaxMomentum	1.75		SuppressOutput	N	
CodefileRes			Maxiter	50		TargetActivation	DEFAULT	
ConvDefaults	Y		Maxtime	4 HOURS		TargetBias	Y	
Decelerate	0.5		MinLearn	0.00001		TargetCombFunction	DEFAULT	
DirectConnection	N		ModelSelectionCriterion	PROFIT/LOSS		TargetError	DEFAULT	
FConvTime	1		Momentum	0		Tilt	0	
FConvValue	0		NetworkArchitecture	MLP		TrainCode		
GConvTime	1		Outest			TrainingTechnique	DEFAULT	
GConvValue	1E-6		Outfit			UseEstimates	N	

Node=Neural Network (2) Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Neural Network (2) Model Fit Statistics

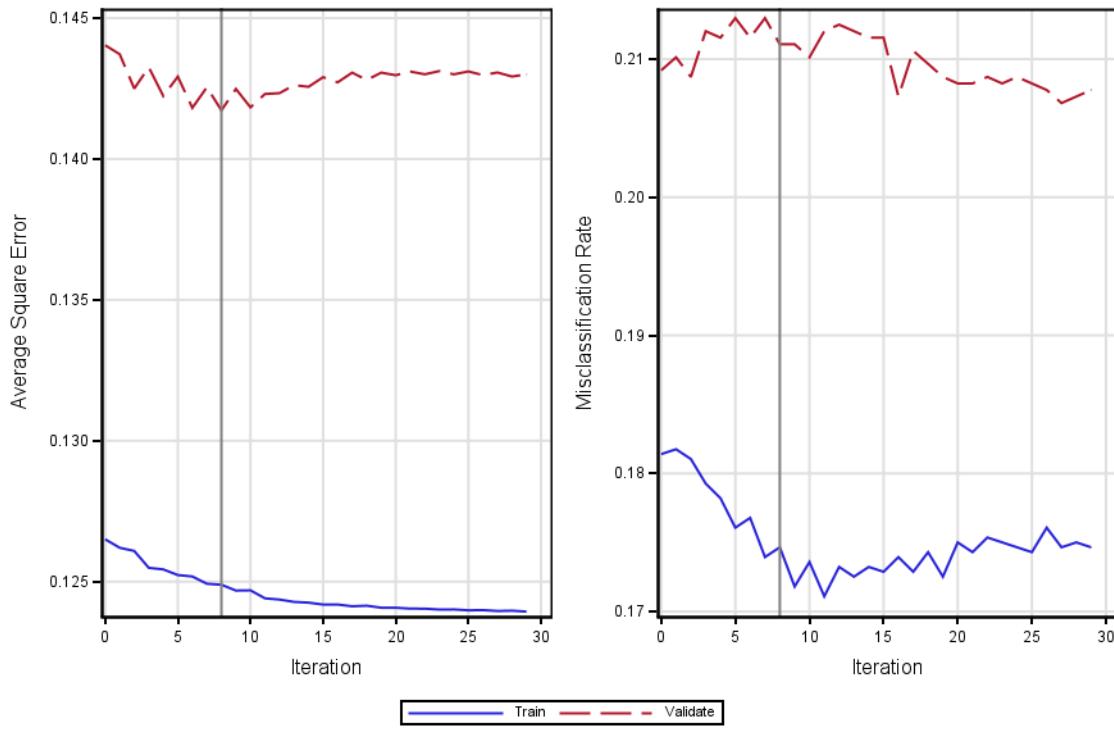
Target=Churn Target Label=''

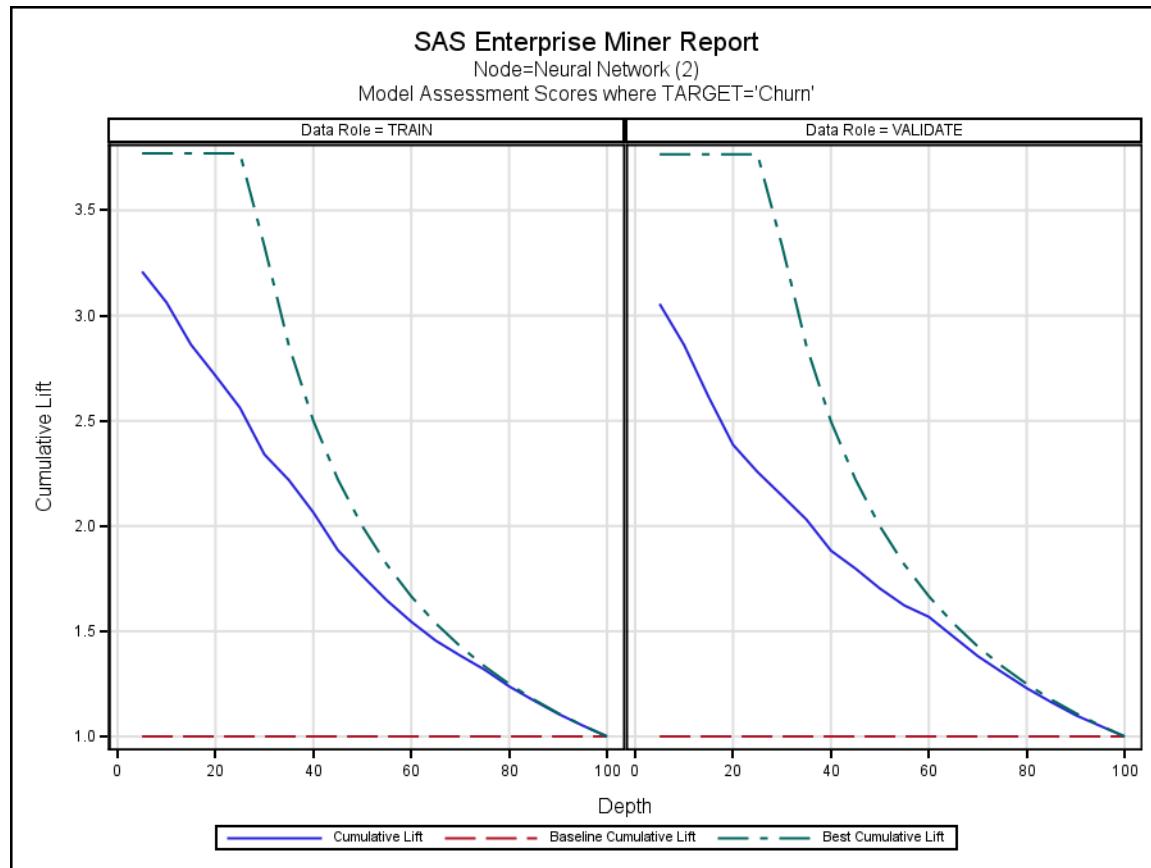
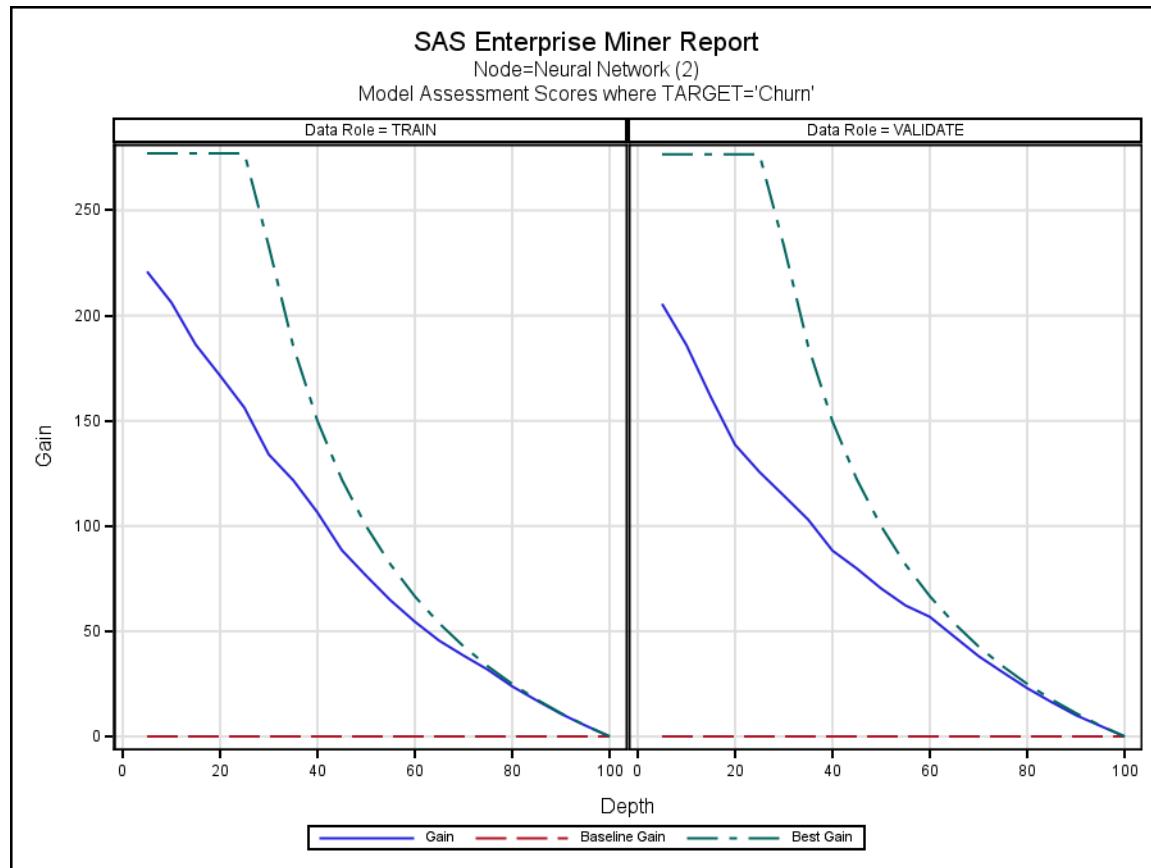
Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Degrees of Freedom for Error	2720.00	.	.
Model Degrees of Freedom	97.00	.	.
Number of Estimated Weights	97.00	.	.

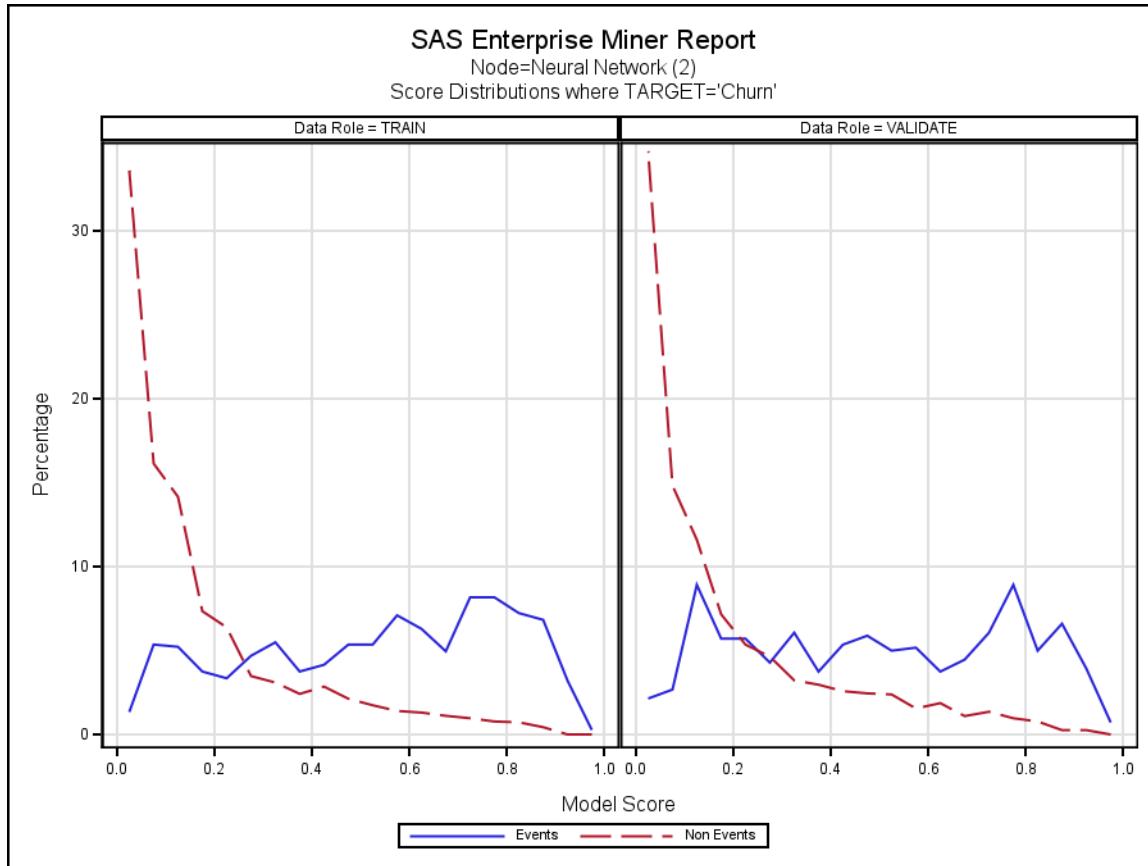
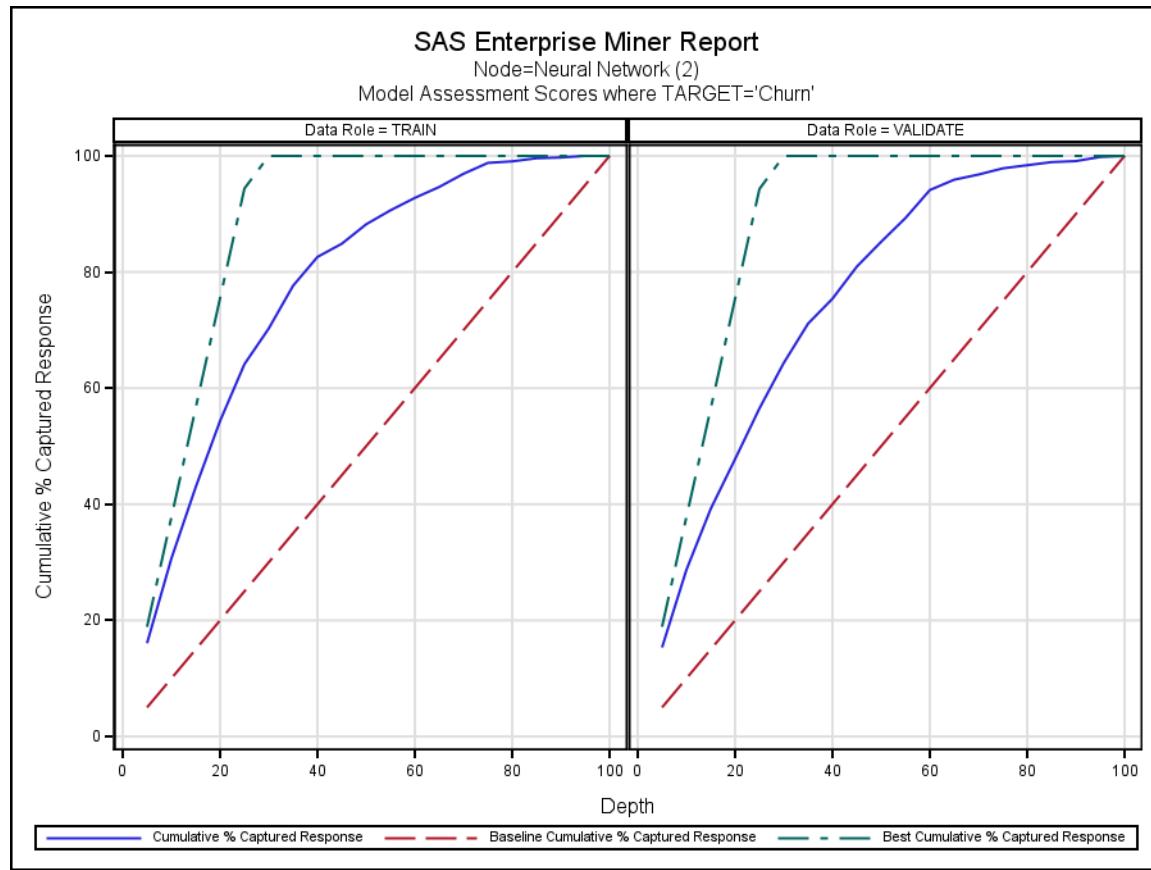
Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2399.93	.	.
Schwarz's Bayesian Criterion	2976.44	.	.
Average Squared Error	0.12	0.14	0.14
Maximum Absolute Error	0.99	0.99	1.00
Divisor for ASE	5634.00	4226.00	4226.00
Sum of Frequencies	2817.00	2113.00	2113.00
Root Average Squared Error	0.35	0.38	0.37
Sum of Squared Errors	703.63	598.93	590.77
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Final Prediction Error	0.13	.	.
Mean Squared Error	0.13	0.14	0.14
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.36	0.38	0.37
Average Error Function	0.39	0.43	0.43
Error Function	2205.93	1830.85	1800.54
Misclassification Rate	0.17	0.21	0.21
Number of Wrong Classifications	492.00	446.00	446.00

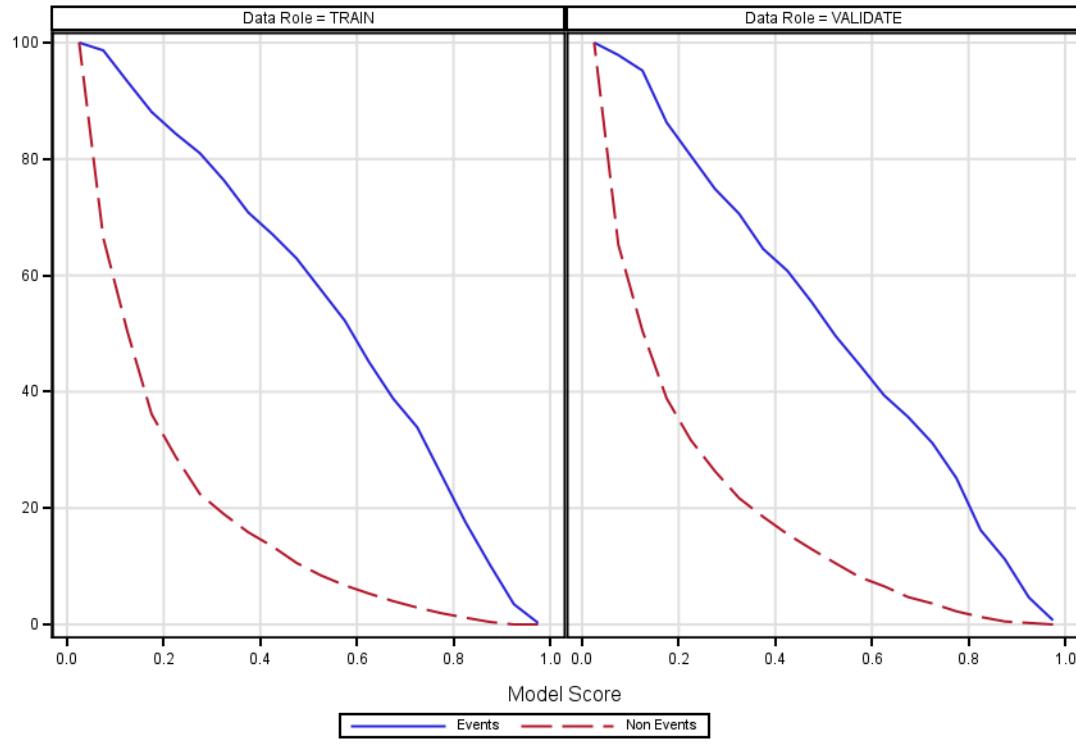
SAS Enterprise Miner Report
Node=Neural Network (2)
Model Iteration Plots







SAS Enterprise Miner Report
 Node=Neural Network (2)
 Score Distributions where TARGET='Churn'



Node=Neural Network (2)
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.95-1.00	2	0.26774	0.0000	0.268	0.000
0.90-0.95	24	3.21285	0.0000	3.481	0.000
0.85-0.90	51	6.82731	0.4348	10.308	0.435
0.80-0.85	54	7.22892	0.7246	17.537	1.159
0.75-0.80	61	8.16600	0.7729	25.703	1.932
0.70-0.75	61	8.16600	0.9662	33.869	2.899
0.65-0.70	37	4.95315	1.1111	38.822	4.010
0.60-0.65	47	6.29183	1.3043	45.114	5.314
0.55-0.60	53	7.09505	1.4010	52.209	6.715
0.50-0.55	40	5.35475	1.7391	57.564	8.454
0.45-0.50	40	5.35475	2.1256	62.918	10.580
0.40-0.45	31	4.14993	2.8502	67.068	13.430
0.35-0.40	28	3.74833	2.4155	70.817	15.845
0.30-0.35	41	5.48862	3.0918	76.305	18.937
0.25-0.30	35	4.68541	3.4783	80.991	22.415
0.20-0.25	25	3.34672	6.3768	84.337	28.792
0.15-0.20	28	3.74833	7.3430	88.086	36.135
0.10-0.15	39	5.22088	14.1546	93.307	50.290
0.05-0.10	40	5.35475	16.1353	98.661	66.425
0.00-0.05	10	1.33869	33.5749	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.95-1.00	4	0.71301	0.0000	0.713	0.000
0.90-0.95	22	3.92157	0.2577	4.635	0.258
0.85-0.90	37	6.59537	0.2577	11.230	0.515
0.80-0.85	28	4.99109	0.7732	16.221	1.289
0.75-0.80	50	8.91266	0.9665	25.134	2.255
0.70-0.75	34	6.06061	1.3531	31.194	3.608
0.65-0.70	25	4.45633	1.0954	35.651	4.704
0.60-0.65	21	3.74332	1.8686	39.394	6.572
0.55-0.60	29	5.16934	1.5464	44.563	8.119
0.50-0.55	28	4.99109	2.3840	49.554	10.503
0.45-0.50	33	5.88235	2.4485	55.437	12.951
0.40-0.45	30	5.34759	2.5773	60.784	15.528
0.35-0.40	21	3.74332	2.9639	64.528	18.492
0.30-0.35	34	6.06061	3.2216	70.588	21.714
0.25-0.30	24	4.27807	4.6392	74.866	26.353
0.20-0.25	32	5.70410	5.3479	80.570	31.701
0.15-0.20	32	5.70410	7.1521	86.275	38.853
0.10-0.15	50	8.91266	11.5979	95.187	50.451
0.05-0.10	15	2.67380	14.8196	97.861	65.271
0.00-0.05	12	2.13904	34.7294	100.000	100.000

SAS Enterprise Miner Report

Node=Neural Network Summary

Node id = Neural
 Node label = Neural Network
 Meta path = Ids => Part => Neural
 Notes =

Node=Neural Network Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	NeuralNetwork		Hidden	3		Prelim	Y	
AbsConvValue	-1.34078E154	-7.237006E75	HiddenActivation	DEFAULT		PrelimMaxTime	1 HOUR	
AbsFTime	1		HiddenBias	Y		PrelimMaxiter	10	
AbsFValue	0		HiddenCombFunction	DEFAULT		PrelimOutest		
AbsGTime	1		HiddenUnits	N		PreliminaryRuns	5	
AbsGValue	1E-5	0.00001	InitialDs			RandDist	NORMAL	
AbsXTime	1		InitialSeed	12345		RandLoc	0	
AbsXValue	1E-8		InputStandardization	STD		RandScale	0.1	
Accelerate	1.2		Learn	0.1		Residuals	Y	
AddHidden	Y		MaxLearn	50		Standardizations	N	
CodefileNoRes			MaxMomentum	1.75		SuppressOutput	N	
CodefileRes			Maxiter	50		TargetActivation	DEFAULT	
ConvDefaults	Y		Maxtime	4 HOURS		TargetBias	Y	
Decelerate	0.5		MinLearn	1E-5	0.00001	TargetCombFunction	DEFAULT	
DirectConnection	N		ModelSelectionCriterion	PROFIT/LOSS		TargetError	DEFAULT	
FConvTime	1		Momentum	0		Tilt	0	
FConvValue	0		NetworkArchitecture	MLP		TrainCode		
GConvTime	1		Outest			TrainingTechnique	BPROP	DEFAULT
GConvValue	1E-6		Outfit			UseEstimates	N	

Node=Neural Network Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Neural Network Model Fit Statistics

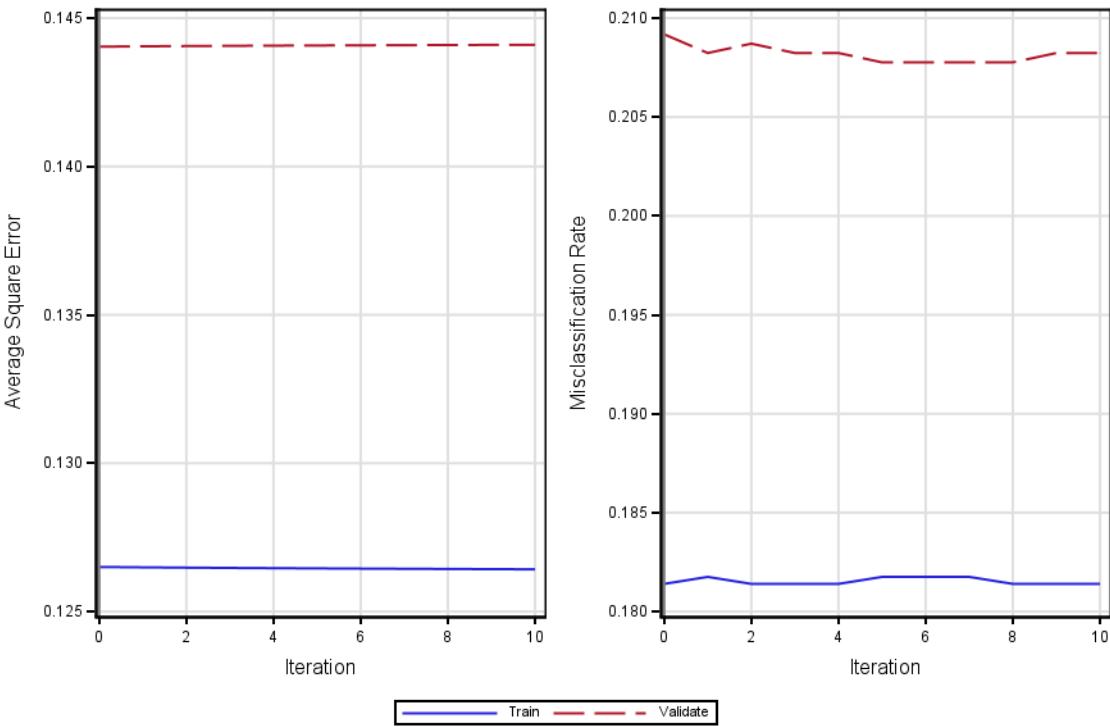
Target=Churn Target Label=''

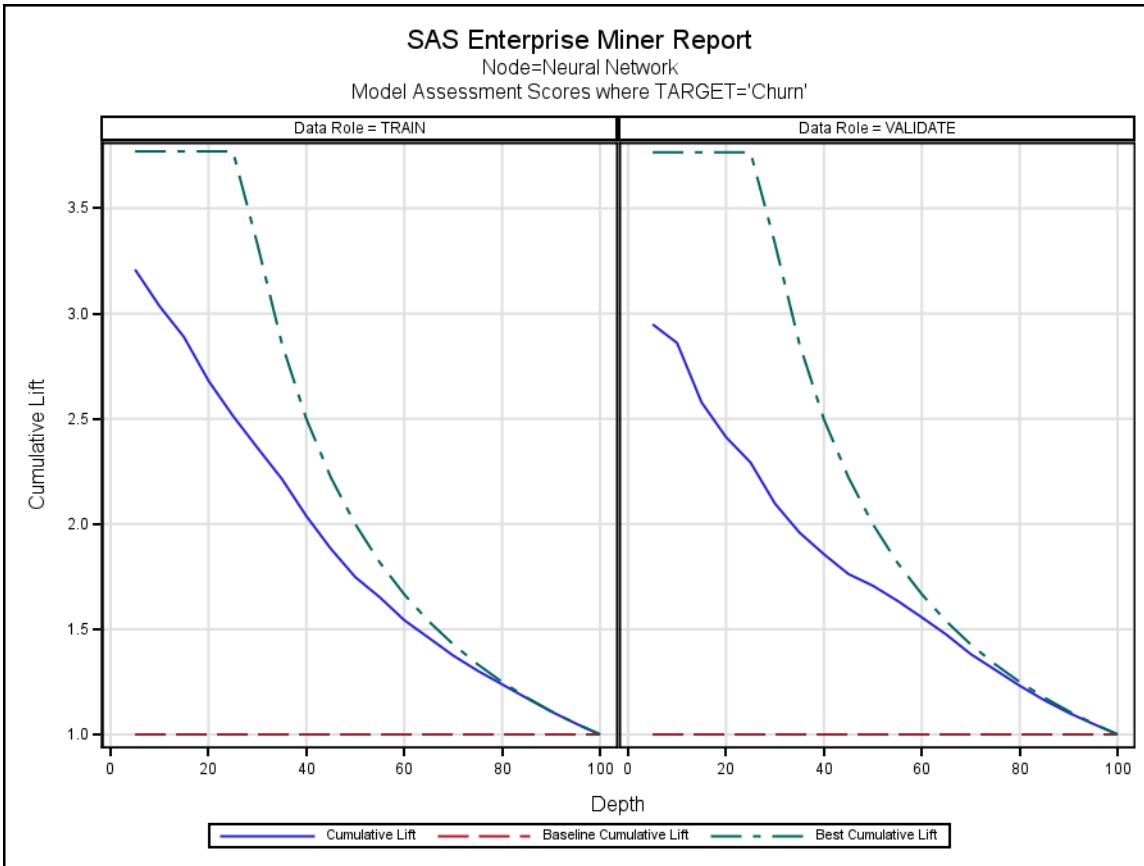
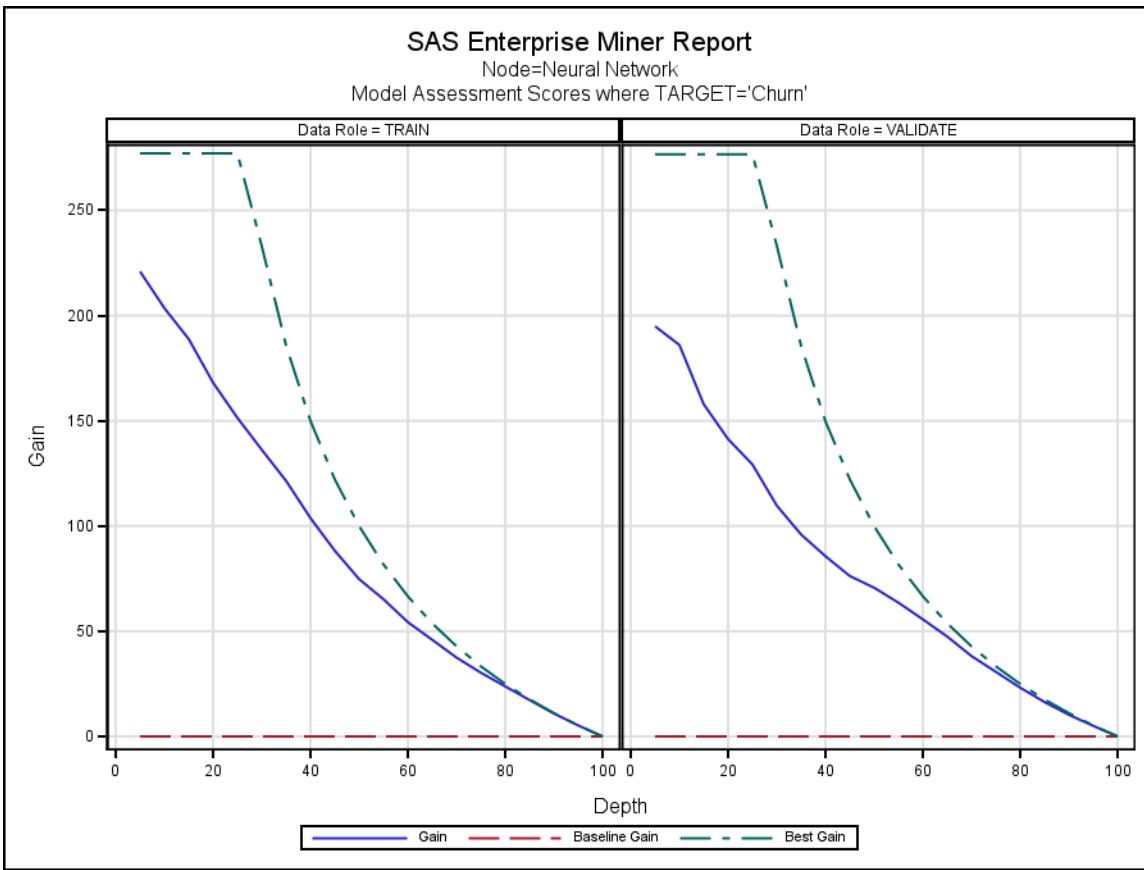
Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Degrees of Freedom for Error	2720.00	.	.
Model Degrees of Freedom	97.00	.	.
Number of Estimated Weights	97.00	.	.

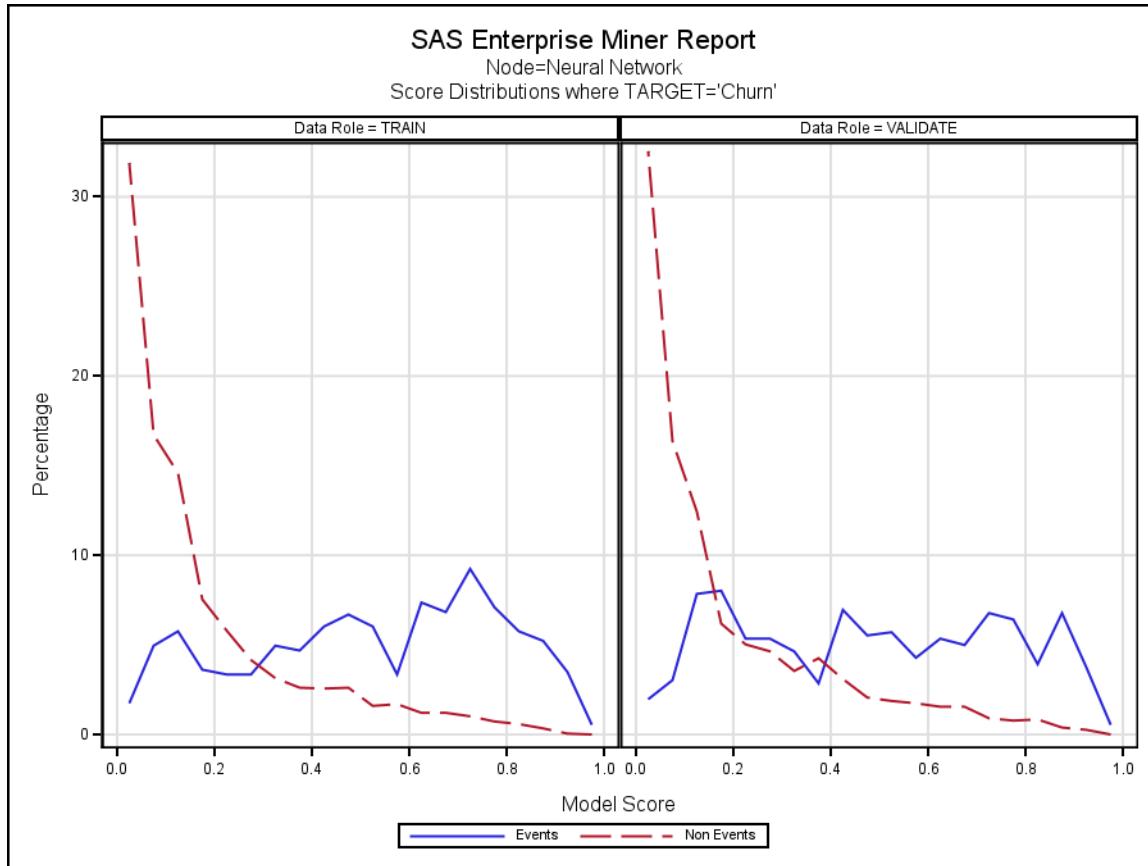
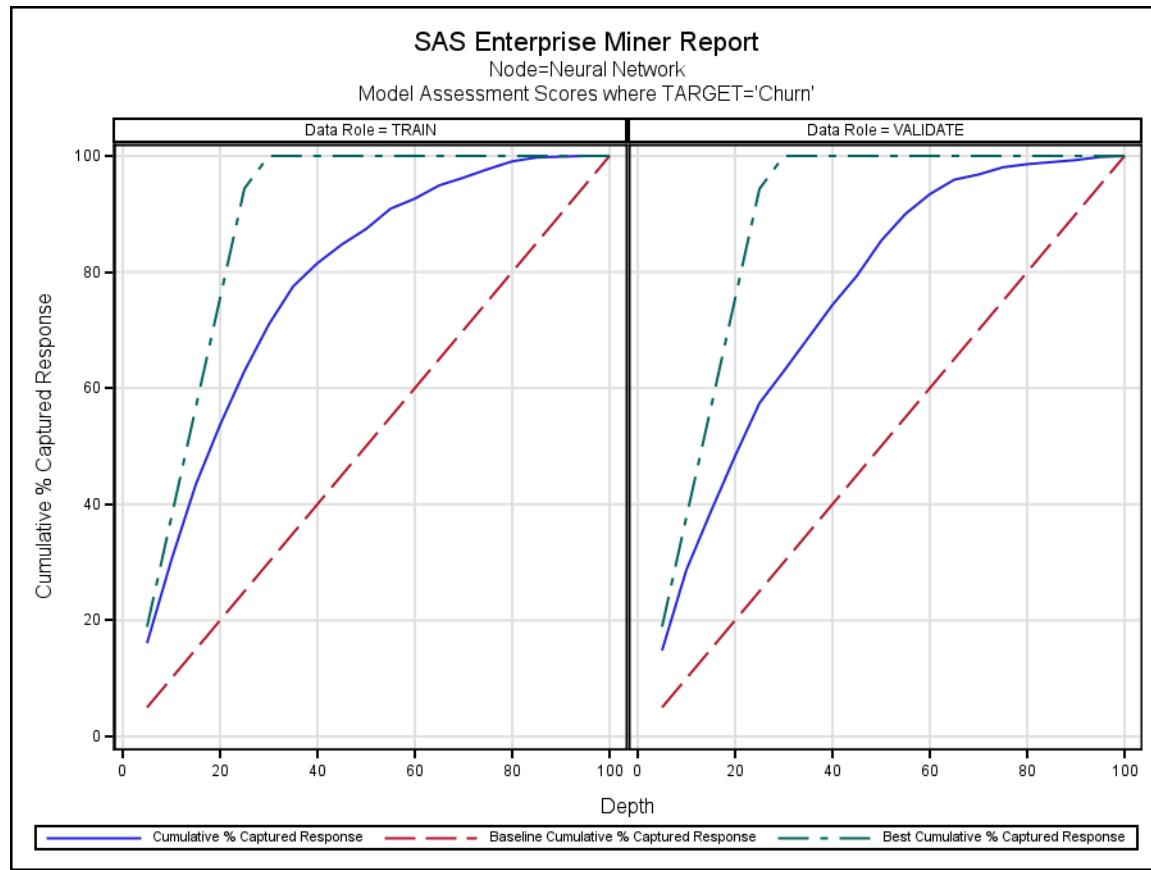
Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2424.84	.	.
Schwarz's Bayesian Criterion	3001.35	.	.
Average Squared Error	0.13	0.14	0.14
Maximum Absolute Error	0.99	0.99	1.00
Divisor for ASE	5634.00	4226.00	4226.00
Sum of Frequencies	2817.00	2113.00	2113.00
Root Average Squared Error	0.36	0.38	0.37
Sum of Squared Errors	712.72	608.70	591.37
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Final Prediction Error	0.14	.	.
Mean Squared Error	0.13	0.14	0.14
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.36	0.38	0.37
Average Error Function	0.40	0.44	0.43
Error Function	2230.84	1856.39	1806.07
Misclassification Rate	0.18	0.21	0.20
Number of Wrong Classifications	511.00	442.00	430.00

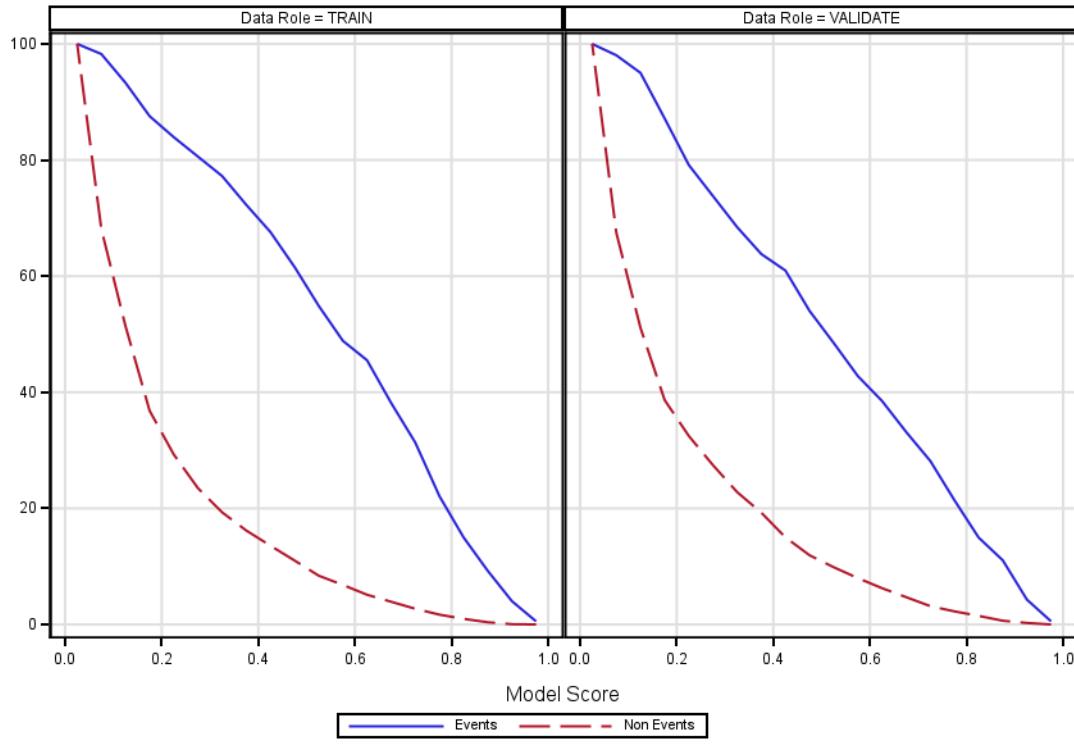
SAS Enterprise Miner Report
Node=Neural Network
Model Iteration Plots







SAS Enterprise Miner Report
 Node=Neural Network
 Score Distributions where TARGET='Churn'



Node=Neural Network
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.95-1.00	4	0.53548	0.0000	0.535	0.000
0.90-0.95	26	3.48059	0.0483	4.016	0.048
0.85-0.90	39	5.22088	0.3382	9.237	0.386
0.80-0.85	43	5.75636	0.5797	14.993	0.966
0.75-0.80	53	7.09505	0.7246	22.088	1.691
0.70-0.75	69	9.23695	1.0145	31.325	2.705
0.65-0.70	51	6.82731	1.2077	38.153	3.913
0.60-0.65	55	7.36278	1.2077	45.515	5.121
0.55-0.60	25	3.34672	1.6908	48.862	6.812
0.50-0.55	45	6.02410	1.5942	54.886	8.406
0.45-0.50	50	6.69344	2.6087	61.580	11.014
0.40-0.45	45	6.02410	2.5604	67.604	13.575
0.35-0.40	35	4.68541	2.6087	72.289	16.184
0.30-0.35	37	4.95315	3.1401	77.242	19.324
0.25-0.30	25	3.34672	4.1546	80.589	23.478
0.20-0.25	25	3.34672	5.7971	83.936	29.275
0.15-0.20	27	3.61446	7.5362	87.550	36.812
0.10-0.15	43	5.75636	14.5894	93.307	51.401
0.05-0.10	37	4.95315	16.7150	98.260	68.116
0.00-0.05	13	1.74029	31.8841	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.95-1.00	3	0.53476	0.0000	0.535	0.000
0.90-0.95	21	3.74332	0.2577	4.278	0.258
0.85-0.90	38	6.77362	0.3866	11.052	0.644
0.80-0.85	22	3.92157	0.8376	14.973	1.482
0.75-0.80	36	6.41711	0.7732	21.390	2.255
0.70-0.75	38	6.77362	0.9021	28.164	3.157
0.65-0.70	28	4.99109	1.5464	33.155	4.704
0.60-0.65	30	5.34759	1.5464	38.503	6.250
0.55-0.60	24	4.27807	1.7397	42.781	7.990
0.50-0.55	32	5.70410	1.8686	48.485	9.858
0.45-0.50	31	5.52585	2.0619	54.011	11.920
0.40-0.45	39	6.95187	3.0928	60.963	15.013
0.35-0.40	16	2.85205	4.2526	63.815	19.265
0.30-0.35	26	4.63458	3.5438	68.449	22.809
0.25-0.30	30	5.34759	4.6392	73.797	27.448
0.20-0.25	30	5.34759	5.0258	79.144	32.474
0.15-0.20	45	8.02139	6.1856	87.166	38.660
0.10-0.15	44	7.84314	12.4356	95.009	51.095
0.05-0.10	17	3.03030	16.3660	98.039	67.461
0.00-0.05	11	1.96078	32.5387	100.000	100.000

SAS Enterprise Miner Report

Node=Stepwise Regression Summary

Node id = Reg4
 Node label = Stepwise Regression
 Meta path = Ids => Part => Reg4
 Notes =

Node=Stepwise Regression Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Regression		Force	0		PolynomialDegree	2	
AbsConvValue	-1.34078E154	-7.237006E75	GConvTimes	1		PrintDesignMatrix	N	
AbsFTime	1		GConvValue	1E-6		Rule	NONE	
AbsFValue	0		Hierarchy	CLASS		SASSPDS	N	
AbsGTime	1		InputCoding	DEVIATION		SelectionCriterion	DEFAULT	
AbsGValue	0.00001		Interactions			SelectionDefault	Y	
AbsXTime	1		LinkFunction	LOGIT		Sequential	N	
AbsXValue	1E-8		MainEffect	Y		Simple	N	
CIParam	N		MaxCPUTime	1 HOUR		SIEntry	0.05	
ConvDefaults	Y		MaxFunctionCalls	.		SIStay	0.05	
CorB	N		MaxIterations	.		Start	0	
CovB	N		MaxStep	.		StepOutput	N	
Covout	N		MinResourceUse	N		Stop	0	
Details	N		ModelDefaults	Y		SuppressIntercept	N	
Error	LOGISTIC		ModelSelection	STEPWISE	NONE	SuppressOutput	N	
ExcludedVariable	REJECT		OptimizationTechnique	DEFAULT		Terms	N	
FConvTimes	1		Performance	N		TwoFactor	N	
FConvValue	0		Polynomial	N				

Node=Stepwise Regression Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Stepwise Regression Model Fit Statistics

Target=Churn Target Label=''

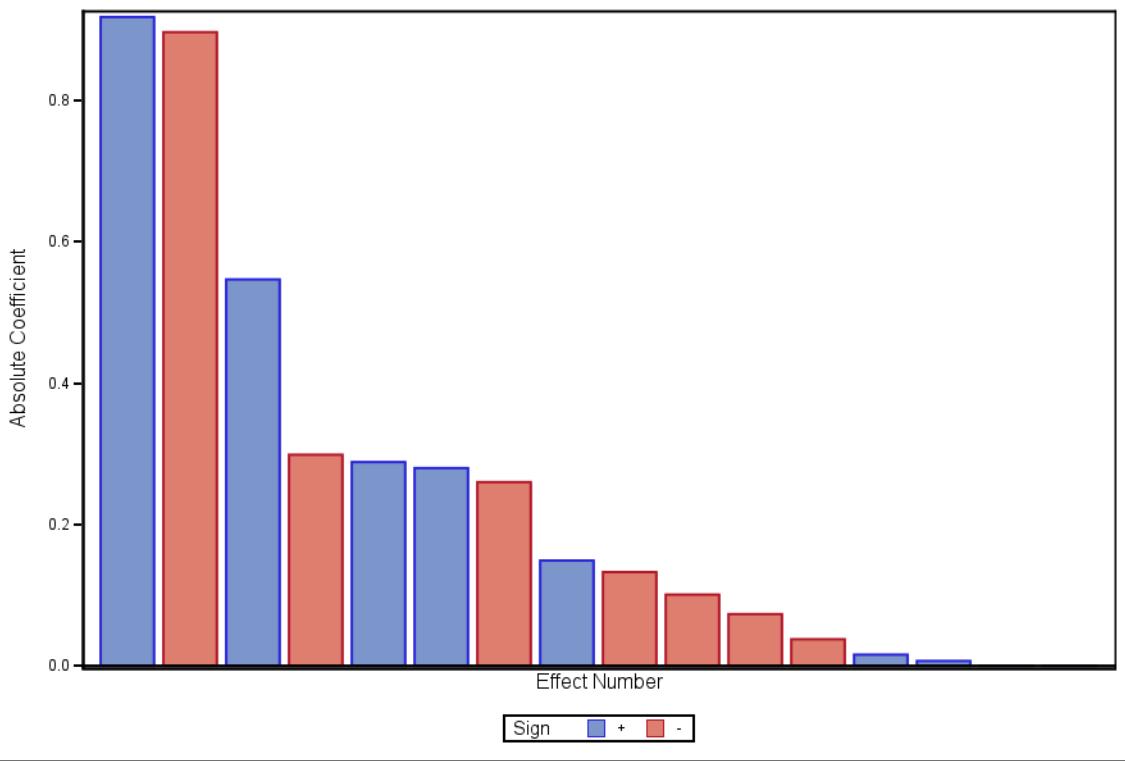
Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2370.06	.	.
Average Squared Error	0.13	0.14	0.14
Average Error Function	0.42	0.43	0.42
Degrees of Freedom for Error	2803.00	.	.
Model Degrees of Freedom	14.00	.	.

Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Divisor for ASE	5634.00	4226.00	4226.00
Error Function	2342.06	1821.12	1756.37
Final Prediction Error	0.14	.	.
Maximum Absolute Error	0.99	0.99	0.99
Mean Square Error	0.13	0.14	0.14
Sum of Frequencies	2817.00	2113.00	2113.00
Number of Estimate Weights	14.00	.	.
Root Average Sum of Squares	0.37	0.38	0.37
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.37	0.38	0.37
Schwarz's Bayesian Criterion	2453.27	.	.
Sum of Squared Errors	753.18	600.29	572.50
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Misclassification Rate	0.19	0.21	0.19

SAS Enterprise Miner Report

Node=Stepwise Regression
Regression Model Effects

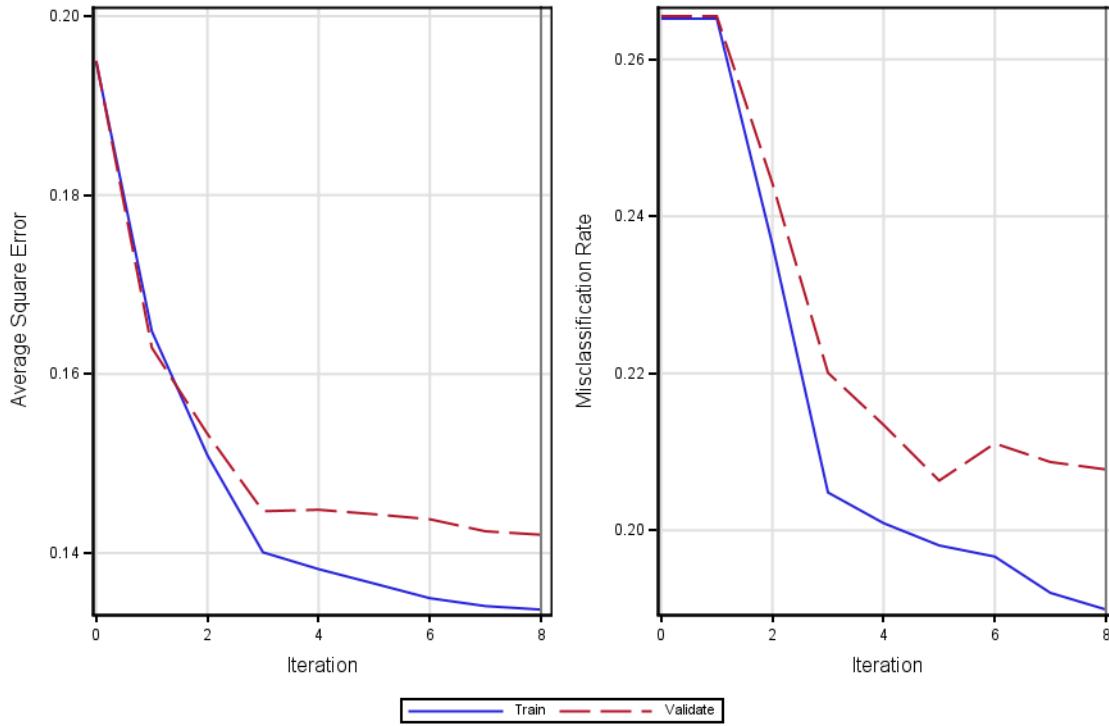


Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
1	InternetService	FIBER_OPTIC	0.91847	9.55907	0.00000	9	StreamingMovies		-0.13258	-2.2769	0.02279
2	Intercept	YES	-0.89703	-5.57513	0.00000	10	PaymentMethod	_CARD__AUTOMATIC_	-0.10068	-0.9501	0.34205
3	Contract	MONTH_TO_MONTH	0.54695	4.63874	0.00000	11	PaymentMethod	RANSFER__AUTOMATIC_	-0.07307	-0.6945	0.48735
4	MultipleLines	NO	-0.29876	-3.49219	0.00048	12	tenure		-0.03745	-10.5208	0.00000
5	OnlineSecurity	O	0.28836	4.35760	0.00001	13	Contract	ONE_YEAR	0.01570	0.1297	0.89678
6	PaymentMethod	ONIC_CHECK	0.27982	3.40392	0.00066	14	InternetService	DSL	0.00677	0.0697	0.94441
7	PaperlessBilling	NO	-0.25999	-4.41812	0.00001	15	OnlineSecurity	O_INTERNET_SERVICE	0.00000	.	.
8	MultipleLines	NO_PHONE_SERVICE	0.14889	1.13727	0.25543	16	StreamingMovies	_INTERNET_SERVICE	0.00000	.	.

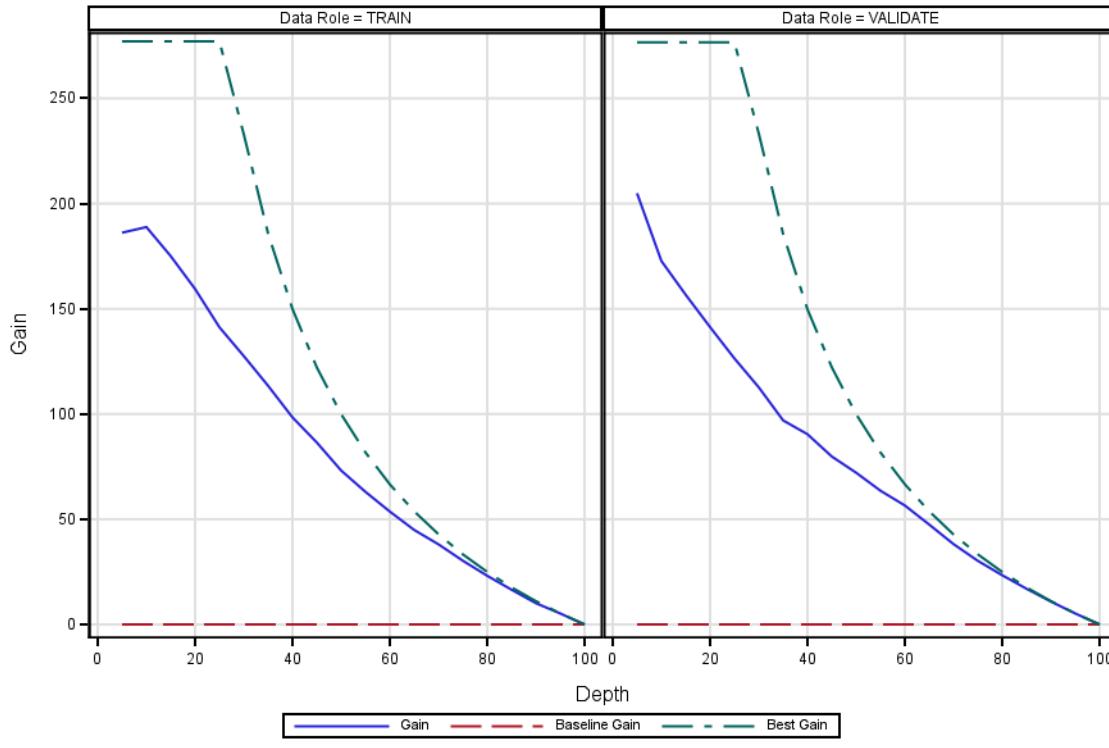
SAS Enterprise Miner Report
Node=Stepwise Regression
Model Iteration Plots

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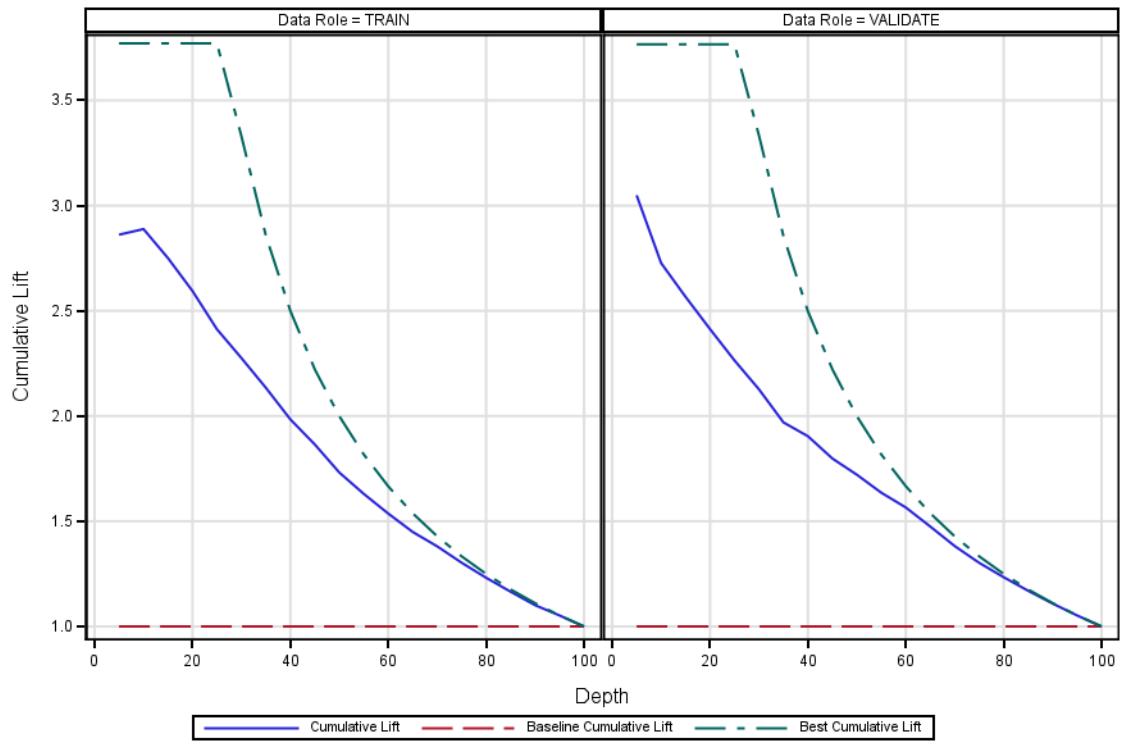
SAS Enterprise Miner Report
Node=Stepwise Regression
Model Iteration Plots



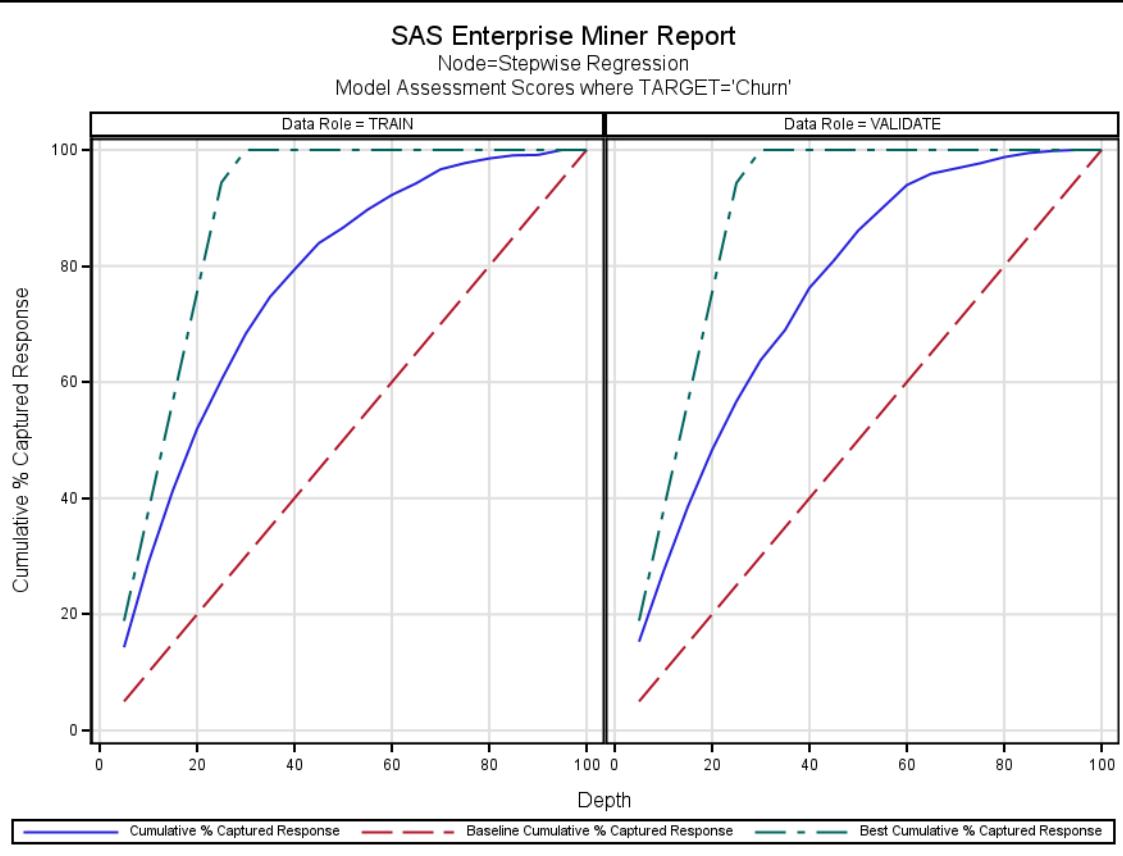
SAS Enterprise Miner Report
Node=Stepwise Regression
Model Assessment Scores where TARGET='Churn'



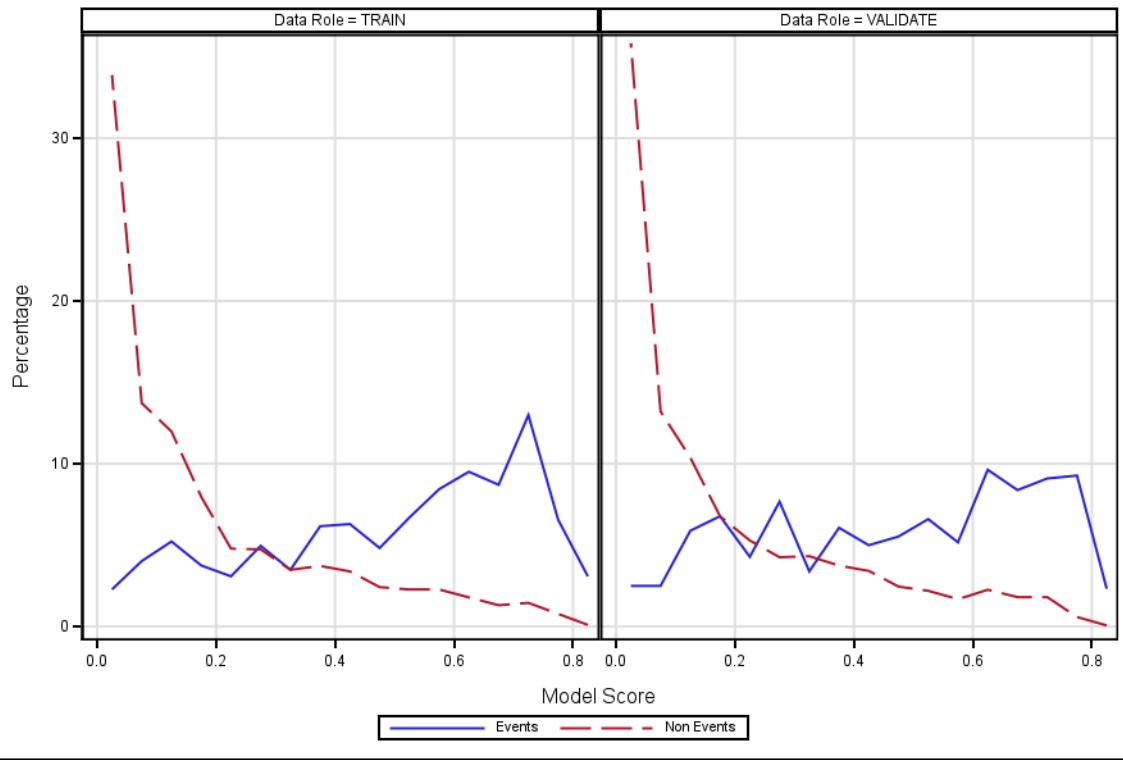
SAS Enterprise Miner Report
 Node=Stepwise Regression
 Model Assessment Scores where TARGET='Churn'



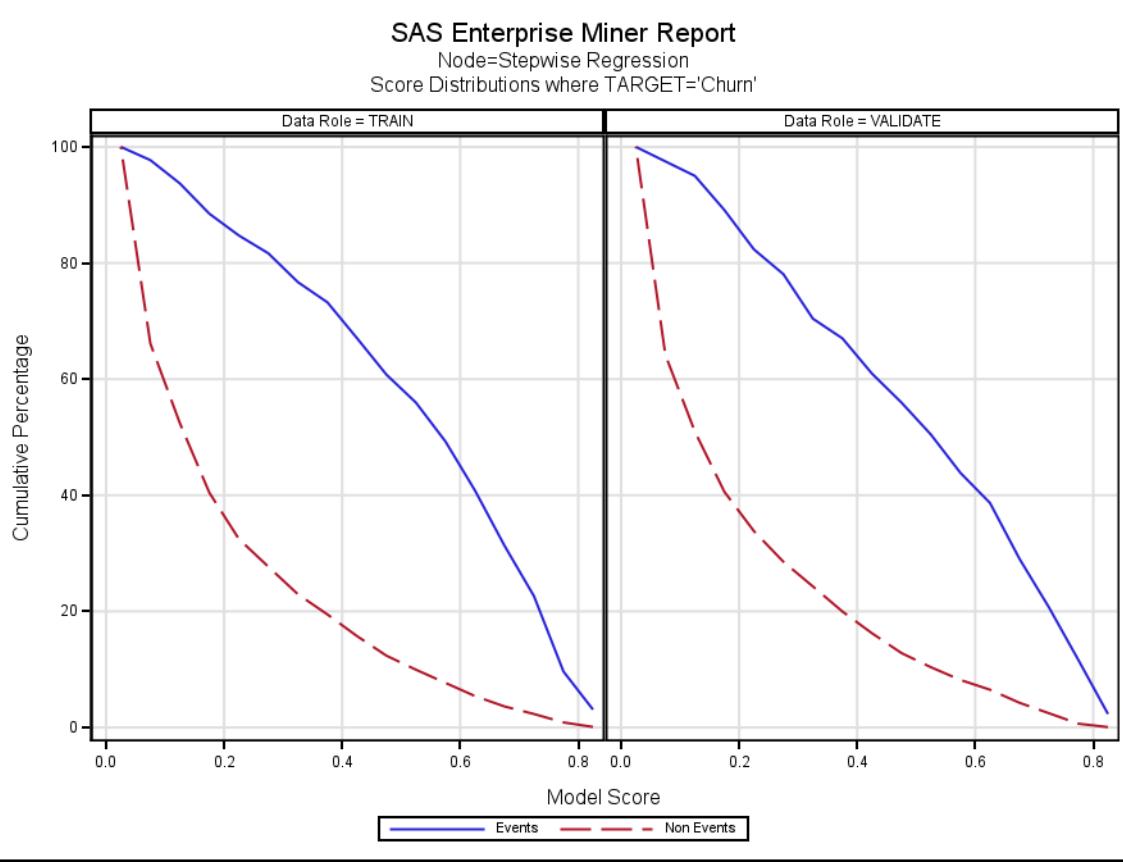
SAS Enterprise Miner Report
 Node=Stepwise Regression
 Model Assessment Scores where TARGET='Churn'



SAS Enterprise Miner Report
 Node=Stepwise Regression
 Score Distributions where TARGET='Churn'



SAS Enterprise Miner Report
 Node=Stepwise Regression
 Score Distributions where TARGET='Churn'



Node=Stepwise Regression
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	23	3.0790	0.0966	3.079	0.097
0.75-0.80	49	6.5596	0.7729	9.639	0.870
0.70-0.75	97	12.9853	1.4493	22.624	2.319
0.65-0.70	65	8.7015	1.3043	31.325	3.623
0.60-0.65	71	9.5047	1.7874	40.830	5.411
0.55-0.60	63	8.4337	2.2705	49.264	7.681
0.50-0.55	50	6.6934	2.2705	55.957	9.952
0.45-0.50	36	4.8193	2.4155	60.776	12.367
0.40-0.45	47	6.2918	3.3816	67.068	15.749
0.35-0.40	46	6.1580	3.7198	73.226	19.469
0.30-0.35	26	3.4806	3.4783	76.707	22.947
0.25-0.30	37	4.9531	4.7343	81.660	27.681
0.20-0.25	23	3.0790	4.7826	84.739	32.464
0.15-0.20	28	3.7483	7.9710	88.487	40.435
0.10-0.15	39	5.2209	11.9807	93.708	52.415
0.05-0.10	30	4.0161	13.7198	97.724	66.135
0.00-0.05	17	2.2758	33.8647	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	13	2.31729	0.0644	2.317	0.064
0.75-0.80	52	9.26916	0.5799	11.586	0.644
0.70-0.75	51	9.09091	1.8041	20.677	2.448
0.65-0.70	47	8.37790	1.8041	29.055	4.253
0.60-0.65	54	9.62567	2.2552	38.681	6.508
0.55-0.60	29	5.16934	1.6753	43.850	8.183
0.50-0.55	37	6.59537	2.1907	50.446	10.374
0.45-0.50	31	5.52585	2.4485	55.971	12.822
0.40-0.45	28	4.99109	3.4149	60.963	16.237
0.35-0.40	34	6.06061	3.7371	67.023	19.974
0.30-0.35	19	3.38681	4.3170	70.410	24.291
0.25-0.30	43	7.66488	4.2526	78.075	28.544
0.20-0.25	24	4.27807	5.2835	82.353	33.827
0.15-0.20	38	6.77362	6.7655	89.127	40.593
0.10-0.15	33	5.88235	10.3737	95.009	50.966
0.05-0.10	14	2.49554	13.2088	97.504	64.175
0.00-0.05	14	2.49554	35.8247	100.000	100.000

SAS Enterprise Miner Report

Node=Backward Regression Summary

Node id = Reg3
 Node label = Backward Regression
 Meta path = Ids => Part => Reg3
 Notes =

Node=Backward Regression Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Regression		Force	0		PolynomialDegree	2	
AbsConvValue	-1.34078E154	-7.237006E75	GConvTimes	1		PrintDesignMatrix	N	
AbsFTime	1		GConvValue	1E-6		Rule	NONE	
AbsFValue	0		Hierarchy	CLASS		SASSPDS	N	
AbsGTime	1		InputCoding	DEVIATION		SelectionCriterion	DEFAULT	
AbsGValue	0.00001		Interactions			SelectionDefault	Y	
AbsXTime	1		LinkFunction	LOGIT		Sequential	N	
AbsXValue	1E-8		MainEffect	Y		Simple	N	
CIParam	N		MaxCPUTime	1 HOUR		SIEntry	0.05	
ConvDefaults	Y		MaxFunctionCalls	.		SISStay	0.05	
CorB	N		MaxIterations	.		Start	0	
CovB	N		MaxStep	.		StepOutput	N	
Covout	N		MinResourceUse	N		Stop	0	
Details	N		ModelDefaults	Y		SuppressIntercept	N	
Error	LOGISTIC		ModelSelection	BACKWARD	NONE	SuppressOutput	N	
ExcludedVariable	REJECT		OptimizationTechnique	DEFAULT		Terms	N	
FConvTimes	1		Performance	N		TwoFactor	N	
FConvValue	0		Polynomial	N				

Node=Backward Regression Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Backward Regression Model Fit Statistics

Target=Churn Target Label=''

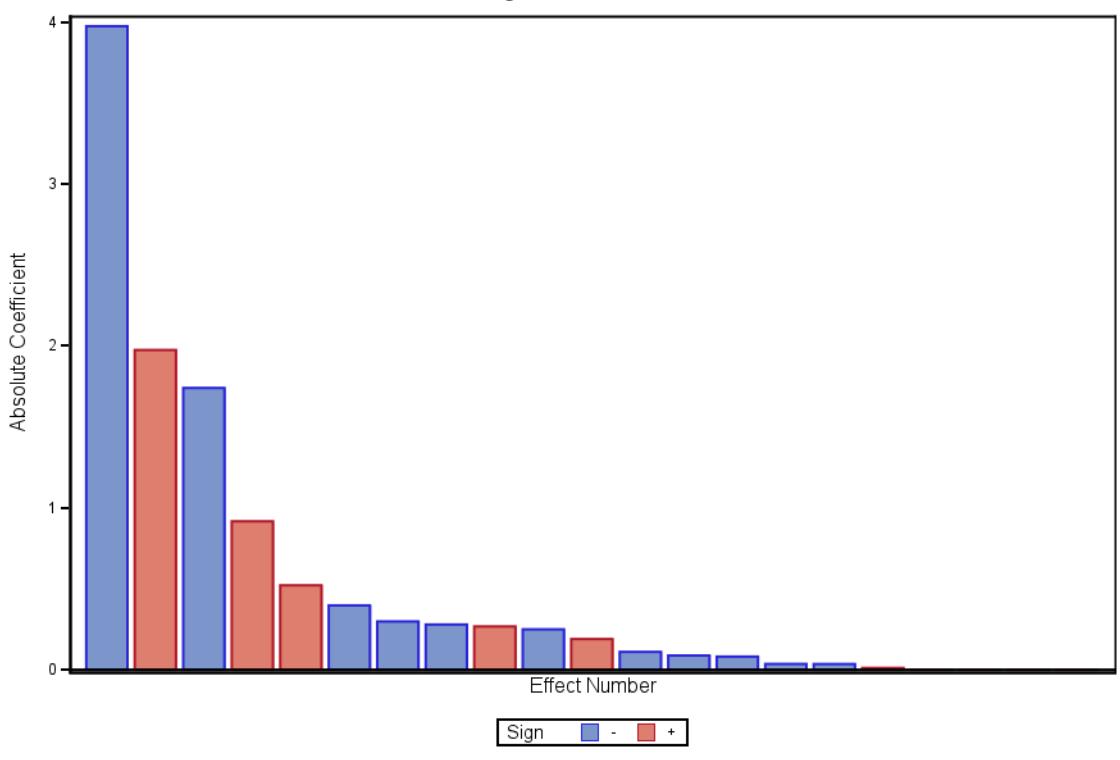
Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2367.88	.	.
Average Squared Error	0.13	0.14	0.13
Average Error Function	0.41	0.43	0.41
Degrees of Freedom for Error	2800.00	.	.
Model Degrees of Freedom	17.00	.	.

Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Divisor for ASE	5634.00	4226.00	4226.00
Error Function	2333.88	1817.91	1745.68
Final Prediction Error	0.13	.	.
Maximum Absolute Error	0.99	0.99	0.99
Mean Square Error	0.13	0.14	0.13
Sum of Frequencies	2817.00	2113.00	2113.00
Number of Estimate Weights	17.00	.	.
Root Average Sum of Squares	0.36	0.38	0.37
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.37	0.38	0.37
Schwarz's Bayesian Criterion	2468.92	.	.
Sum of Squared Errors	749.43	599.02	567.73
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Misclassification Rate	0.19	0.21	0.19

SAS Enterprise Miner Report

Node=Backward Regression
Regression Model Effects



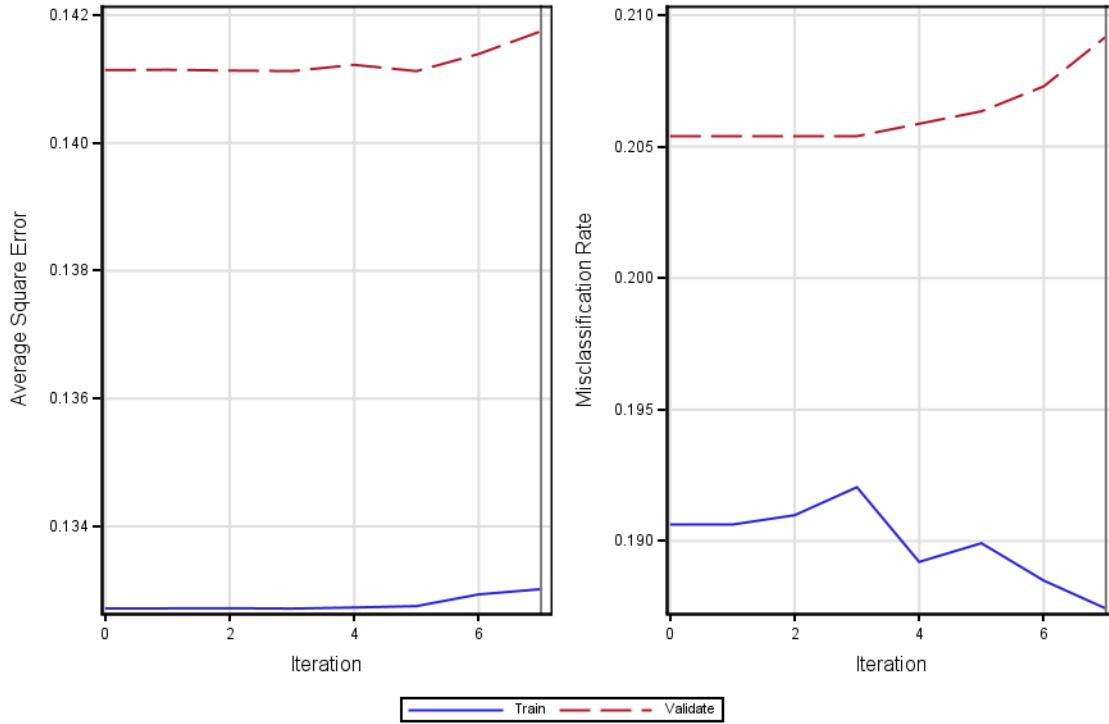
Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
1	DeviceProtection	INTERNET_SERVICE	-3.97597	-3.84205	0.00012	12	MultipleLines	NO	-0.11017	-0.90012	0.36805
2	DeviceProtection		1.97540	4.14216	0.00003	13	PaymentMethod	_CARD_AUTOMATIC_	-0.08766	-0.82559	0.40904
3	InternetService	DSL	-1.74093	-4.10846	0.00004	14	PaymentMethod	RANSFER_AUTOMATIC_	-0.08103	-0.76766	0.44269
4	Intercept	YES	0.91697	1.05118	0.29318	15	tenure		-0.03578	-9.55044	0.00000
5	Contract	MONTH_TO_MONTH	0.52140	4.37460	0.00001	16	MonthlyCharges		-0.03520	-2.12618	0.03349
6	MultipleLines	NO_PHONE_SERVICE	-0.39742	-1.38170	0.16706	17	Contract	ONE_YEAR	0.01111	0.09168	0.92695
7	StreamingMovies		-0.29816	-2.83303	0.00461	18	InternetService	FIBER_OPTIC	0.00000	.	.
8	StreamingTV	NO	-0.27922	-2.61578	0.00890	19	OnlineSecurity	O_INTERNET_SERVICE	0.00000	.	.
9	PaymentMethod	ONIC_CHECK	0.26734	3.24061	0.00119	20	StreamingMovies	_INTERNET_SERVICE	0.00000	.	.

SAS Enterprise Miner Report
Node=Backward Regression
Regression Model Effects

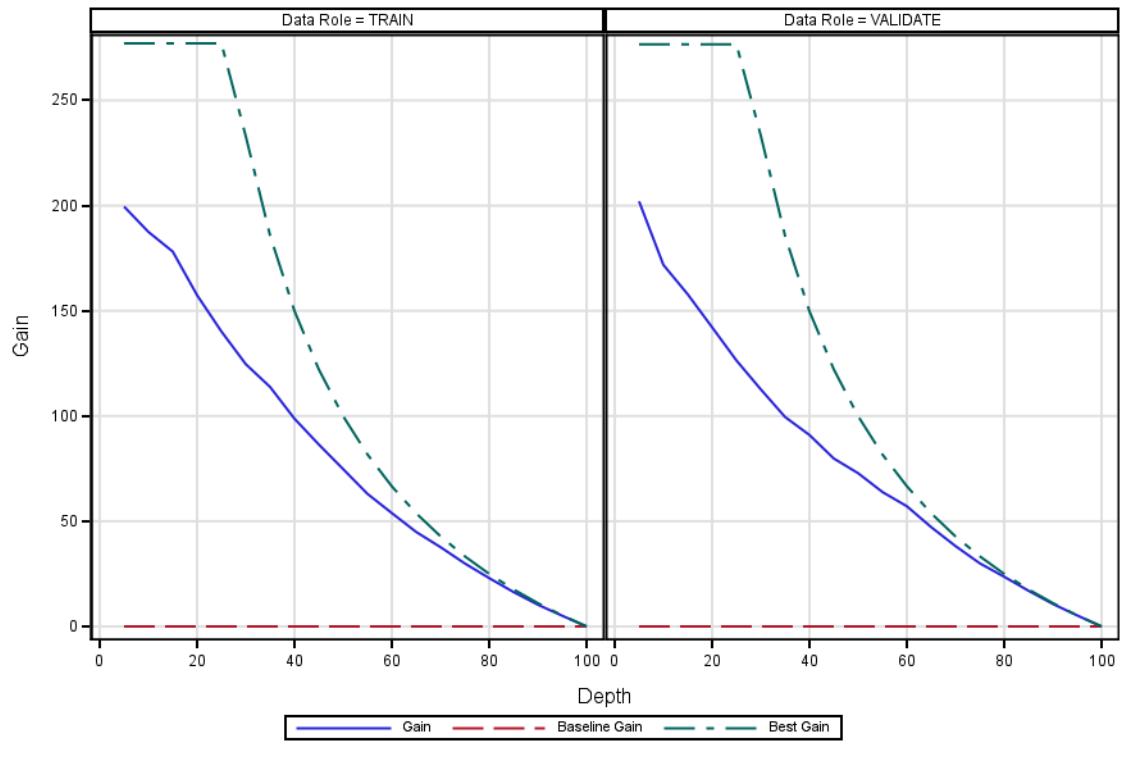
25

Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
10	PaperlessBilling	NO	-0.24950	-4.21603	0.00002	21	StreamingTV	NO_INTERNET_SERVICE	0.00000	.	.
11	OnlineSecurity	O	0.18956	2.36674	0.01795

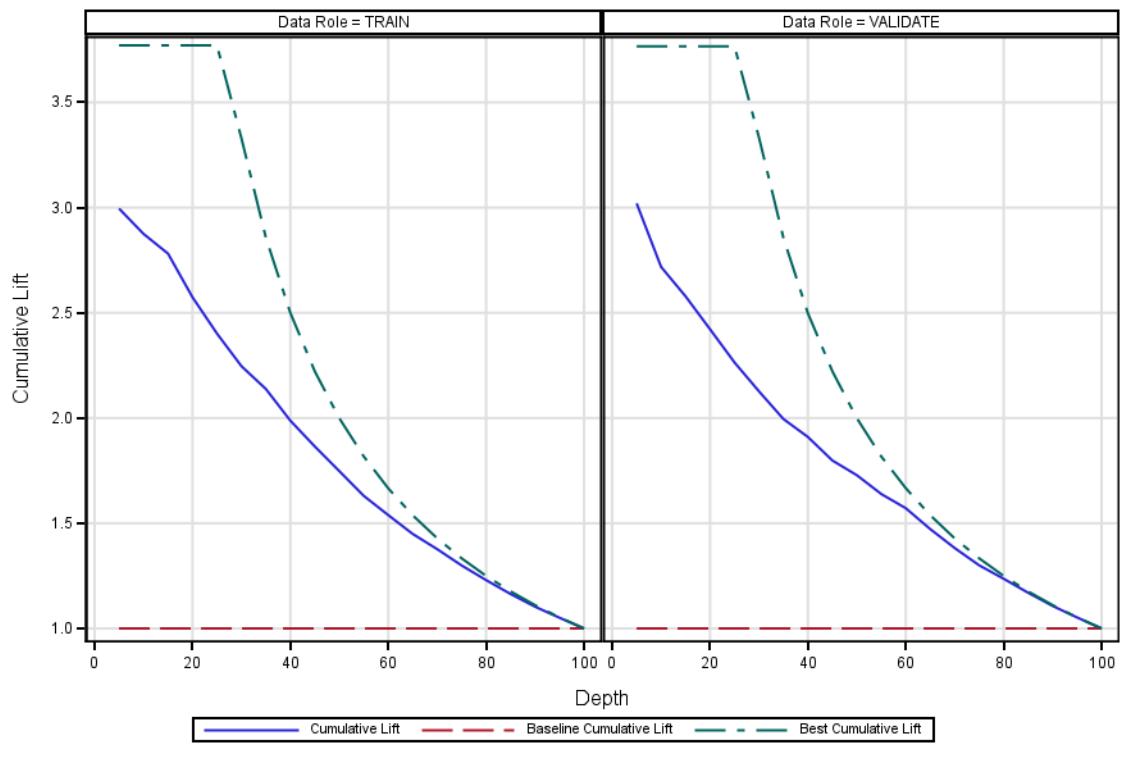
SAS Enterprise Miner Report
Node=Backward Regression
Model Iteration Plots

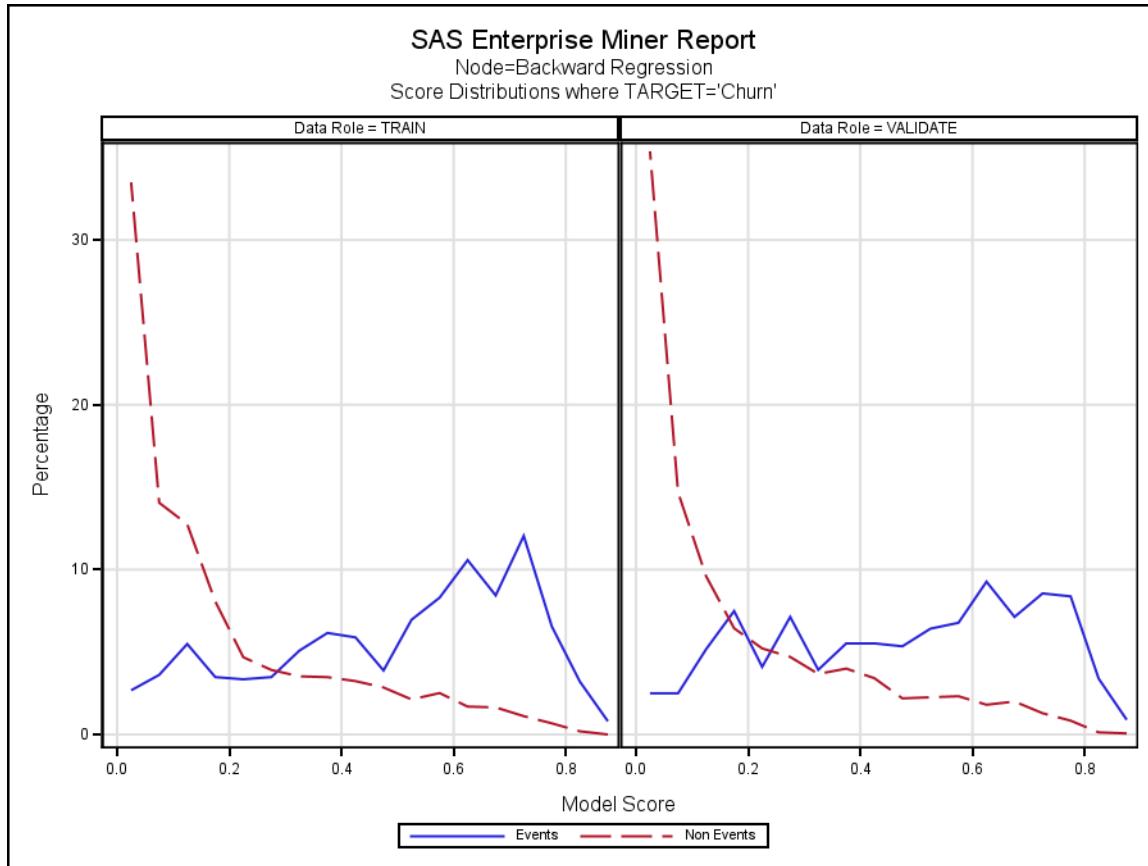
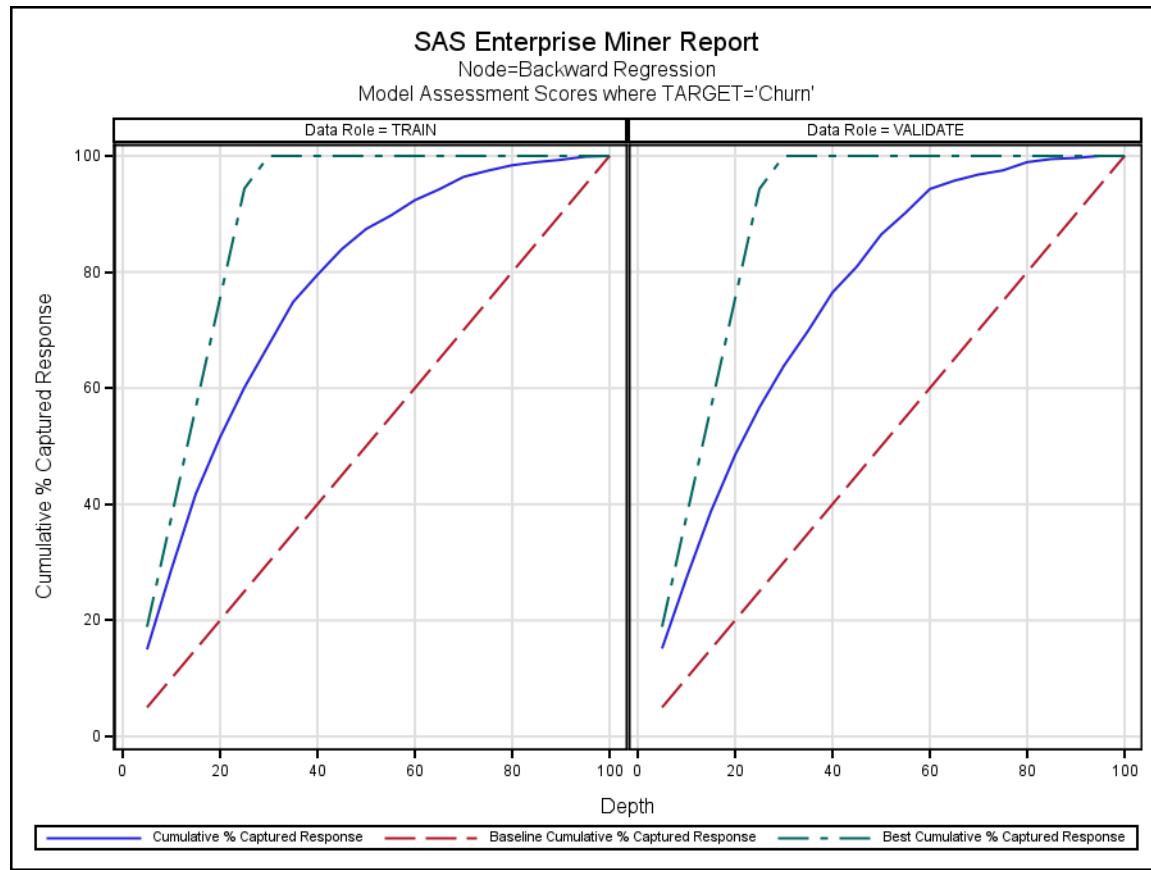


SAS Enterprise Miner Report
 Node=Backward Regression
 Model Assessment Scores where TARGET='Churn'

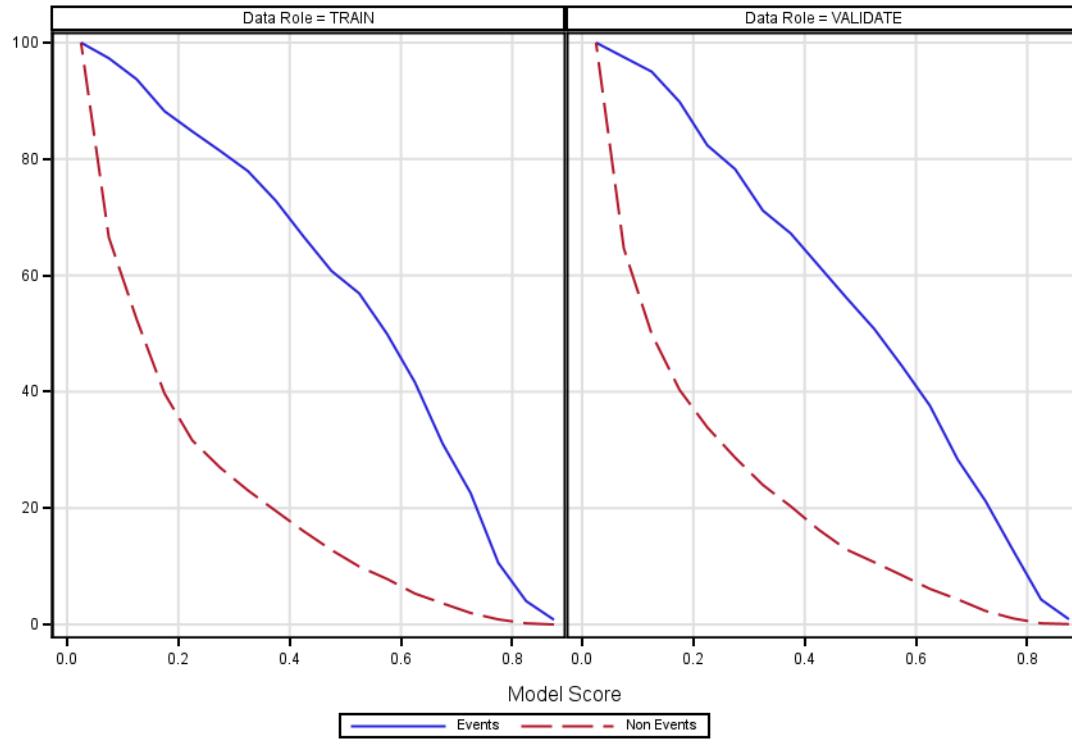


SAS Enterprise Miner Report
 Node=Backward Regression
 Model Assessment Scores where TARGET='Churn'





SAS Enterprise Miner Report
 Node=Backward Regression
 Score Distributions where TARGET='Churn'



Node=Backward Regression
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	6	0.8032	0.0000	0.803	0.000
0.80-0.85	24	3.2129	0.1932	4.016	0.193
0.75-0.80	49	6.5596	0.6763	10.576	0.870
0.70-0.75	90	12.0482	1.1111	22.624	1.981
0.65-0.70	63	8.4337	1.6425	31.058	3.623
0.60-0.65	79	10.5756	1.6908	41.633	5.314
0.55-0.60	62	8.2999	2.5121	49.933	7.826
0.50-0.55	52	6.9612	2.1256	56.894	9.952
0.45-0.50	29	3.8822	2.8502	60.776	12.802
0.40-0.45	44	5.8902	3.2367	66.667	16.039
0.35-0.40	46	6.1580	3.4783	72.825	19.517
0.30-0.35	38	5.0870	3.5266	77.912	23.043
0.25-0.30	26	3.4806	3.9130	81.392	26.957
0.20-0.25	25	3.3467	4.6860	84.739	31.643
0.15-0.20	26	3.4806	8.0676	88.220	39.710
0.10-0.15	41	5.4886	12.7536	93.708	52.464
0.05-0.10	27	3.6145	14.0580	97.323	66.522
0.00-0.05	20	2.6774	33.4783	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	5	0.89127	0.0644	0.891	0.064
0.80-0.85	19	3.38681	0.1289	4.278	0.193
0.75-0.80	47	8.37790	0.8376	12.656	1.031
0.70-0.75	48	8.55615	1.2887	21.212	2.320
0.65-0.70	40	7.13012	1.9974	28.342	4.317
0.60-0.65	52	9.26916	1.8041	37.611	6.121
0.55-0.60	38	6.77362	2.3196	44.385	8.441
0.50-0.55	36	6.41711	2.2552	50.802	10.696
0.45-0.50	30	5.34759	2.1907	56.150	12.887
0.40-0.45	31	5.52585	3.4149	61.676	16.302
0.35-0.40	31	5.52585	3.9948	67.201	20.296
0.30-0.35	22	3.92157	3.6727	71.123	23.969
0.25-0.30	40	7.13012	4.7036	78.253	28.673
0.20-0.25	23	4.09982	5.2191	82.353	33.892
0.15-0.20	42	7.48663	6.4433	89.840	40.335
0.10-0.15	29	5.16934	9.6005	95.009	49.936
0.05-0.10	14	2.49554	14.6907	97.504	64.626
0.00-0.05	14	2.49554	35.3737	100.000	100.000

SAS Enterprise Miner Report

Node=Forward Regression Summary

Node id = Reg2
 Node label = Forward Regression
 Meta path = Ids => Part => Reg2
 Notes =

Node=Forward Regression Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Regression		Force	0		PolynomialDegree	2	
AbsConvValue	-1.34078E154	-7.237006E75	GConvTimes	1		PrintDesignMatrix	N	
AbsFTime	1		GConvValue	1E-6		Rule	NONE	
AbsFValue	0		Hierarchy	CLASS		SASSPDS	N	
AbsGTime	1		InputCoding	DEVIATION		SelectionCriterion	DEFAULT	
AbsGValue	0.00001		Interactions			SelectionDefault	Y	
AbsXTime	1		LinkFunction	LOGIT		Sequential	N	
AbsXValue	1E-8		MainEffect	Y		Simple	N	
CIParam	N		MaxCPUTime	1 HOUR		SIEntry	0.05	
ConvDefaults	Y		MaxFunctionCalls	.		SISStay	0.05	
CorB	N		MaxIterations	.		Start	0	
CovB	N		MaxStep	.		StepOutput	N	
Covout	N		MinResourceUse	N		Stop	0	
Details	N		ModelDefaults	Y		SuppressIntercept	N	
Error	LOGISTIC		ModelSelection	FORWARD	NONE	SuppressOutput	N	
ExcludedVariable	REJECT		OptimizationTechnique	DEFAULT		Terms	N	
FConvTimes	1		Performance	N		TwoFactor	N	
FConvValue	0		Polynomial	N				

Node=Forward Regression Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Forward Regression Model Fit Statistics

Target=Churn Target Label=''

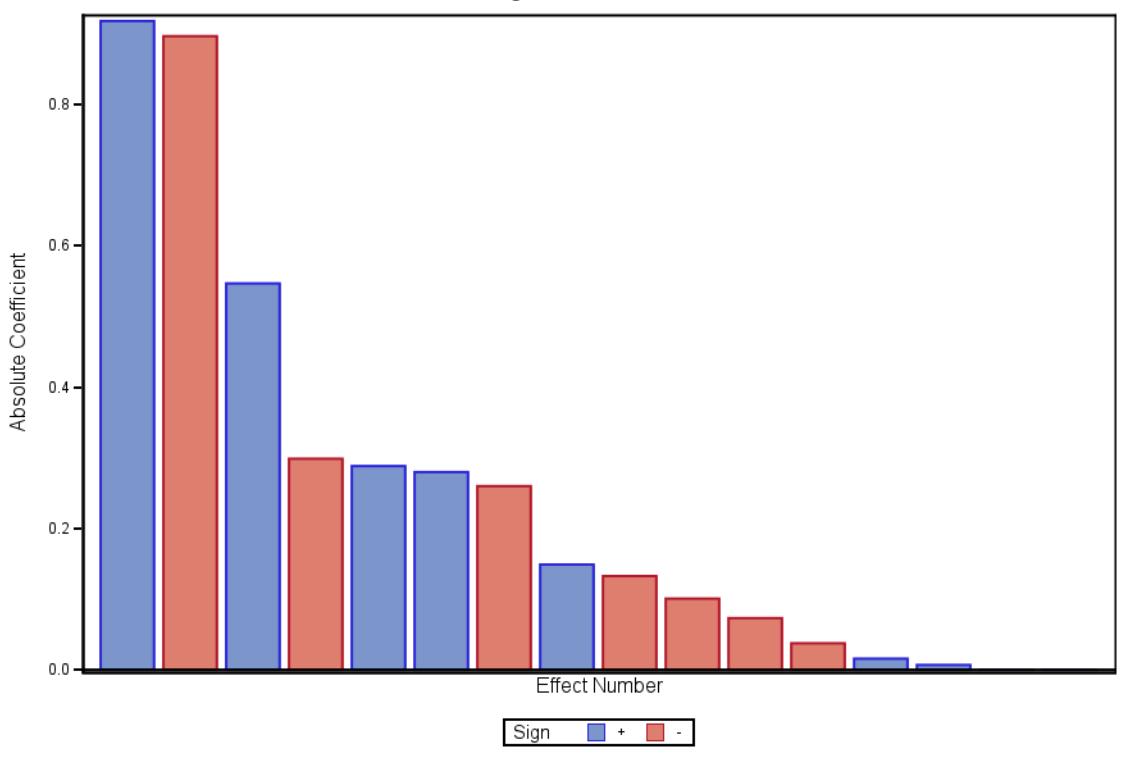
Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2370.06	.	.
Average Squared Error	0.13	0.14	0.14
Average Error Function	0.42	0.43	0.42
Degrees of Freedom for Error	2803.00	.	.
Model Degrees of Freedom	14.00	.	.

Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Divisor for ASE	5634.00	4226.00	4226.00
Error Function	2342.06	1821.12	1756.37
Final Prediction Error	0.14	.	.
Maximum Absolute Error	0.99	0.99	0.99
Mean Square Error	0.13	0.14	0.14
Sum of Frequencies	2817.00	2113.00	2113.00
Number of Estimate Weights	14.00	.	.
Root Average Sum of Squares	0.37	0.38	0.37
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.37	0.38	0.37
Schwarz's Bayesian Criterion	2453.27	.	.
Sum of Squared Errors	753.18	600.29	572.50
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Misclassification Rate	0.19	0.21	0.19

SAS Enterprise Miner Report

Node=Forward Regression
Regression Model Effects

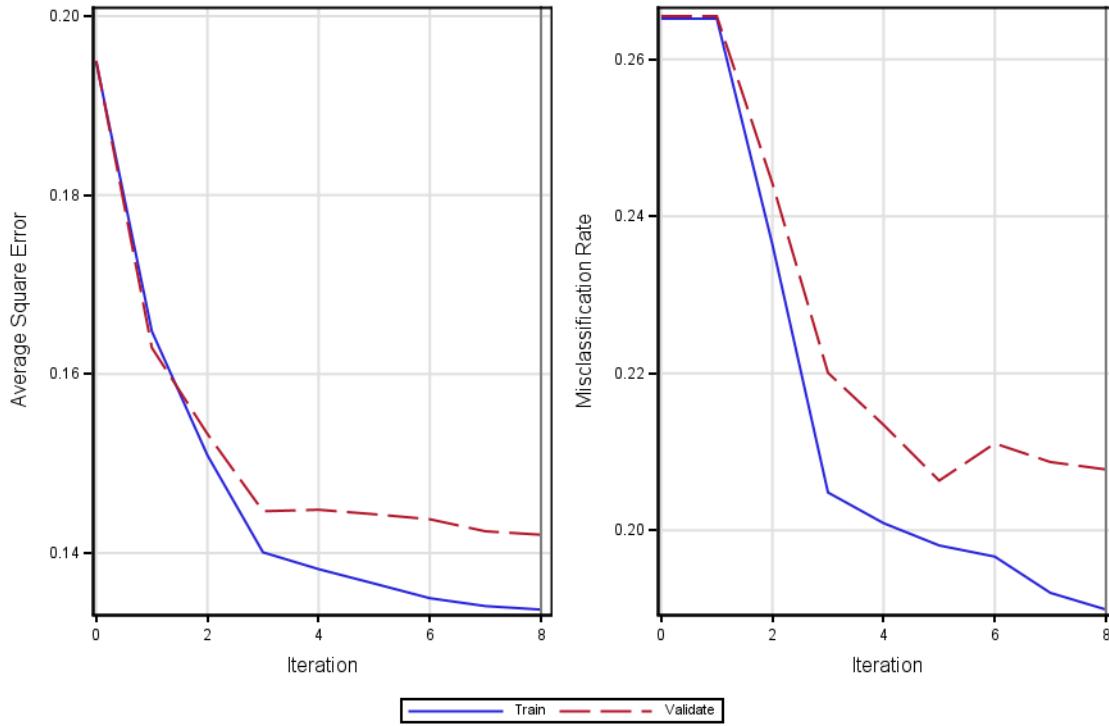


Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
1	InternetService	FIBER_OPTIC	0.91847	9.55907	0.00000	9	StreamingMovies		-0.13258	-2.2769	0.02279
2	Intercept	YES	-0.89703	-5.57513	0.00000	10	PaymentMethod	_CARD__AUTOMATIC_	-0.10068	-0.9501	0.34205
3	Contract	MONTH_TO_MONTH	0.54695	4.63874	0.00000	11	PaymentMethod	RANSFER__AUTOMATIC_	-0.07307	-0.6945	0.48735
4	MultipleLines	NO	-0.29876	-3.49219	0.00048	12	tenure		-0.03745	-10.5208	0.00000
5	OnlineSecurity	O	0.28836	4.35760	0.00001	13	Contract	ONE_YEAR	0.01570	0.1297	0.89678
6	PaymentMethod	ONIC_CHECK	0.27982	3.40392	0.00066	14	InternetService	DSL	0.00677	0.0697	0.94441
7	PaperlessBilling	NO	-0.25999	-4.41812	0.00001	15	OnlineSecurity	O_INTERNET_SERVICE	0.00000	.	.
8	MultipleLines	NO_PHONE_SERVICE	0.14889	1.13727	0.25543	16	StreamingMovies	_INTERNET_SERVICE	0.00000	.	.

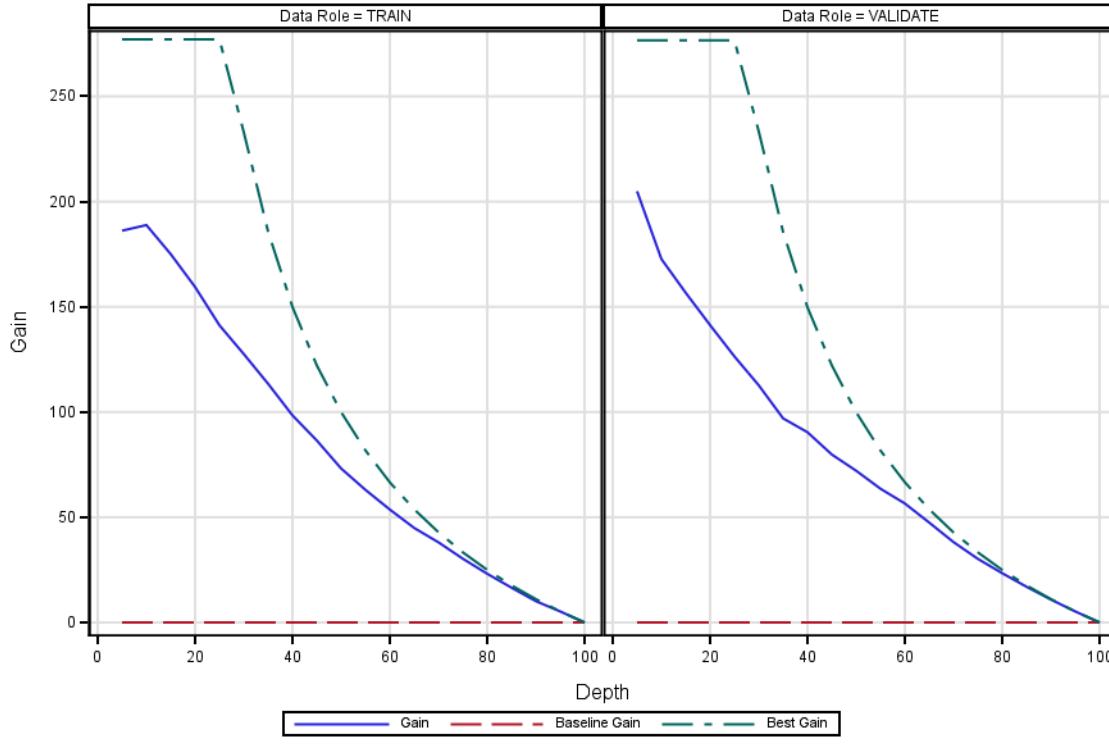
SAS Enterprise Miner Report
Node=Forward Regression
Model Iteration Plots

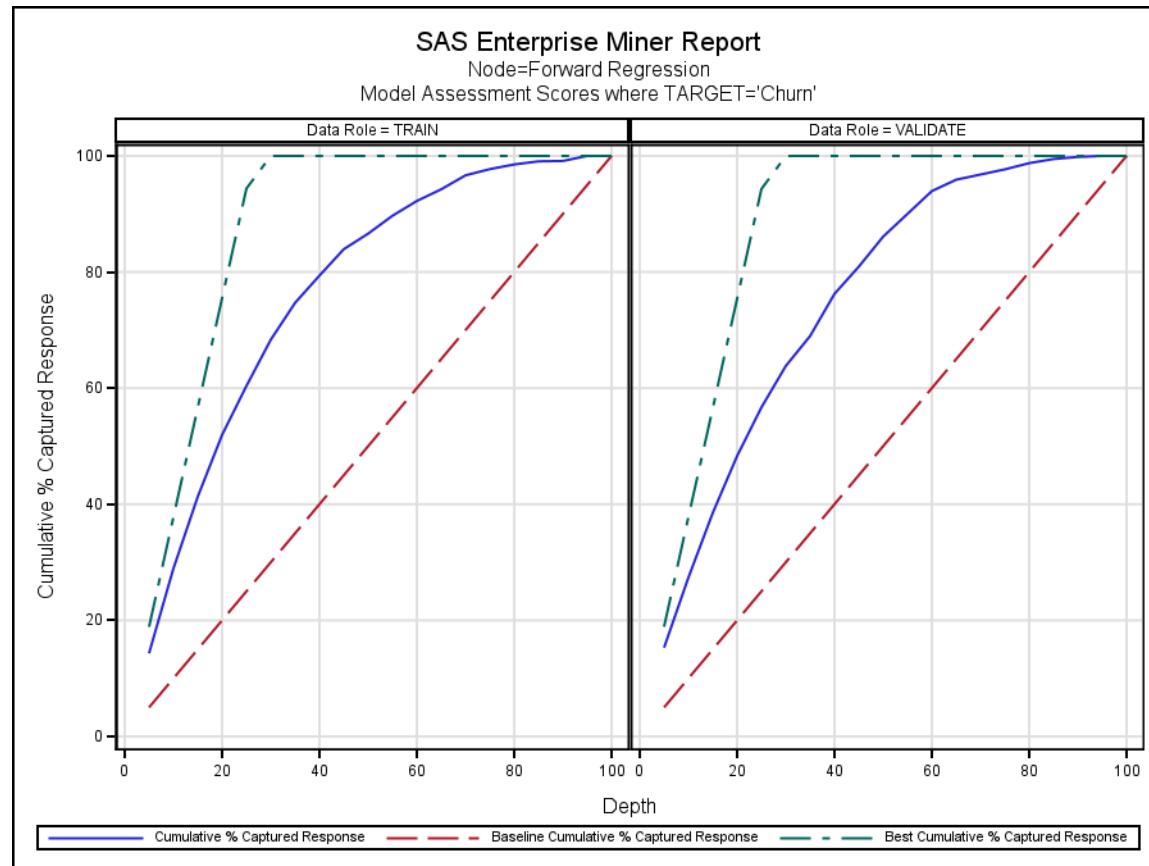
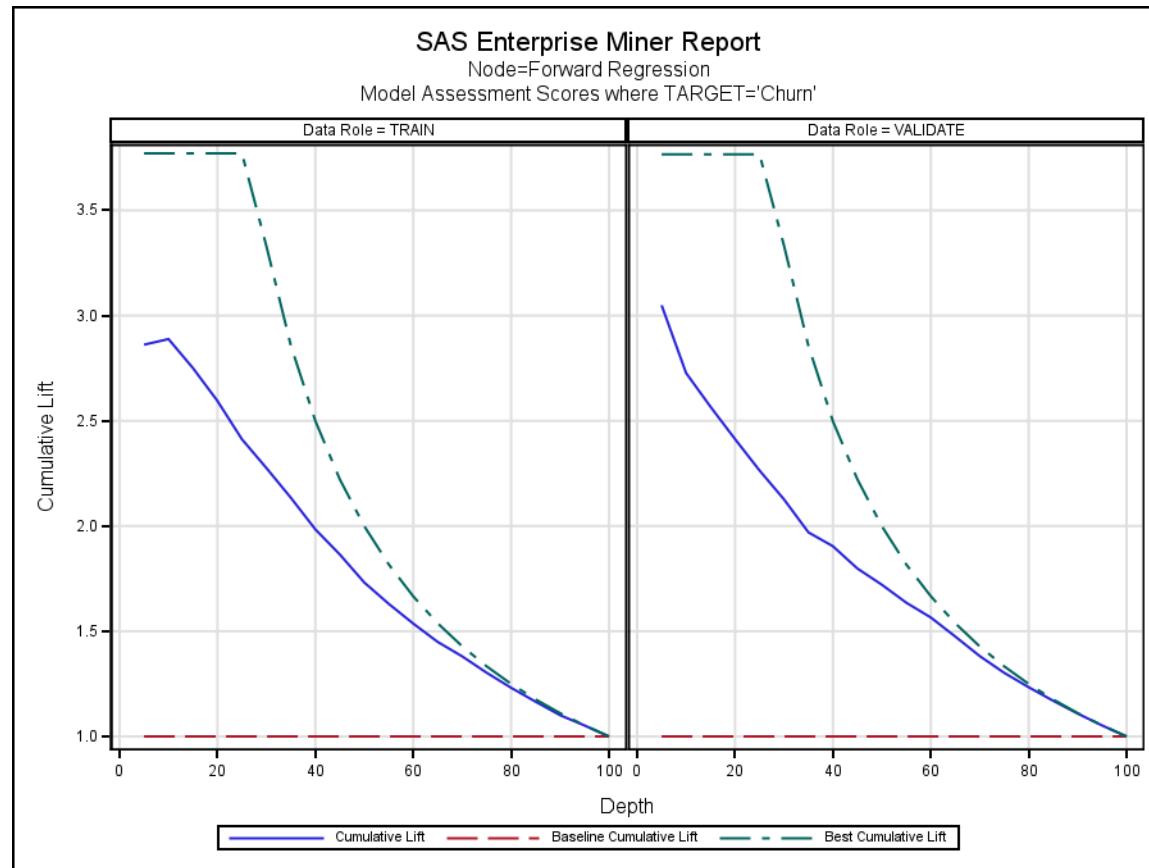
32

SAS Enterprise Miner Report
Node=Forward Regression
Model Iteration Plots

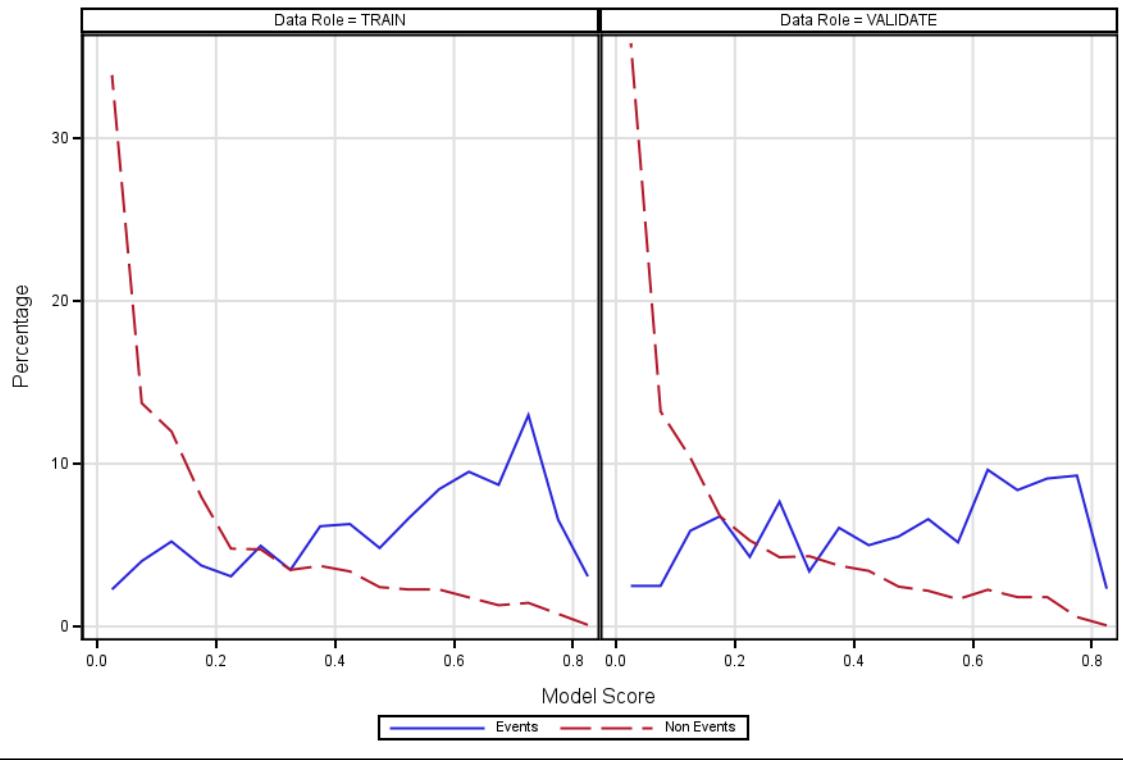


SAS Enterprise Miner Report
Node=Forward Regression
Model Assessment Scores where TARGET='Churn'

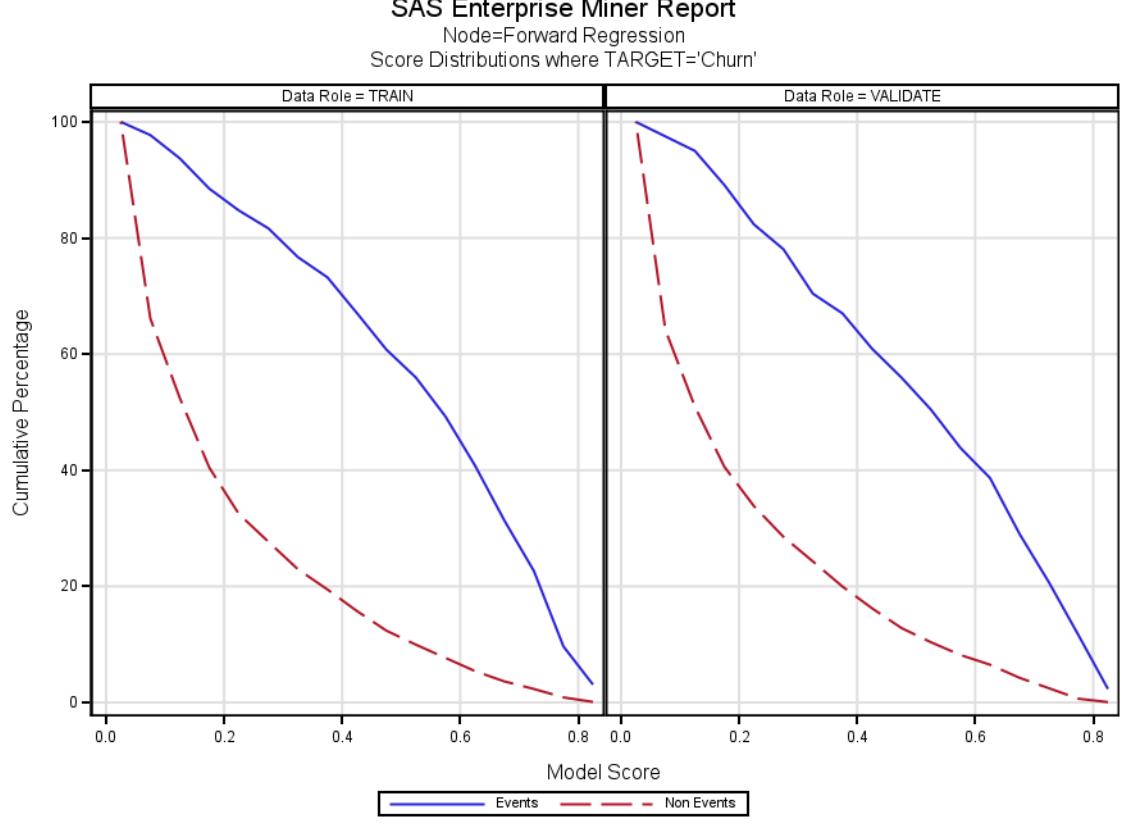




SAS Enterprise Miner Report
 Node=Forward Regression
 Score Distributions where TARGET='Churn'



SAS Enterprise Miner Report
 Node=Forward Regression
 Score Distributions where TARGET='Churn'



**Node=Forward Regression
 Score Distributions**

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	23	3.0790	0.0966	3.079	0.097
0.75-0.80	49	6.5596	0.7729	9.639	0.870
0.70-0.75	97	12.9853	1.4493	22.624	2.319
0.65-0.70	65	8.7015	1.3043	31.325	3.623
0.60-0.65	71	9.5047	1.7874	40.830	5.411
0.55-0.60	63	8.4337	2.2705	49.264	7.681
0.50-0.55	50	6.6934	2.2705	55.957	9.952
0.45-0.50	36	4.8193	2.4155	60.776	12.367
0.40-0.45	47	6.2918	3.3816	67.068	15.749
0.35-0.40	46	6.1580	3.7198	73.226	19.469
0.30-0.35	26	3.4806	3.4783	76.707	22.947
0.25-0.30	37	4.9531	4.7343	81.660	27.681
0.20-0.25	23	3.0790	4.7826	84.739	32.464
0.15-0.20	28	3.7483	7.9710	88.487	40.435
0.10-0.15	39	5.2209	11.9807	93.708	52.415
0.05-0.10	30	4.0161	13.7198	97.724	66.135
0.00-0.05	17	2.2758	33.8647	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	13	2.31729	0.0644	2.317	0.064
0.75-0.80	52	9.26916	0.5799	11.586	0.644
0.70-0.75	51	9.09091	1.8041	20.677	2.448
0.65-0.70	47	8.37790	1.8041	29.055	4.253
0.60-0.65	54	9.62567	2.2552	38.681	6.508
0.55-0.60	29	5.16934	1.6753	43.850	8.183
0.50-0.55	37	6.59537	2.1907	50.446	10.374
0.45-0.50	31	5.52585	2.4485	55.971	12.822
0.40-0.45	28	4.99109	3.4149	60.963	16.237
0.35-0.40	34	6.06061	3.7371	67.023	19.974
0.30-0.35	19	3.38681	4.3170	70.410	24.291
0.25-0.30	43	7.66488	4.2526	78.075	28.544
0.20-0.25	24	4.27807	5.2835	82.353	33.827
0.15-0.20	38	6.77362	6.7655	89.127	40.593
0.10-0.15	33	5.88235	10.3737	95.009	50.966
0.05-0.10	14	2.49554	13.2088	97.504	64.175
0.00-0.05	14	2.49554	35.8247	100.000	100.000

SAS Enterprise Miner Report

Node=Exhaustive Regression Summary

Node id = Reg
 Node label = Exhaustive Regression
 Meta path = Ids => Part => Reg
 Notes =

Node=Exhaustive Regression Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Regression		Force	0		PolynomialDegree	2	
AbsConvValue	-1.34078E154	-7.237006E75	GConvTimes	1		PrintDesignMatrix	N	
AbsFTime	1		GConvValue	1E-6		Rule	NONE	
AbsFValue	0		Hierarchy	CLASS		SASSPDS	N	
AbsGTime	1		InputCoding	DEVIATION		SelectionCriterion	DEFAULT	
AbsGValue	0.00001		Interactions			SelectionDefault	Y	
AbsXTime	1		LinkFunction	LOGIT		Sequential	N	
AbsXValue	1E-8		MainEffect	Y		Simple	N	
CIParam	N		MaxCPUTime	1 HOUR		SIEntry	0.05	
ConvDefaults	Y		MaxFunctionCalls	.		SISStay	0.05	
CorB	N		MaxIterations	.		Start	0	
CovB	N		MaxStep	.		StepOutput	N	
Covout	N		MinResourceUse	N		Stop	0	
Details	N		ModelDefaults	Y		SuppressIntercept	N	
Error	LOGISTIC		ModelSelection	NONE		SuppressOutput	N	
ExcludedVariable	REJECT		OptimizationTechnique	DEFAULT		Terms	N	
FConvTimes	1		Performance	N		TwoFactor	N	
FConvValue	0		Polynomial	N				

Node=Exhaustive Regression Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Exhaustive Regression Model Fit Statistics

Target=Churn Target Label=''

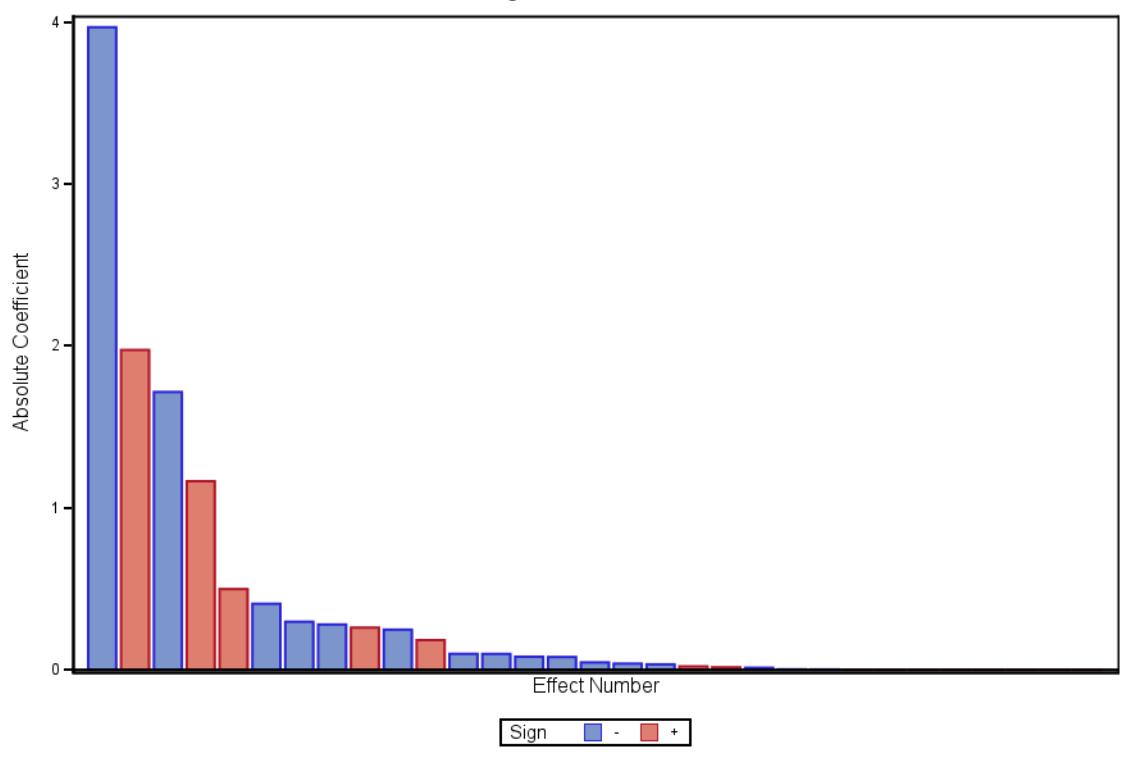
Label of Statistic	Train	Validation	Test
Akaike's Information Criterion	2378.39	.	.
Average Squared Error	0.13	0.14	0.13
Average Error Function	0.41	0.43	0.41
Degrees of Freedom for Error	2793.00	.	.
Model Degrees of Freedom	24.00	.	.

Target=Churn Target Label=''

Label of Statistic	Train	Validation	Test
Total Degrees of Freedom	2817.00	.	.
Divisor for ASE	5634.00	4226.00	4226.00
Error Function	2330.39	1810.77	1738.96
Final Prediction Error	0.13	.	.
Maximum Absolute Error	0.99	0.99	1.00
Mean Square Error	0.13	0.14	0.13
Sum of Frequencies	2817.00	2113.00	2113.00
Number of Estimate Weights	24.00	.	.
Root Average Sum of Squares	0.36	0.38	0.37
Root Final Prediction Error	0.37	.	.
Root Mean Squared Error	0.37	0.38	0.37
Schwarz's Bayesian Criterion	2521.03	.	.
Sum of Squared Errors	747.73	596.45	565.23
Sum of Case Weights Times Freq	5634.00	4226.00	4226.00
Misclassification Rate	0.19	0.21	0.19

SAS Enterprise Miner Report

Node=Exhaustive Regression
Regression Model Effects

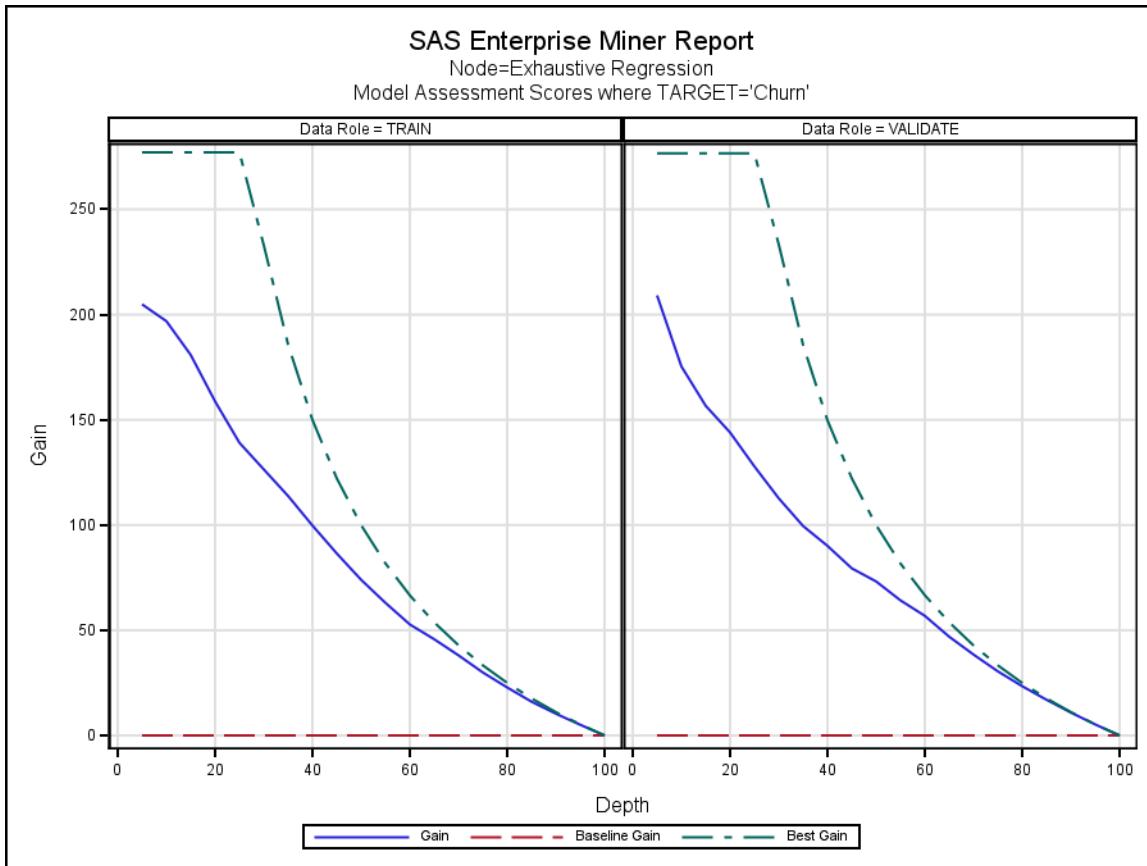


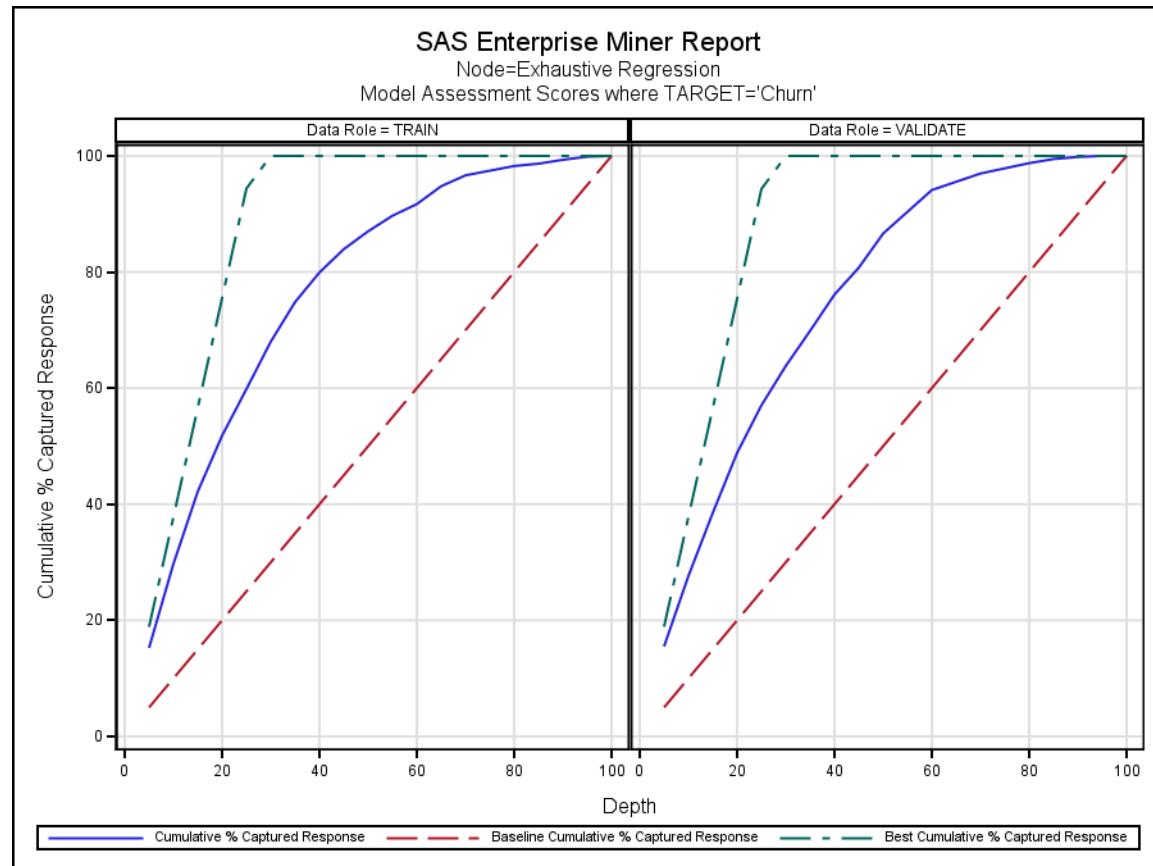
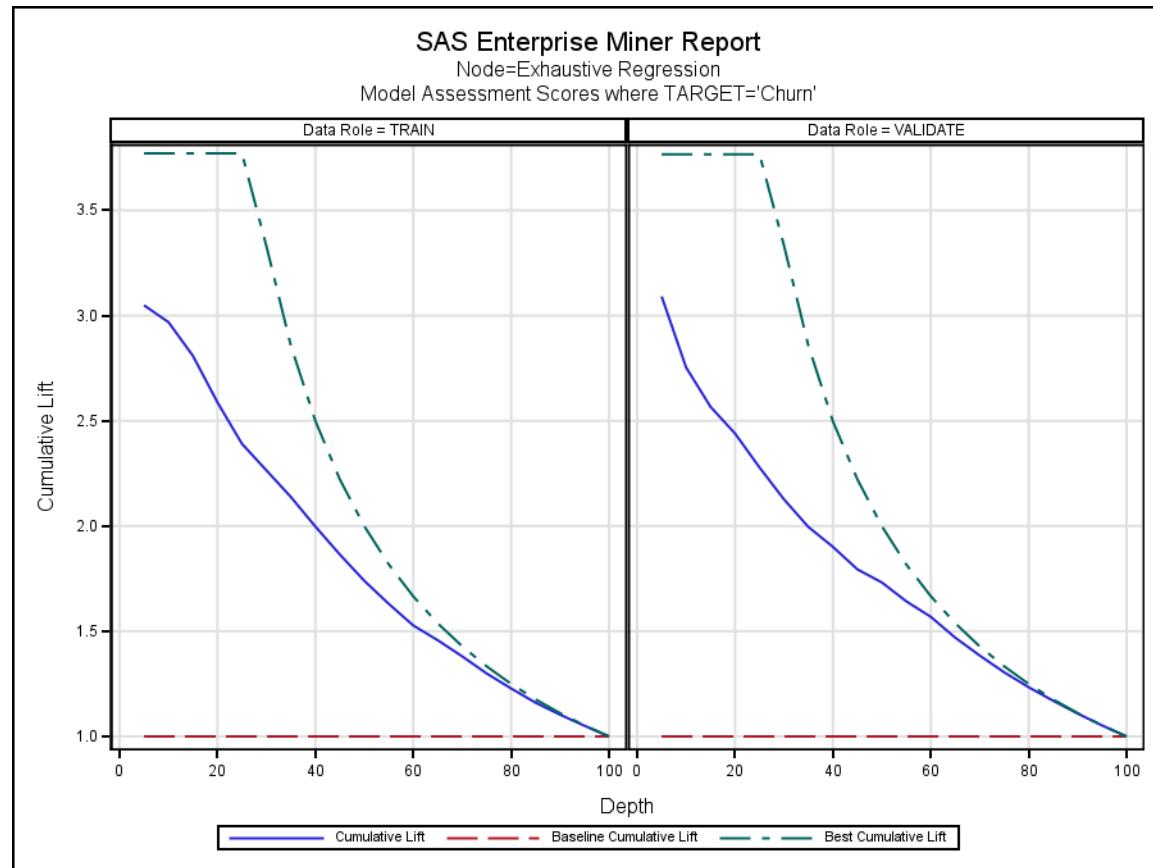
Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
1	DeviceProtection	INTERNET_SERVICE	-3.96951	-1.20930	0.22655	17	MonthlyCharges		-0.037614	-0.72689	0.46729
2	DeviceProtection		1.97567	1.30526	0.19180	18	gender	FEMALE	-0.033425	-0.64713	0.51754
3	InternetService	DSL	-1.71591	-1.32003	0.18682	19	TechSupport	NO	0.020592	0.14083	0.88800
4	Intercept	YES	1.16465	0.42143	0.67344	20	Contract	ONE_YEAR	0.015192	0.12502	0.90050
5	Contract	MONTH_TO_MONTH	0.49846	4.09276	0.00004	21	OnlineBackup	NO	-0.012214	-0.08541	0.93193
6	MultipleLines	NO_PHONE_SERVICE	-0.40740	-0.51563	0.60611	22	Dependents	NO	-0.002329	-0.03282	0.97382
7	StreamingMovies		-0.29643	-1.11346	0.26551	23	Partner	NO	-0.001719	-0.02773	0.97788
8	StreamingTV	NO	-0.27930	-1.05337	0.29217	24	TotalCharges		0.000111	1.02282	0.30639
9	PaymentMethod	ONIC_CHECK	0.26013	3.13572	0.00171	25	InternetService	FIBER_OPTIC	0.000000	.	.

SAS Enterprise Miner Report
Node=Exhaustive Regression
Regression Model Effects

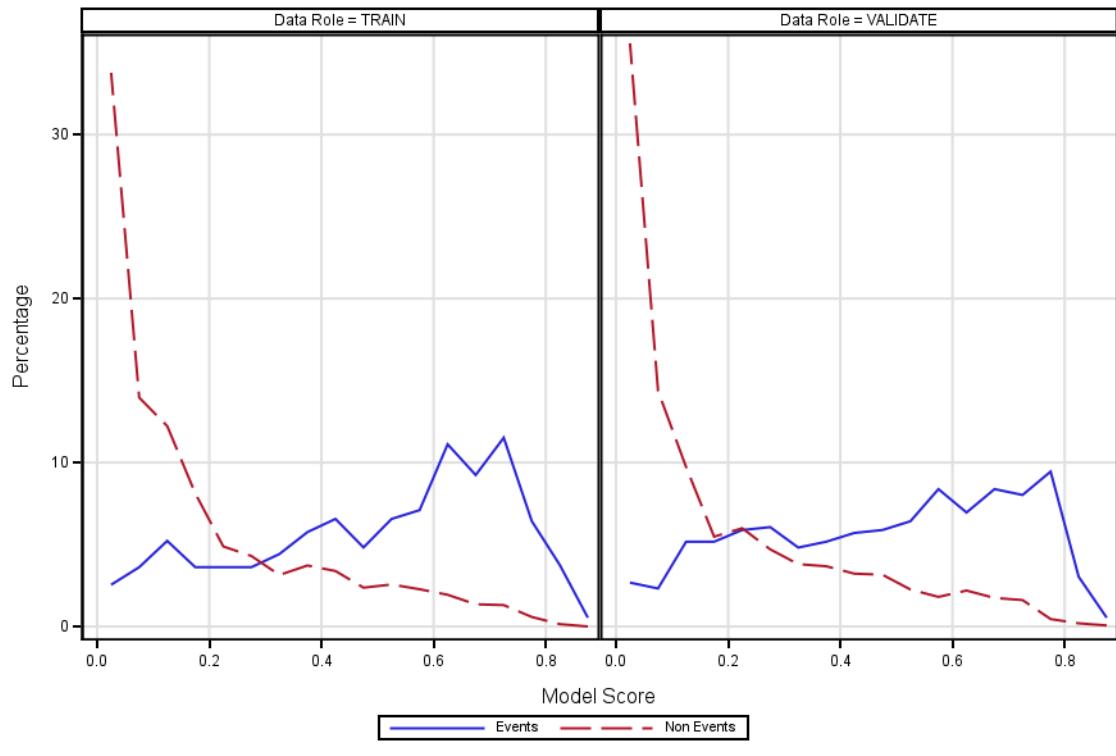
38

Effect Number	Variable	Level	Coefficient	T-value	P Value	Effect Number	Variable	Level	Coefficient	T-value	P Value
10	PaperlessBilling	NO	-0.24764	-4.17002	0.00003	26	OnlineBackup	NO_INTERNET_SERVICE	0.000000	.	.
11	OnlineSecurity	O	0.18287	1.27179	0.20345	27	OnlineSecurity	O_INTERNET_SERVICE	0.000000	.	.
12	SeniorCitizen	0	-0.09806	-1.41876	0.15597	28	PhoneService	NO	0.000000	.	.
13	MultipleLines	NO	-0.09755	-0.35537	0.72231	29	StreamingMovies	_INTERNET_SERVICE	0.000000	.	.
14	PaymentMethod	_CARD_AUTOMATIC_	-0.08029	-0.75494	0.45029	30	StreamingTV	NO_INTERNET_SERVICE	0.000000	.	.
15	PaymentMethod	RANSFER_AUTOMATIC_	-0.07874	-0.74462	0.45650	31	TechSupport	NO_INTERNET_SERVICE	0.000000	.	.
16	tenure		-0.04516	-4.77139	0.00000

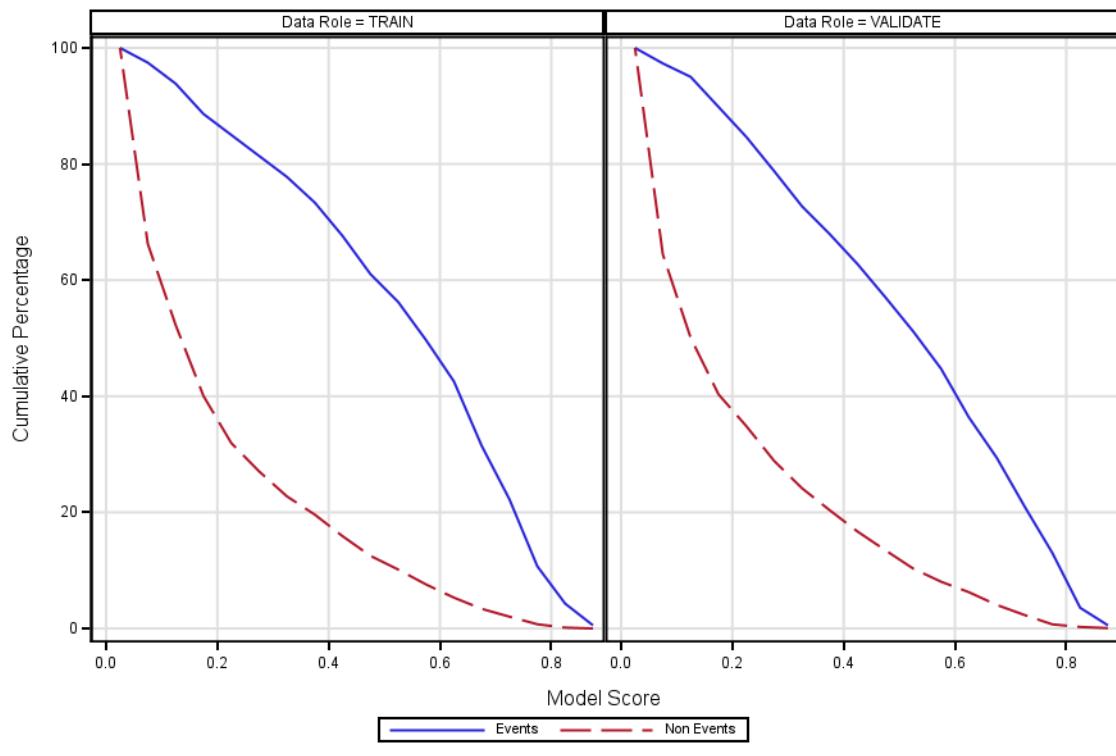




SAS Enterprise Miner Report
 Node=Exhaustive Regression
 Score Distributions where TARGET='Churn'



SAS Enterprise Miner Report
 Node=Exhaustive Regression
 Score Distributions where TARGET='Churn'



**Node=Exhaustive Regression
 Score Distributions**

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	4	0.5355	0.0000	0.535	0.000
0.80-0.85	28	3.7483	0.1449	4.284	0.145
0.75-0.80	48	6.4257	0.5797	10.710	0.725
0.70-0.75	86	11.5127	1.3043	22.222	2.029
0.65-0.70	69	9.2369	1.3527	31.459	3.382
0.60-0.65	83	11.1111	1.9324	42.570	5.314
0.55-0.60	53	7.0950	2.2705	49.665	7.585
0.50-0.55	49	6.5596	2.5604	56.225	10.145
0.45-0.50	36	4.8193	2.3671	61.044	12.512
0.40-0.45	49	6.5596	3.3816	67.604	15.894
0.35-0.40	43	5.7564	3.7198	73.360	19.614
0.30-0.35	33	4.4177	3.1401	77.778	22.754
0.25-0.30	27	3.6145	4.2995	81.392	27.053
0.20-0.25	27	3.6145	4.8792	85.007	31.932
0.15-0.20	27	3.6145	8.1159	88.621	40.048
0.10-0.15	39	5.2209	12.2222	93.842	52.271
0.05-0.10	27	3.6145	13.9614	97.456	66.232
0.00-0.05	19	2.5435	33.7681	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	3	0.53476	0.0644	0.535	0.064
0.80-0.85	17	3.03030	0.1933	3.565	0.258
0.75-0.80	53	9.44742	0.4510	13.012	0.709
0.70-0.75	45	8.02139	1.6108	21.034	2.320
0.65-0.70	47	8.37790	1.7397	29.412	4.059
0.60-0.65	39	6.95187	2.1907	36.364	6.250
0.55-0.60	47	8.37790	1.8041	44.742	8.054
0.50-0.55	36	6.41711	2.2552	51.159	10.309
0.45-0.50	33	5.88235	3.1572	57.041	13.466
0.40-0.45	32	5.70410	3.2216	62.745	16.688
0.35-0.40	29	5.16934	3.6727	67.914	20.361
0.30-0.35	27	4.81283	3.8015	72.727	24.162
0.25-0.30	34	6.06061	4.7036	78.788	28.866
0.20-0.25	33	5.88235	5.9923	84.670	34.858
0.15-0.20	29	5.16934	5.4768	89.840	40.335
0.10-0.15	29	5.16934	9.7294	95.009	50.064
0.05-0.10	13	2.31729	14.3686	97.326	64.433
0.00-0.05	15	2.67380	35.5670	100.000	100.000

SAS Enterprise Miner Report

Node=Decision Tree B3D6 Summary

Node id = Tree4
 Node label = Decision Tree B3D6
 Meta path = Ids => Part => Tree4
 Notes =

Node=Decision Tree B3D6 Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DecisionTree		Kass	Y		Pred	N	
AVG	Y		KassApply	BEFORE		Predict	Y	
AssessMeasure	PROFIT/LOSS		LeafSize	5		ProfitLoss	NONE	
AssessPercentage	0.25		Leafid	Y		RASE	N	
CV	N		Maxbranch	3	2	SampleMethod	RANDOM	
CVNIter	10		Maxdepth	6		SampleSeed	12345	
CVRepeat	1		MinCatSize	5		SampleSize	10000	
CVSeed	12345		MissingValue	USEINSEARCH		ShowNodeld	Y	
ClassColorBy	PERCENTCORRECT		NSubtree	1		ShowValid	Y	
Count	Y		NodeRole	SEGMENT		SigLevel	0.2	
CreateSample	DEFAULT		NodeSample	20000		SplitPrecision	4	
Criterion	DEFAULT		NominalCriterion	PROBCHISQ		Splitsize	.	
Depth	Y		Nrules	5		Subtree	ASSESSMENT	
Dummy	N		Nsurrs	0		Target	ALL	
Exhaustive	5000		NumInputs	1		ToolType	MODEL	
Freeze	N		NumSingleImp	5		TrainMode	BATCH	
ImportModel	N		ObsImportance	N		UseDecision	N	
ImportedTreeData			OrdinalCriterion	ENTROPY		UseMultipleTarget	N	
Inputs	N		PercentCorrect	N		UsePriors	N	
IntColorBy	AVG		Performance	DISK		UseVarOnce	N	
IntervalCriterion	PROBF		Precision	4		VarSelection	Y	

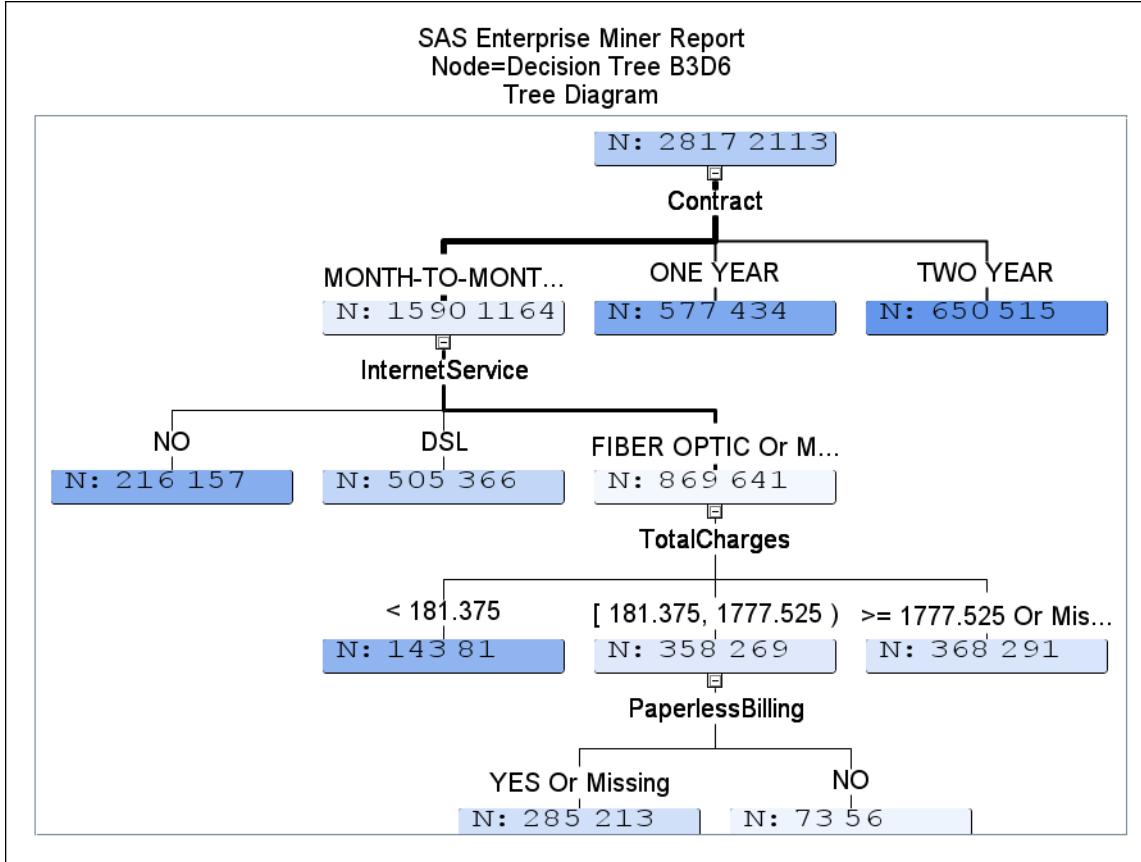
Node=Decision Tree B3D6 Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

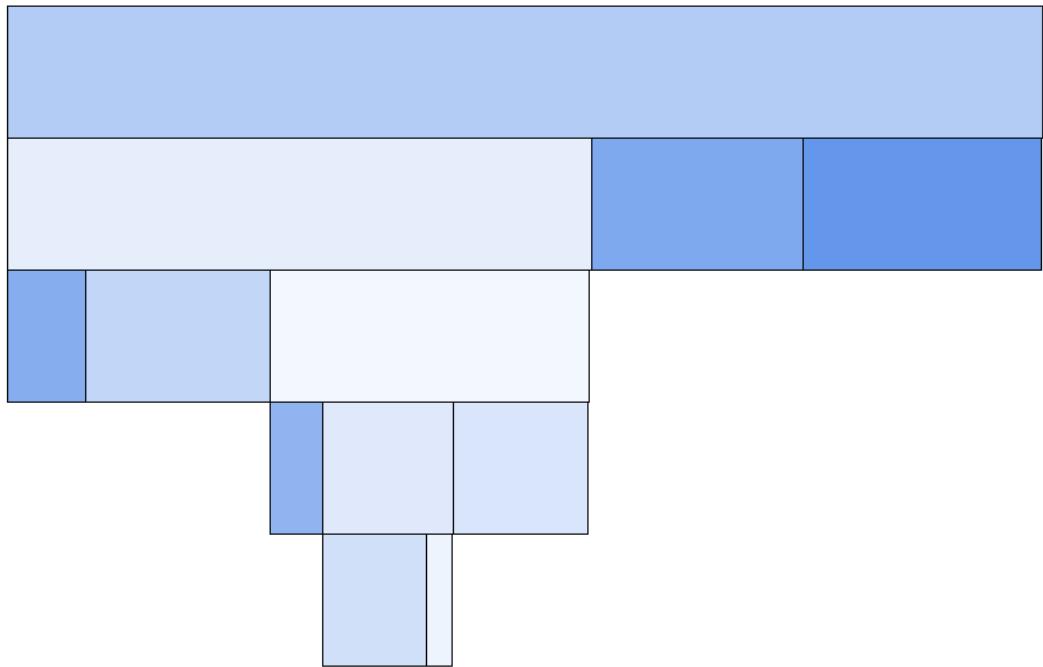
Node=Decision Tree B3D6 Model Fit Statistics

Target=Churn Target Label=''

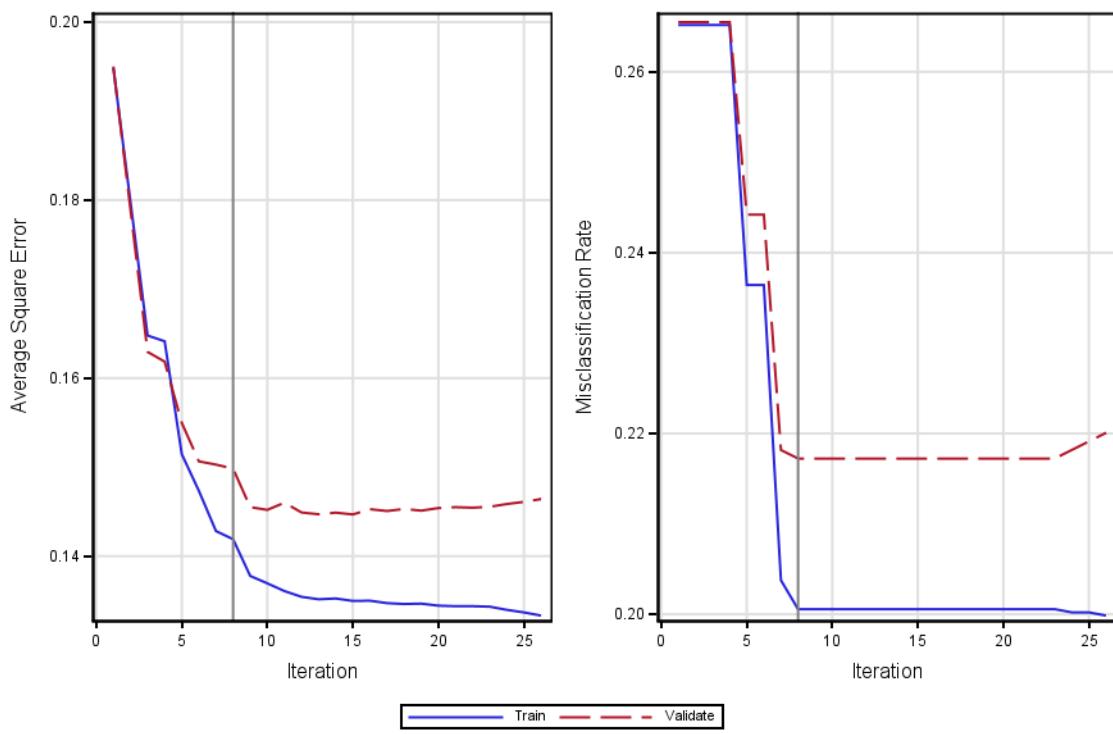
Label of Statistic	Train	Validation	Test
Sum of Frequencies	2817.00	2113.00	2113.00
Misclassification Rate	0.20	0.22	0.21
Maximum Absolute Error	0.97	0.97	0.97
Sum of Squared Errors	799.46	633.19	607.43
Average Squared Error	0.14	0.15	0.14
Root Average Squared Error	0.38	0.39	0.38
Divisor for ASE	5634.00	4226.00	4226.00
Total Degrees of Freedom	2817.00	.	.



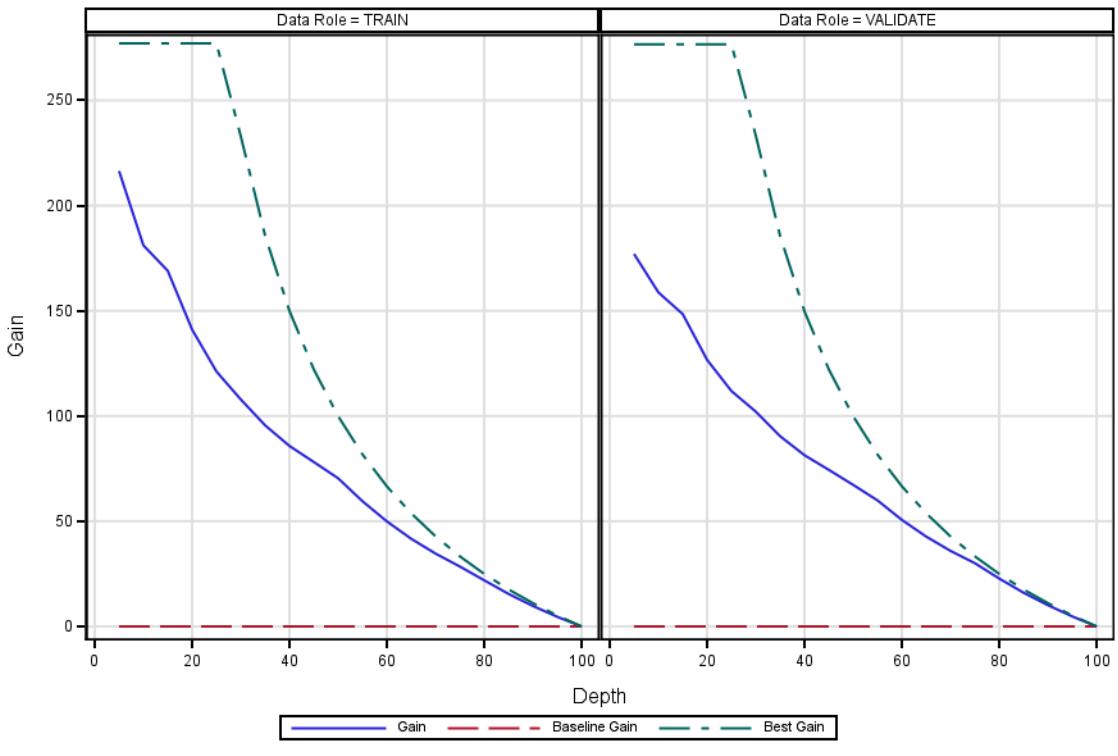
SAS Enterprise Miner Report
Node=Decision Tree B3D6
Treemap



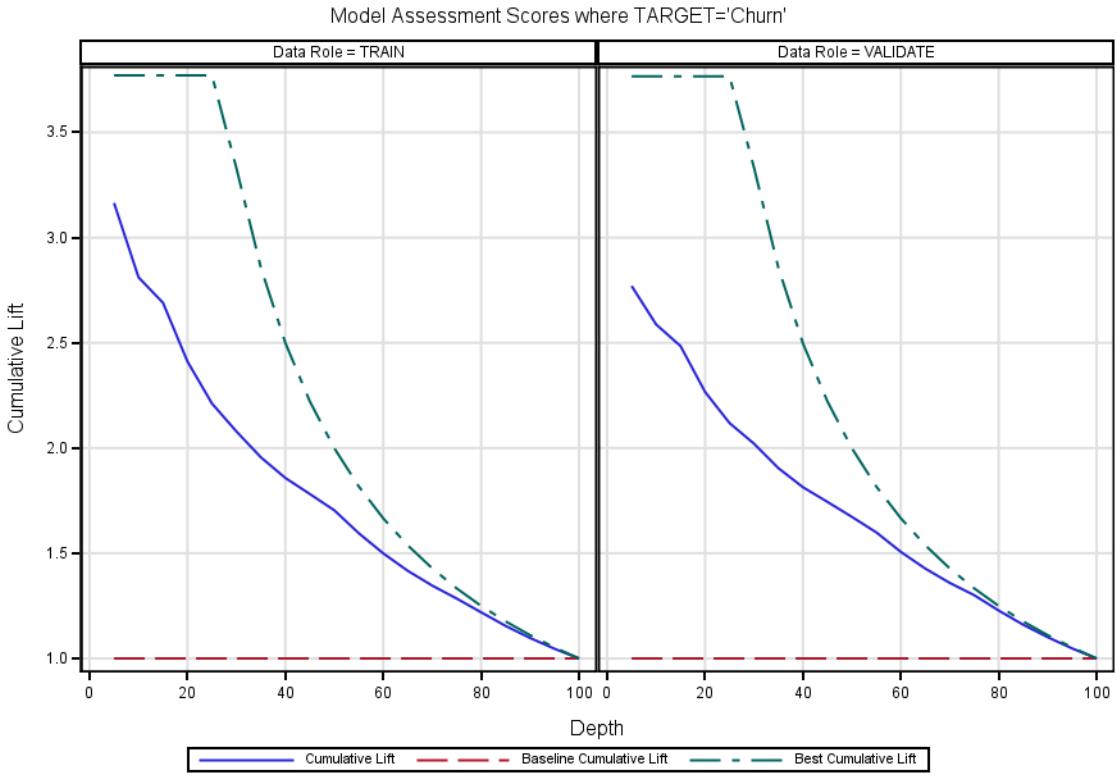
SAS Enterprise Miner Report
Node=Decision Tree B3D6
Model Iteration Plots

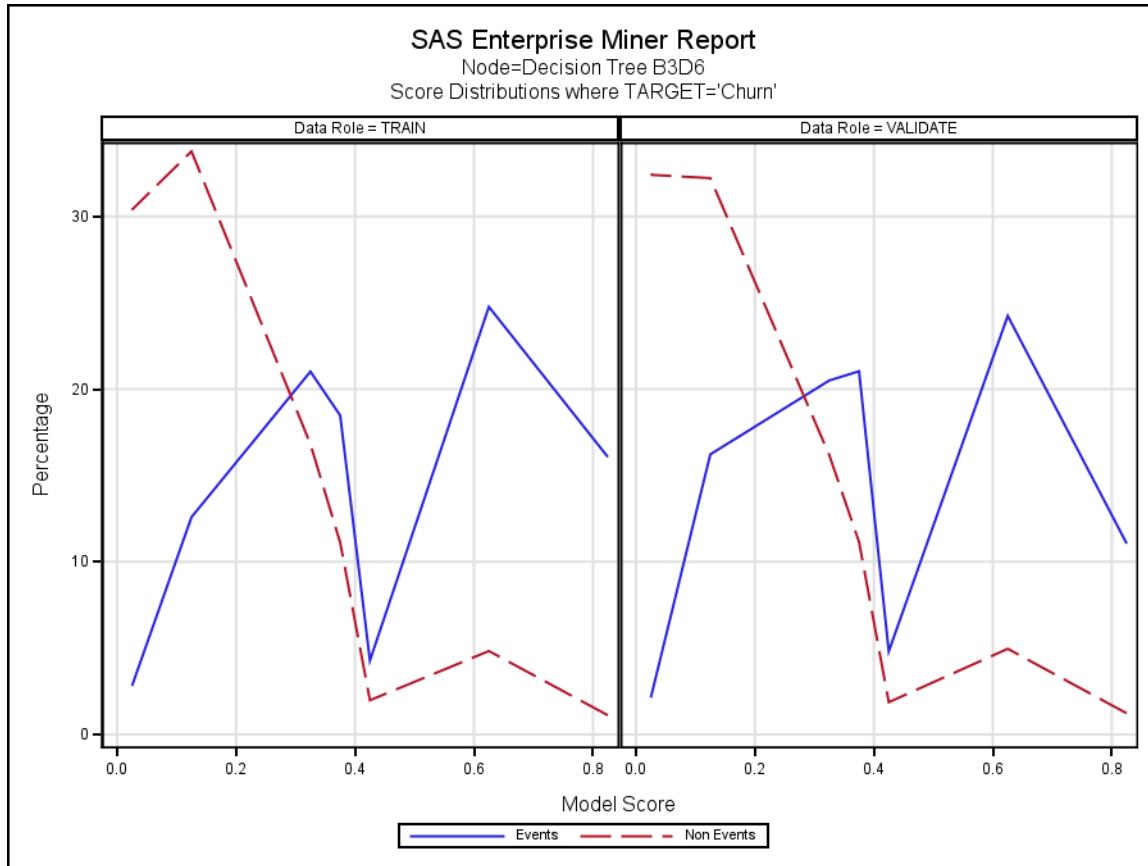
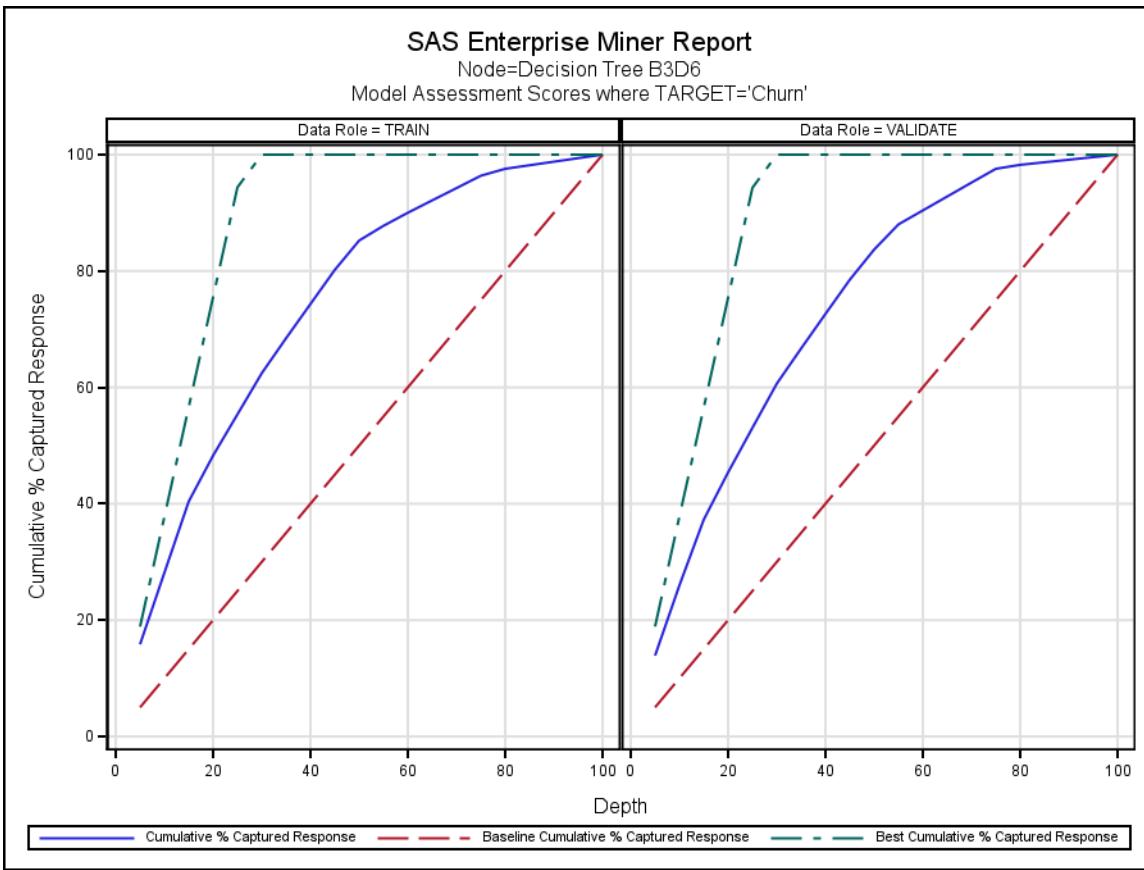


SAS Enterprise Miner Report
 Node=Decision Tree B3D6
 Model Assessment Scores where TARGET='Churn'

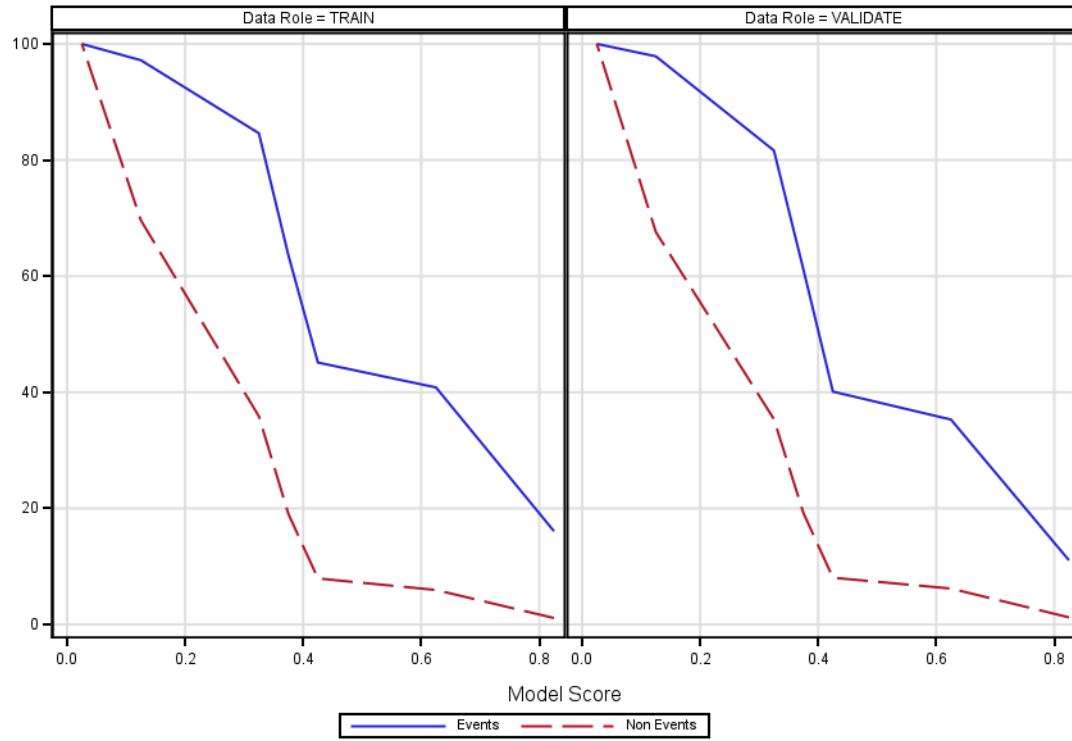


SAS Enterprise Miner Report
 Node=Decision Tree B3D6
 Model Assessment Scores where TARGET='Churn'





SAS Enterprise Miner Report
 Node=Decision Tree B3D6
 Score Distributions where TARGET='Churn'



Node=Decision Tree B3D6
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	120	16.0643	1.1111	16.064	1.111
0.60-0.65	185	24.7657	4.8309	40.830	5.942
0.40-0.45	32	4.2838	1.9807	45.114	7.923
0.35-0.40	138	18.4739	11.1111	63.588	19.034
0.30-0.35	157	21.0174	16.8116	84.605	35.845
0.10-0.15	94	12.5837	33.7681	97.189	69.614
0.00-0.05	21	2.8112	30.3865	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.80-0.85	62	11.0517	1.2242	11.052	1.224
0.60-0.65	136	24.2424	4.9613	35.294	6.186
0.40-0.45	27	4.8128	1.8686	40.107	8.054
0.35-0.40	118	21.0339	11.1469	61.141	19.201
0.30-0.35	115	20.4991	16.1727	81.640	35.374
0.10-0.15	91	16.2210	32.2165	97.861	67.590
0.00-0.05	12	2.1390	32.4098	100.000	100.000

SAS Enterprise Miner Report

Node=Decision Tree B2D2 Summary

Node id = Tree3
 Node label = Decision Tree B2D2
 Meta path = Ids => Part => Tree3
 Notes =

Node=Decision Tree B2D2 Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DecisionTree		Kass	Y		Pred	N	
AVG	Y		KassApply	BEFORE		Predict	Y	
AssessMeasure	PROFIT/LOSS		LeafSize	5		ProfitLoss	NONE	
AssessPercentage	0.25		Leafid	Y		RASE	N	
CV	N		Maxbranch	2		SampleMethod	RANDOM	
CVNIter	10		Maxdepth	2	6	SampleSeed	12345	
CVRepeat	1		MinCatSize	5		SampleSize	10000	
CVSeed	12345		MissingValue	USEINSEARCH		ShowNodeld	Y	
ClassColorBy	PERCENTCORRECT		NSubtree	1		ShowValid	Y	
Count	Y		NodeRole	SEGMENT		SigLevel	0.2	
CreateSample	DEFAULT		NodeSample	20000		SplitPrecision	4	
Criterion	DEFAULT		NominalCriterion	PROBCHISQ		Splitsize	.	
Depth	Y		Nrules	5		Subtree	ASSESSMENT	
Dummy	N		Nsurrs	0		Target	ALL	
Exhaustive	5000		NumInputs	1		ToolType	MODEL	
Freeze	N		NumSingleImp	5		TrainMode	BATCH	
ImportModel	N		ObsImportance	N		UseDecision	N	
ImportedTreeData			OrdinalCriterion	ENTROPY		UseMultipleTarget	N	
Inputs	N		PercentCorrect	N		UsePriors	N	
IntColorBy	AVG		Performance	DISK		UseVarOnce	N	
IntervalCriterion	PROBF		Precision	4		VarSelection	Y	

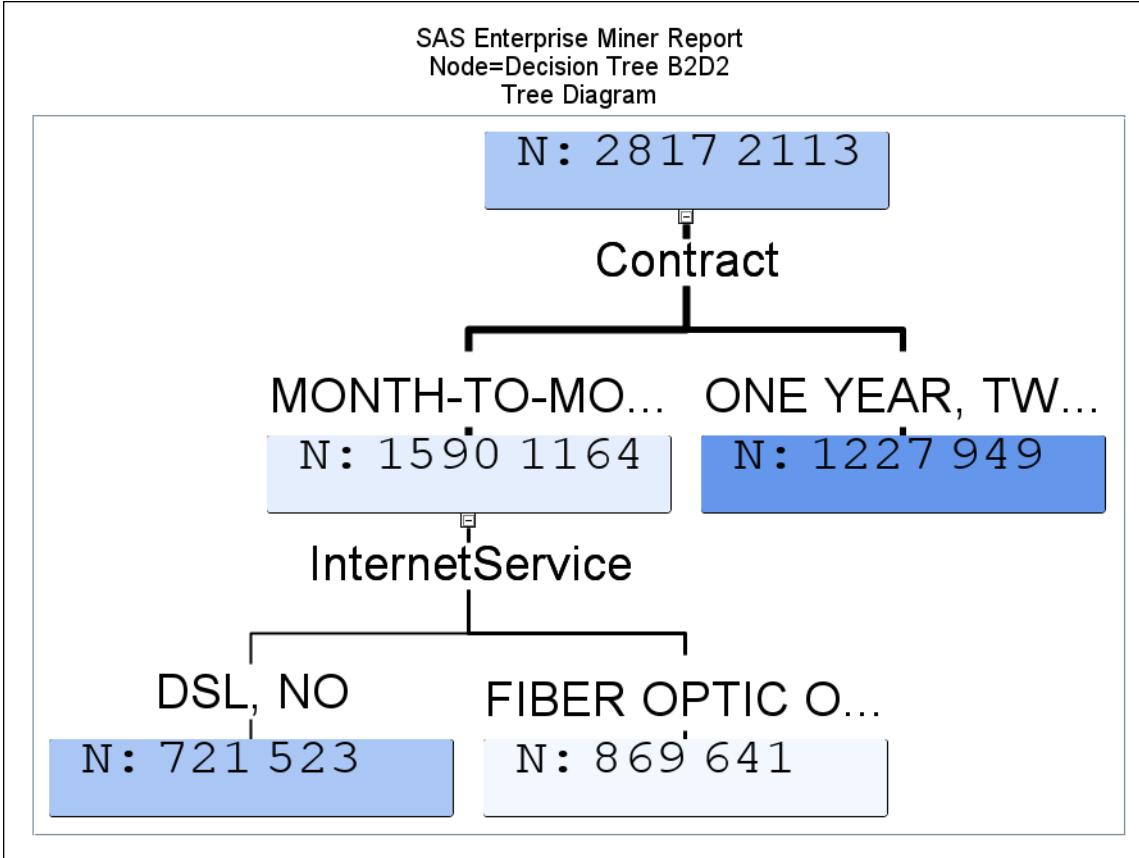
Node=Decision Tree B2D2 Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

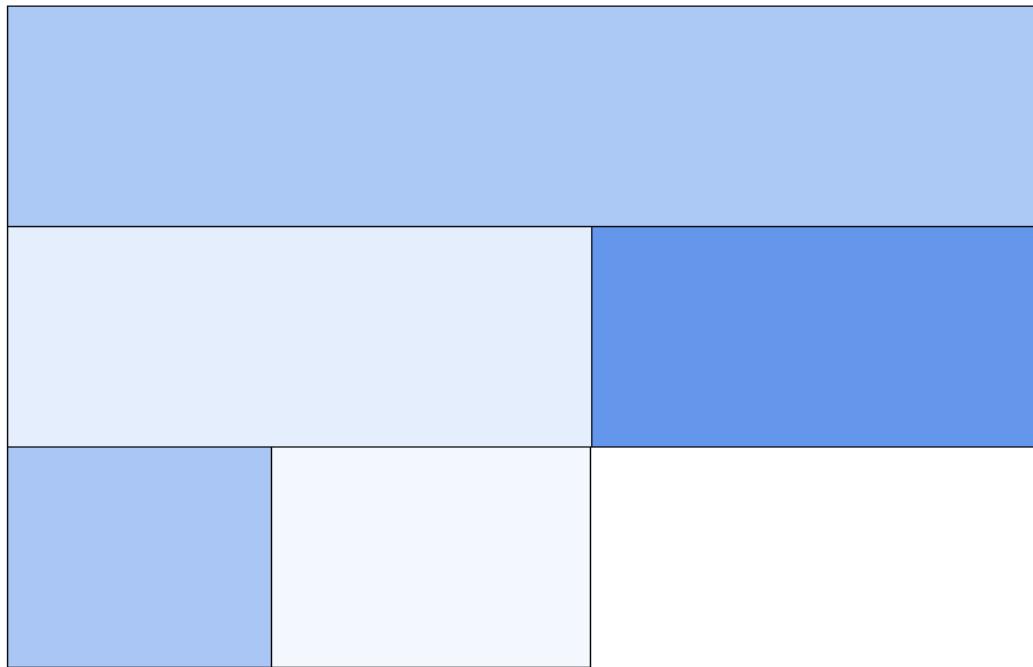
Node=Decision Tree B2D2 Model Fit Statistics

Target=Churn Target Label=''

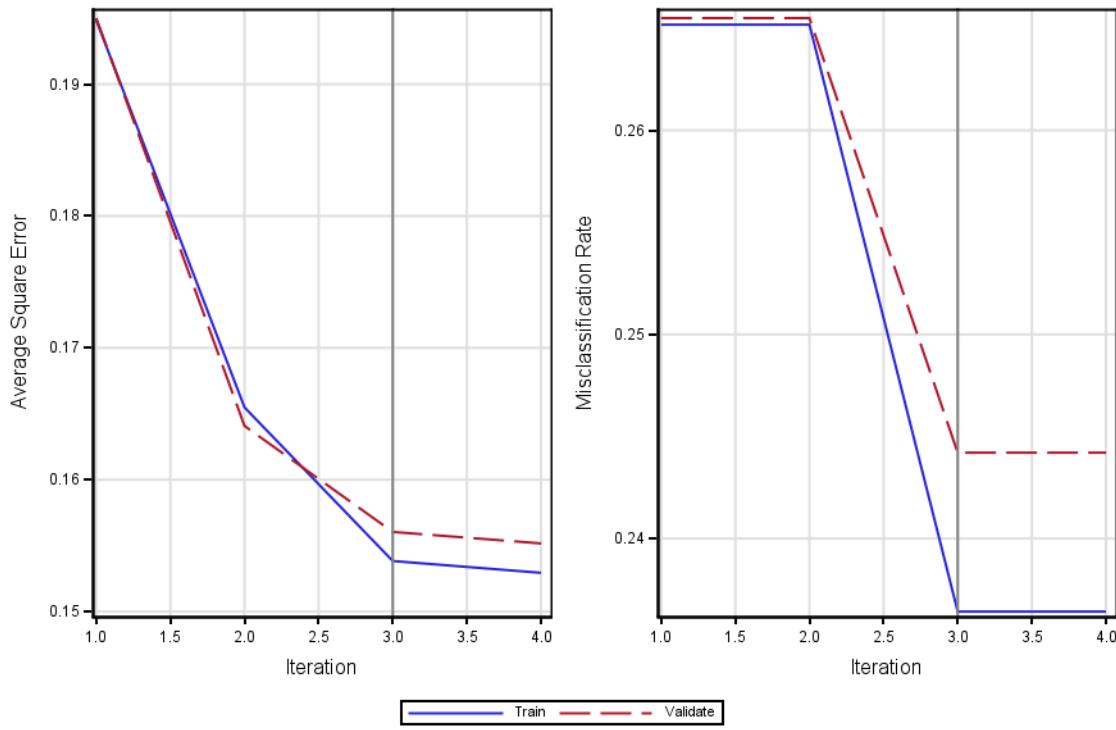
Label of Statistic	Train	Validation	Test
Sum of Frequencies	2817.00	2113.00	2113.00
Misclassification Rate	0.24	0.24	0.23
Maximum Absolute Error	0.93	0.93	0.93
Sum of Squared Errors	866.70	659.43	637.78
Average Squared Error	0.15	0.16	0.15
Root Average Squared Error	0.39	0.40	0.39
Divisor for ASE	5634.00	4226.00	4226.00
Total Degrees of Freedom	2817.00	.	.

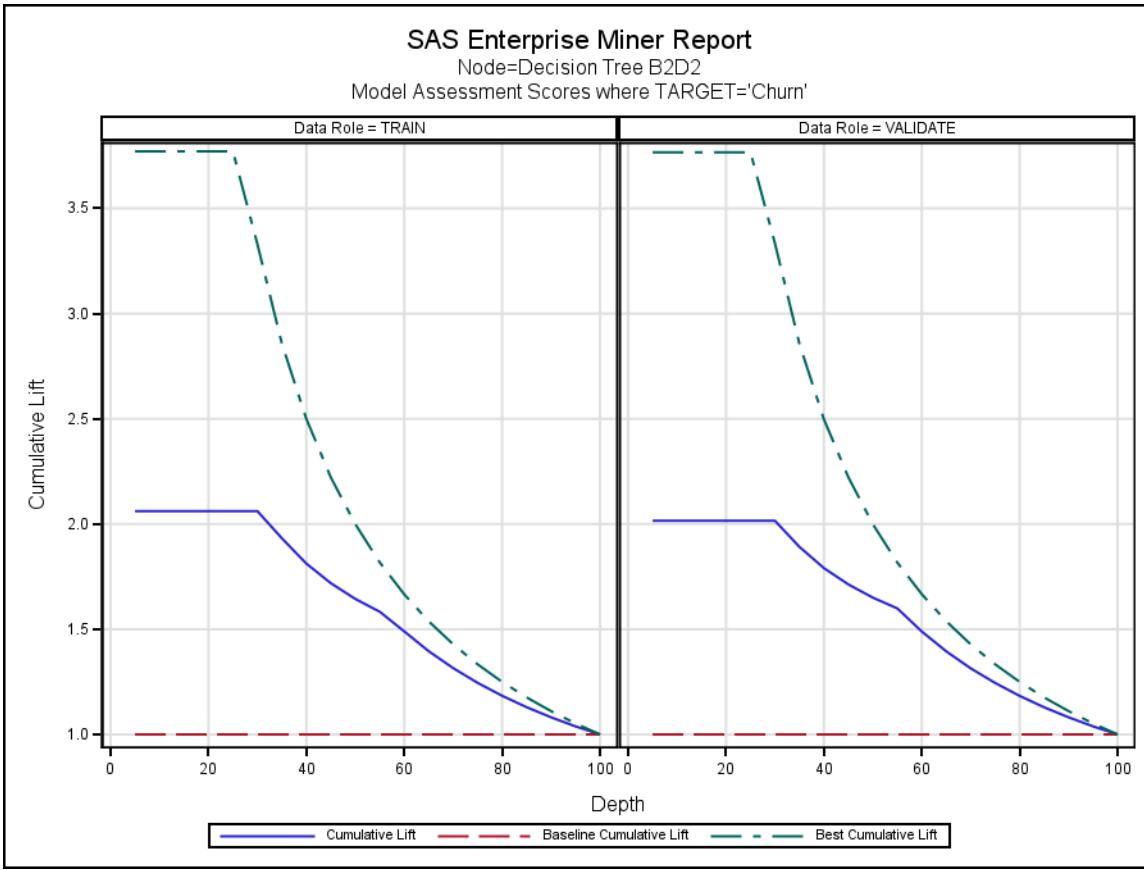
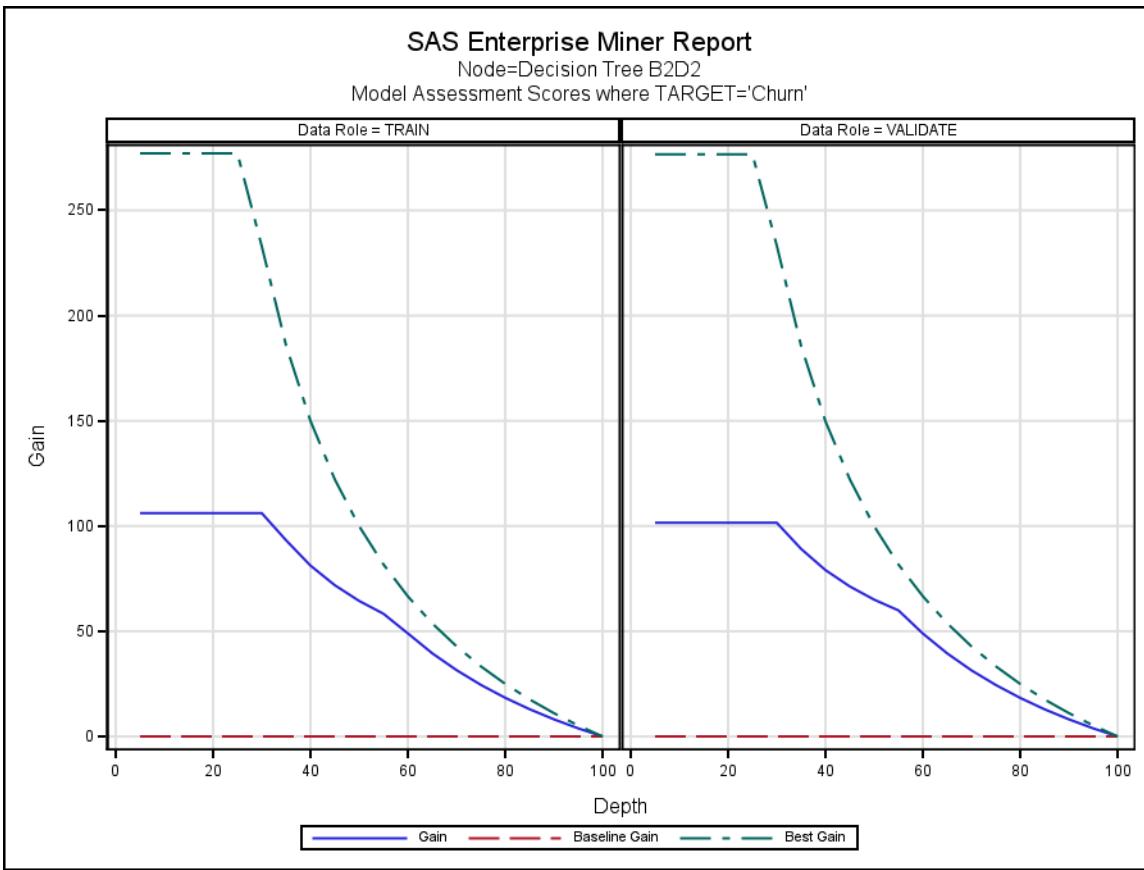


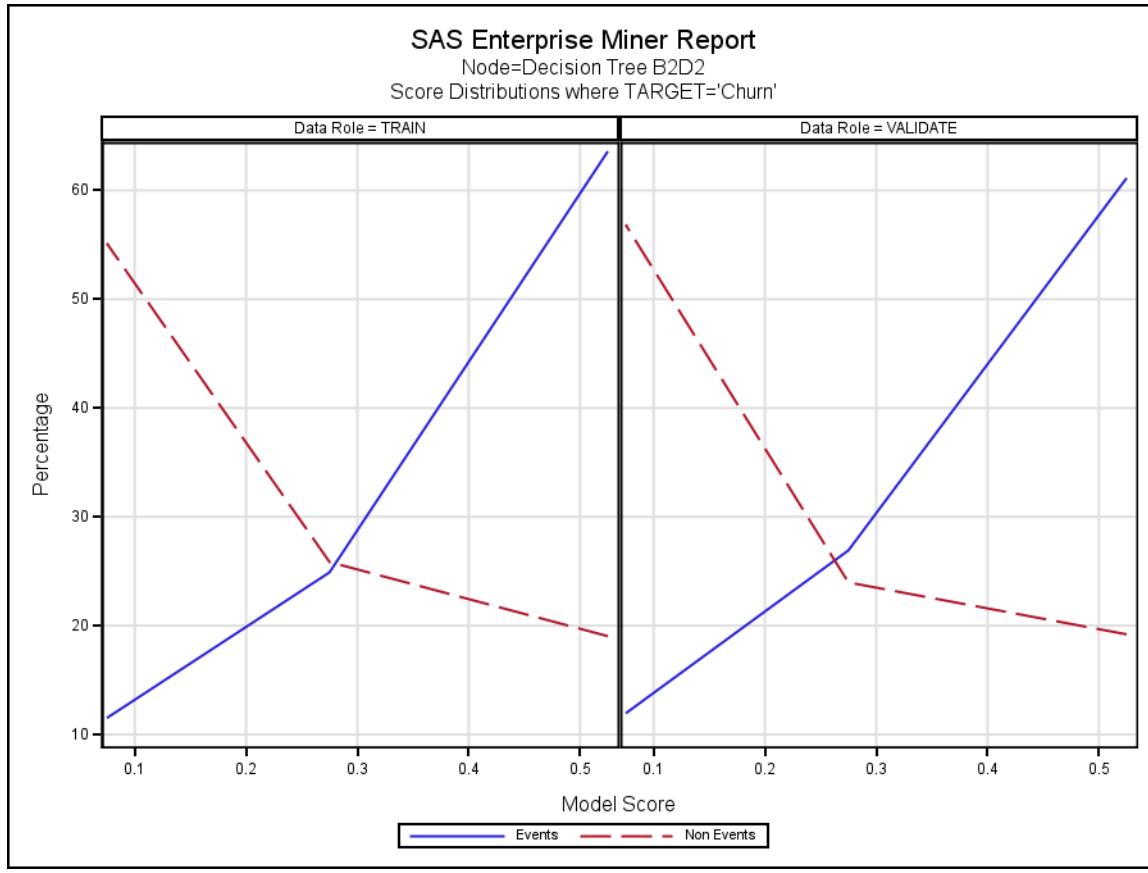
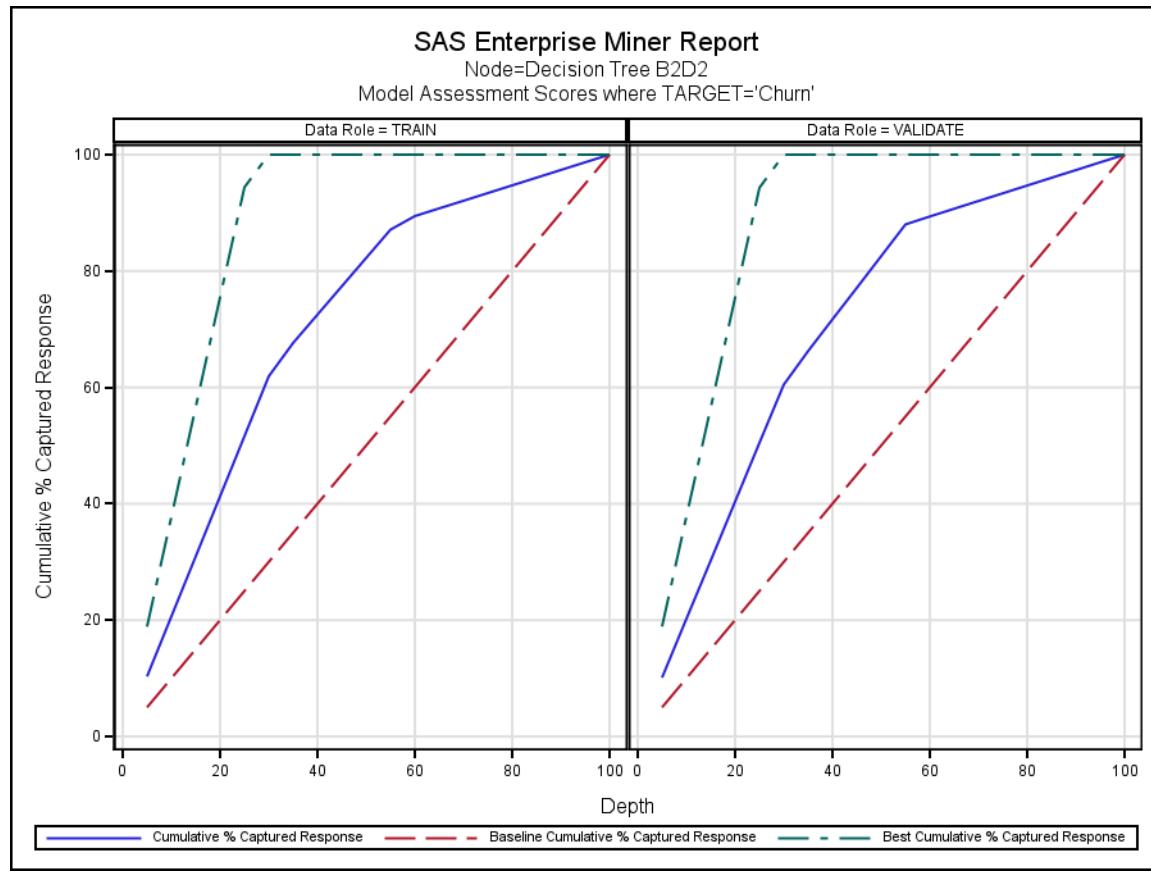
SAS Enterprise Miner Report
Node=Decision Tree B2D2
Treemap



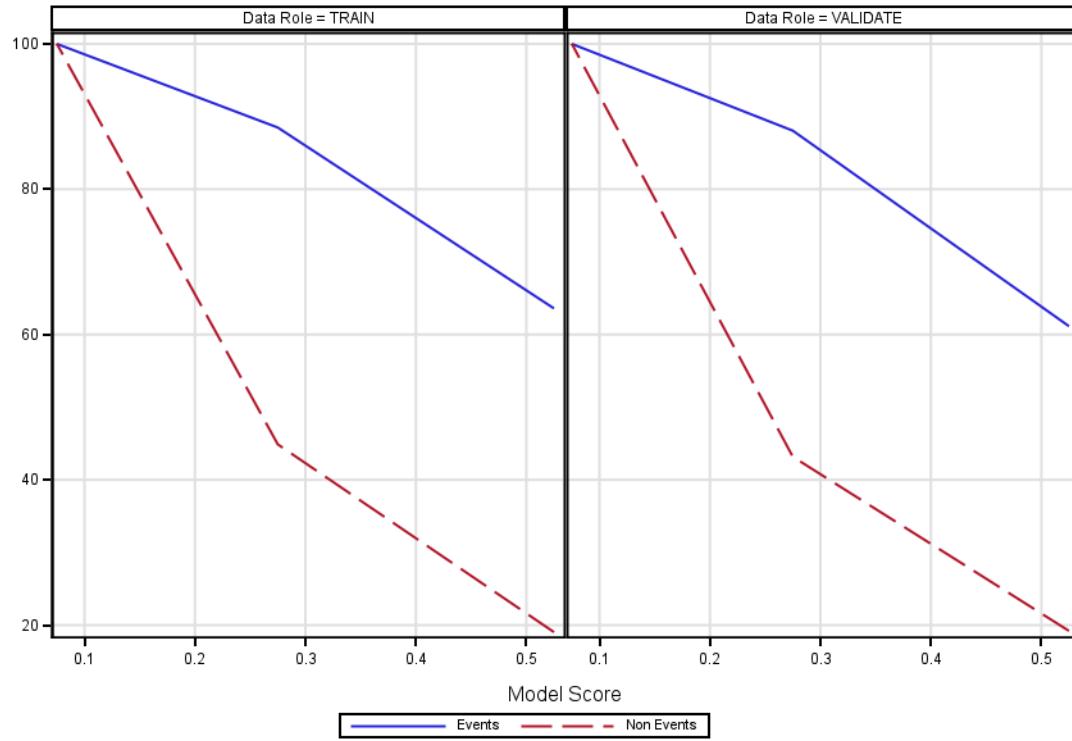
SAS Enterprise Miner Report
Node=Decision Tree B2D2
Model Iteration Plots







SAS Enterprise Miner Report
Node=Decision Tree B2D2
Score Distributions where TARGET='Churn'



Node=Decision Tree B2D2

Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.50-0.55	475	63.5877	19.0338	63.588	19.034
0.25-0.30	186	24.8996	25.8454	88.487	44.879
0.05-0.10	86	11.5127	55.1208	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.50-0.55	343	61.1408	19.2010	61.141	19.201
0.25-0.30	151	26.9162	23.9691	88.057	43.170
0.05-0.10	67	11.9430	56.8299	100.000	100.000

SAS Enterprise Miner Report

Node=Decision Tree B2D4 Summary

Node id = Tree2
 Node label = Decision Tree B2D4
 Meta path = Ids => Part => Tree2
 Notes =

Node=Decision Tree B2D4 Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DecisionTree		Kass	Y		Pred	N	
AVG	Y		KassApply	BEFORE		Predict	Y	
AssessMeasure	PROFIT/LOSS		LeafSize	5		ProfitLoss	NONE	
AssessPercentage	0.25		Leafid	Y		RASE	N	
CV	N		Maxbranch	2		SampleMethod	RANDOM	
CVNIter	10		Maxdepth	4	6	SampleSeed	12345	
CVRepeat	1		MinCatSize	5		SampleSize	10000	
CVSeed	12345		MissingValue	USEINSEARCH		ShowNodeId	Y	
ClassColorBy	PERCENTCORRECT		NSubtree	1		ShowValid	Y	
Count	Y		NodeRole	SEGMENT		SigLevel	0.2	
CreateSample	DEFAULT		NodeSample	20000		SplitPrecision	4	
Criterion	DEFAULT		NominalCriterion	PROBCHISQ		Splitsize	.	
Depth	Y		Nrules	5		Subtree	ASSESSMENT	
Dummy	N		Nsurrs	0		Target	ALL	
Exhaustive	5000		NumInputs	1		ToolType	MODEL	
Freeze	N		NumSingleImp	5		TrainMode	BATCH	
ImportModel	N		ObsImportance	N		UseDecision	N	
ImportedTreeData			OrdinalCriterion	ENTROPY		UseMultipleTarget	N	
Inputs	N		PercentCorrect	N		UsePriors	N	
IntColorBy	AVG		Performance	DISK		UseVarOnce	N	
IntervalCriterion	PROBF		Precision	4		VarSelection	Y	

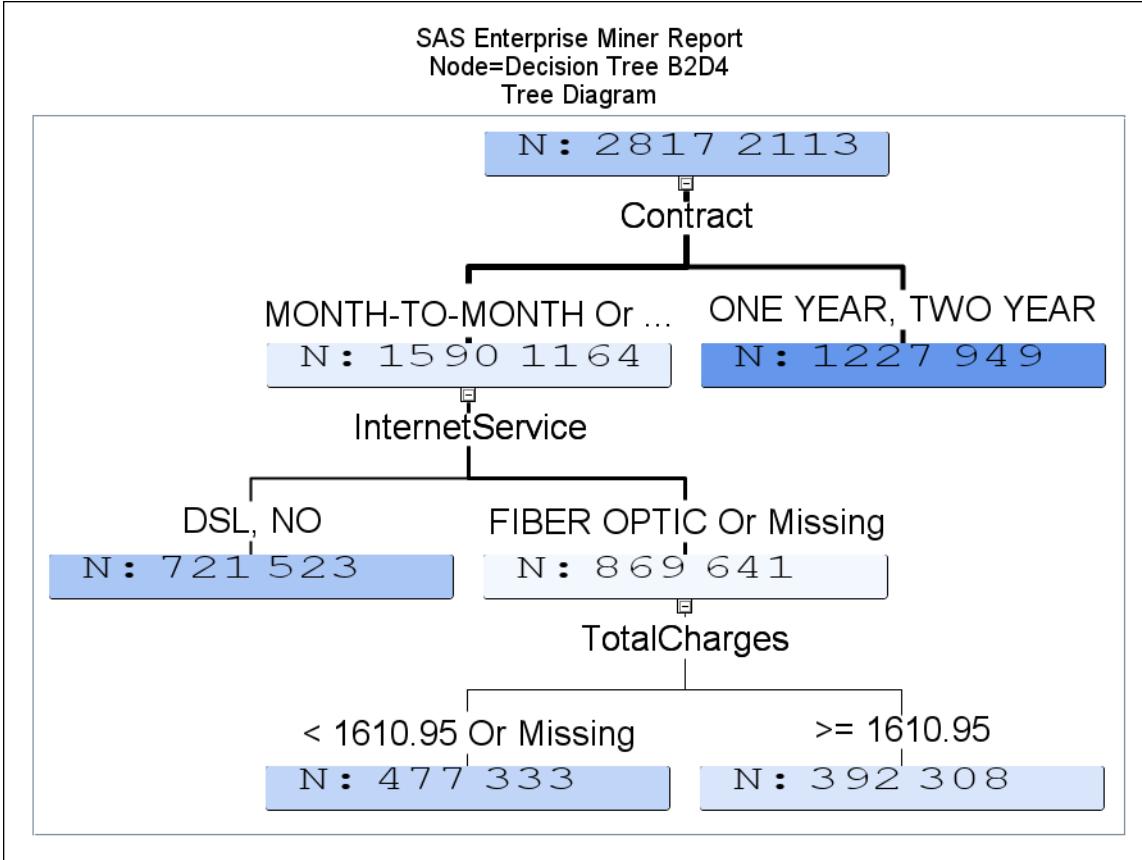
Node=Decision Tree B2D4 Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

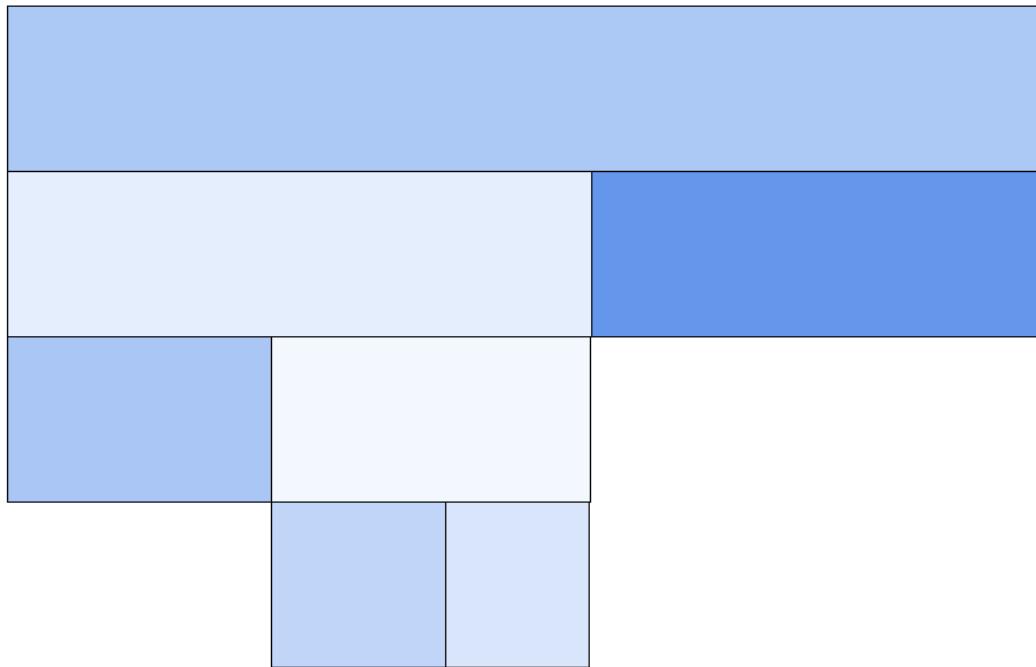
Node=Decision Tree B2D4 Model Fit Statistics

Target=Churn Target Label=''

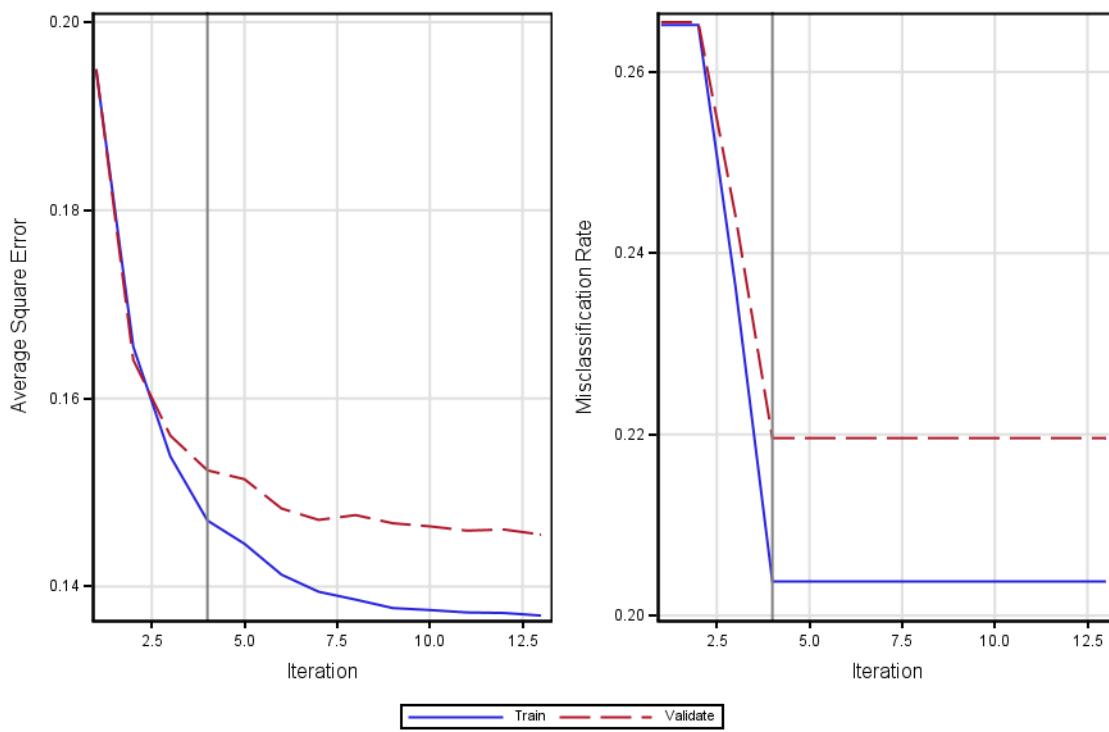
Label of Statistic	Train	Validation	Test
Sum of Frequencies	2817.00	2113.00	2113.00
Misclassification Rate	0.20	0.22	0.21
Maximum Absolute Error	0.93	0.93	0.93
Sum of Squared Errors	828.31	643.83	613.43
Average Squared Error	0.15	0.15	0.15
Root Average Squared Error	0.38	0.39	0.38
Divisor for ASE	5634.00	4226.00	4226.00
Total Degrees of Freedom	2817.00	.	.



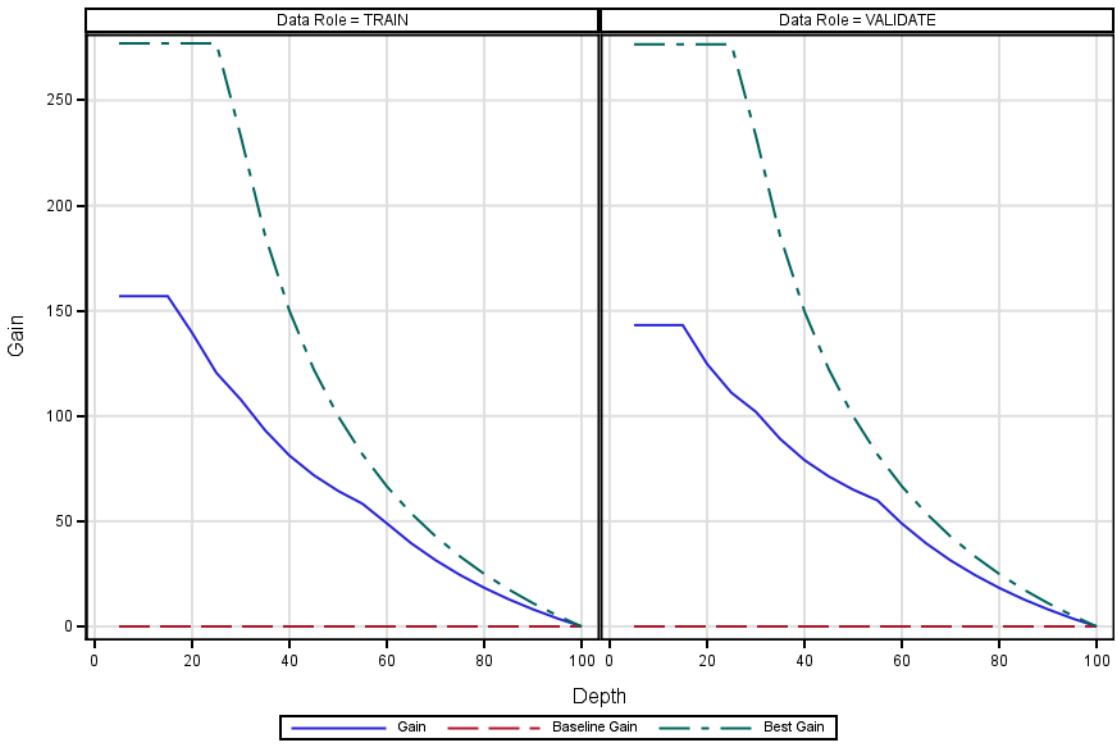
SAS Enterprise Miner Report
Node=Decision Tree B2D4
Treemap



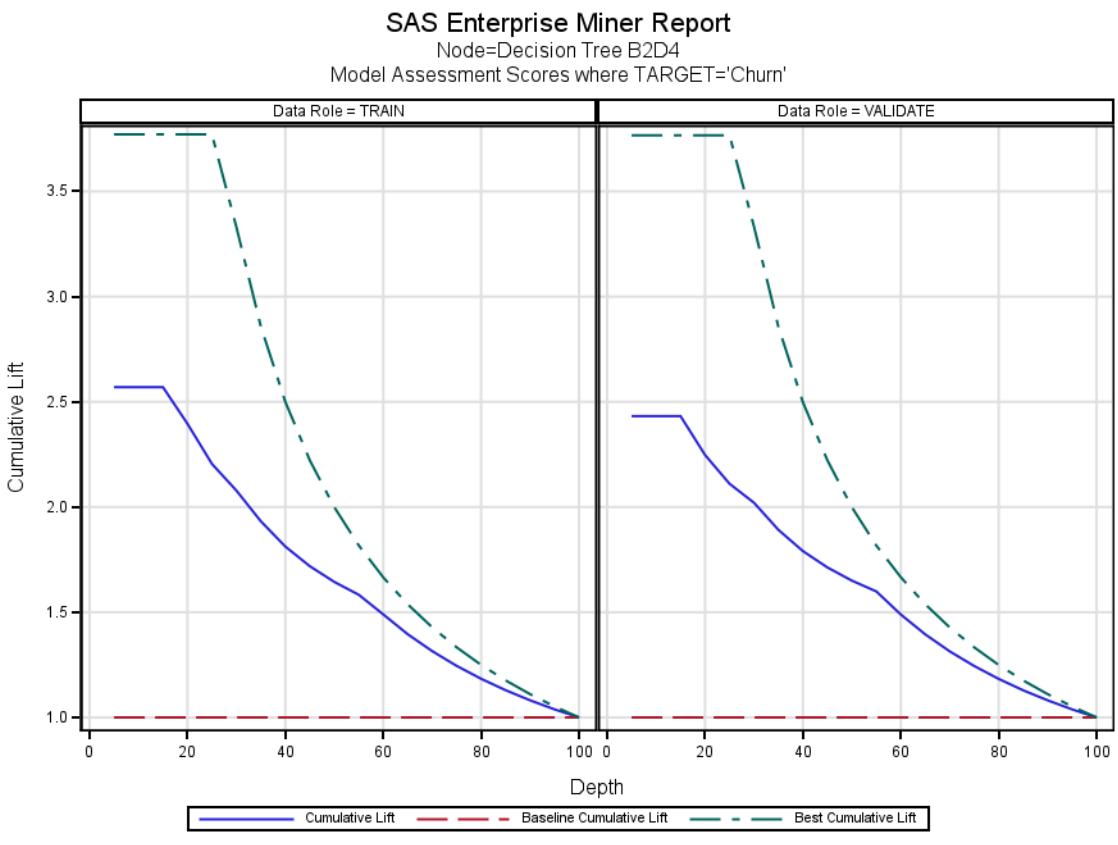
SAS Enterprise Miner Report
Node=Decision Tree B2D4
Model Iteration Plots

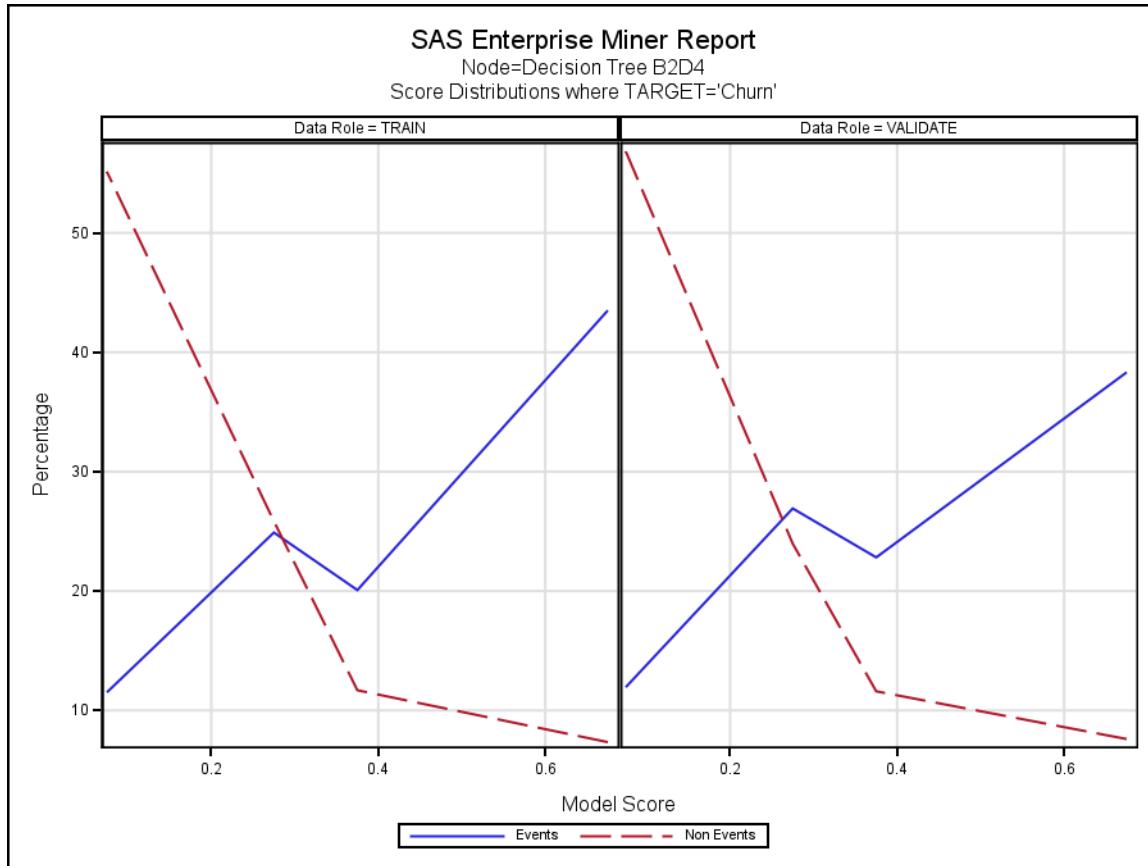
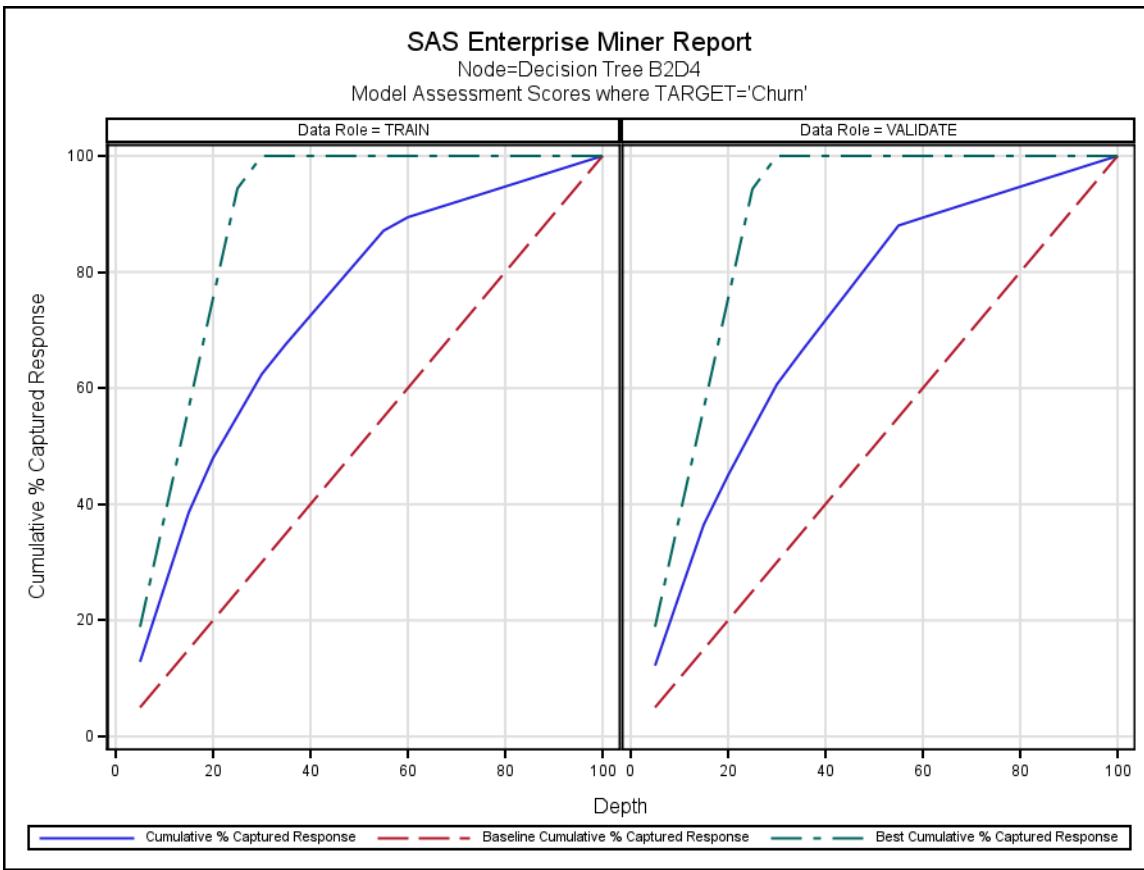


SAS Enterprise Miner Report
 Node=Decision Tree B2D4
 Model Assessment Scores where TARGET='Churn'

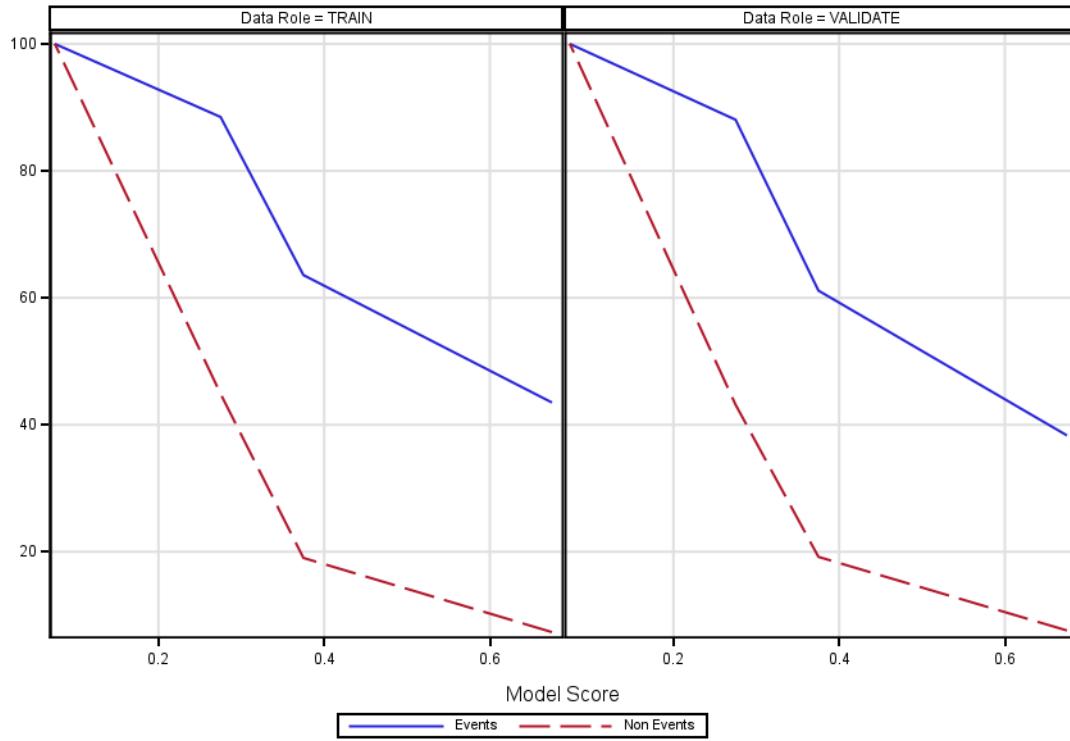


SAS Enterprise Miner Report
 Node=Decision Tree B2D4
 Model Assessment Scores where TARGET='Churn'





SAS Enterprise Miner Report
 Node=Decision Tree B2D4
 Score Distributions where TARGET='Churn'



Node=Decision Tree B2D4
Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.65-0.70	325	43.5074	7.3430	43.507	7.343
0.35-0.40	150	20.0803	11.6908	63.588	19.034
0.25-0.30	186	24.8996	25.8454	88.487	44.879
0.05-0.10	86	11.5127	55.1208	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.65-0.70	215	38.3244	7.6031	38.324	7.603
0.35-0.40	128	22.8164	11.5979	61.141	19.201
0.25-0.30	151	26.9162	23.9691	88.057	43.170
0.05-0.10	67	11.9430	56.8299	100.000	100.000

SAS Enterprise Miner Report

Node=Decision Tree (B2D6) Summary

Node id = Tree
 Node label = Decision Tree (B2D6)
 Meta path = Ids => Part => Tree
 Notes =

Node=Decision Tree (B2D6) Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DecisionTree		Kass	Y		Pred	N	
AVG	Y		KassApply	BEFORE		Predict	Y	
AssessMeasure	PROFIT/LOSS		LeafSize	5		ProfitLoss	NONE	
AssessPercentage	0.25		Leafid	Y		RASE	N	
CV	N		Maxbranch	2		SampleMethod	RANDOM	
CVNIter	10		Maxdepth	6		SampleSeed	12345	
CVRepeat	1		MinCatSize	5		SampleSize	10000	
CVSeed	12345		MissingValue	USEINSEARCH		ShowNodeld	Y	
ClassColorBy	PERCENTCORRECT		NSubtree	1		ShowValid	Y	
Count	Y		NodeRole	SEGMENT		SigLevel	0.2	
CreateSample	DEFAULT		NodeSample	20000		SplitPrecision	4	
Criterion	DEFAULT		NominalCriterion	PROBCHISQ		Splitsize	.	
Depth	Y		Nrules	5		Subtree	ASSESSMENT	
Dummy	N		Nsurrs	0		Target	ALL	
Exhaustive	5000		NumInputs	1		ToolType	MODEL	
Freeze	N		NumSingleImp	5		TrainMode	BATCH	
ImportModel	N		ObsImportance	N		UseDecision	N	
ImportedTreeData			OrdinalCriterion	ENTROPY		UseMultipleTarget	N	
Inputs	N		PercentCorrect	N		UsePriors	N	
IntColorBy	AVG		Performance	DISK		UseVarOnce	N	
IntervalCriterion	PROBF		Precision	4		VarSelection	Y	

Node=Decision Tree (B2D6) Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport
ID	INTERVAL	1	_dataobs_

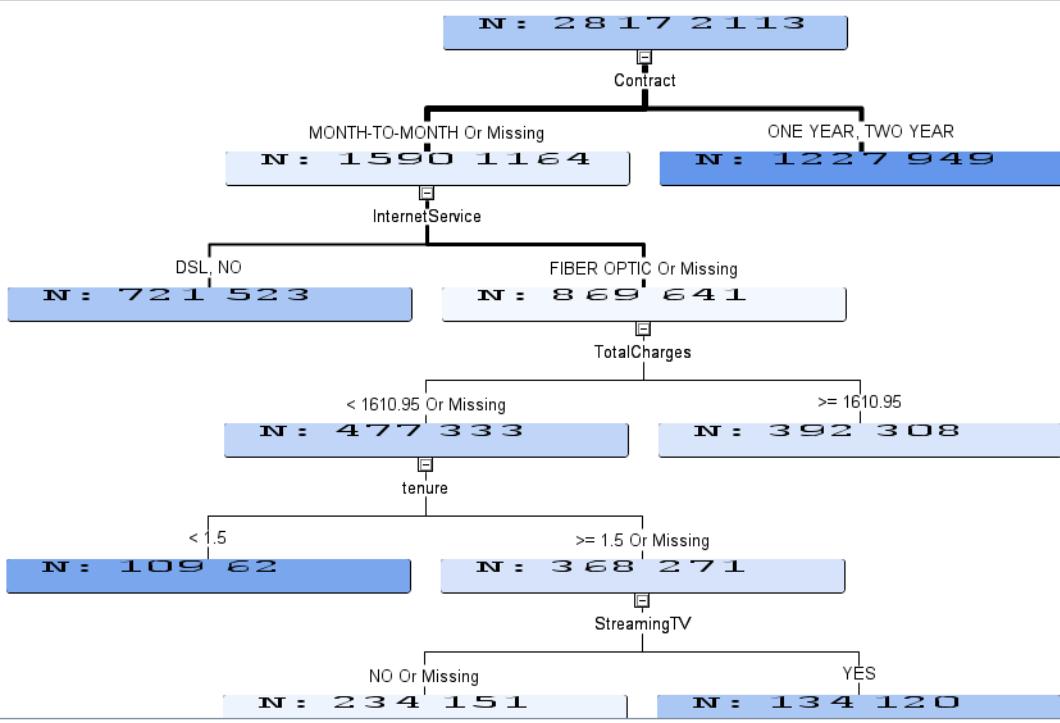
Node=Decision Tree (B2D6) Model Fit Statistics

Target=Churn Target Label=''

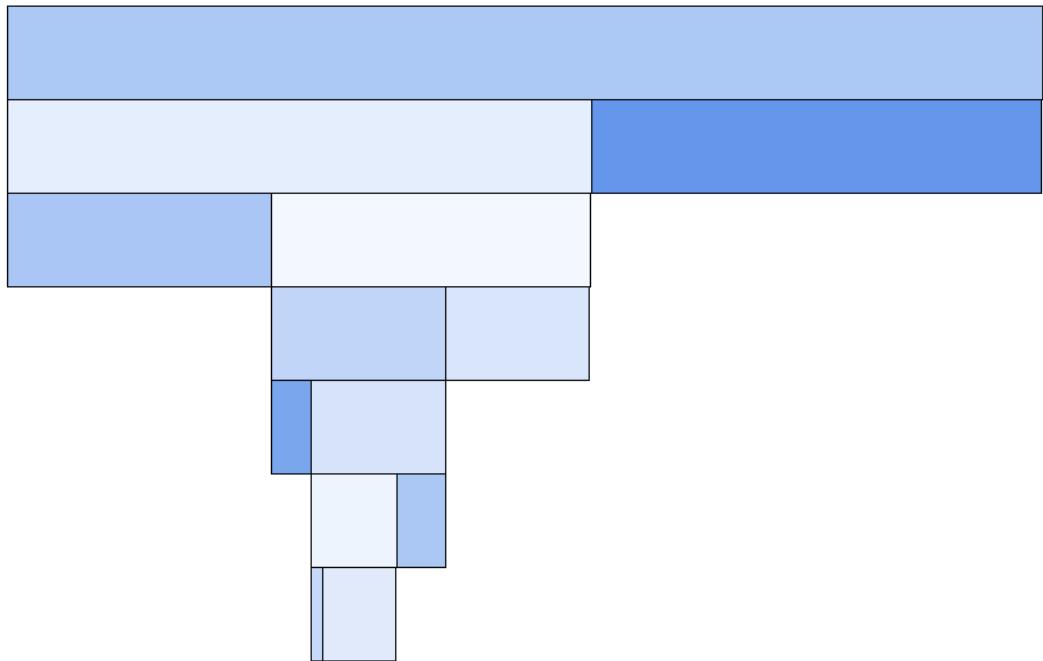
Label of Statistic	Train	Validation	Test
Sum of Frequencies	2817.00	2113.00	2113.00
Misclassification Rate	0.20	0.22	0.21
Maximum Absolute Error	0.93	0.93	0.93
Sum of Squared Errors	808.69	637.26	604.81
Average Squared Error	0.14	0.15	0.14
Root Average Squared Error	0.38	0.39	0.38
Divisor for ASE	5634.00	4226.00	4226.00
Total Degrees of Freedom	2817.00	.	.

SAS Enterprise Miner Report
Node=Decision Tree (B2D6)

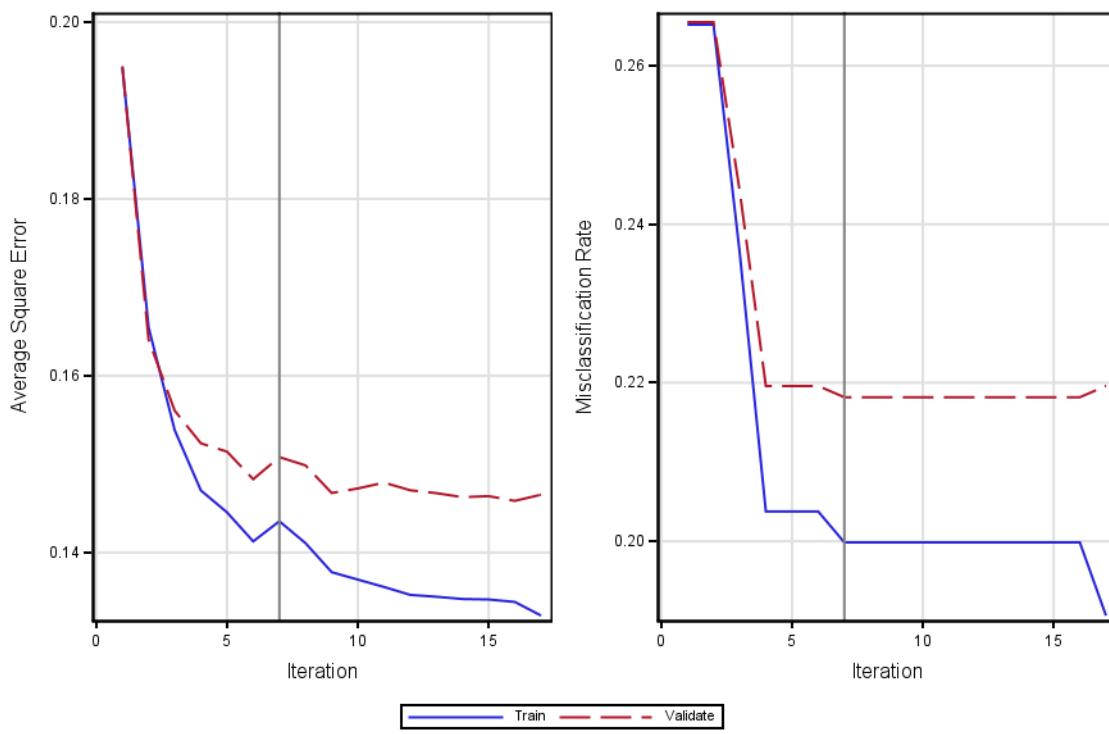
Tree Diagram



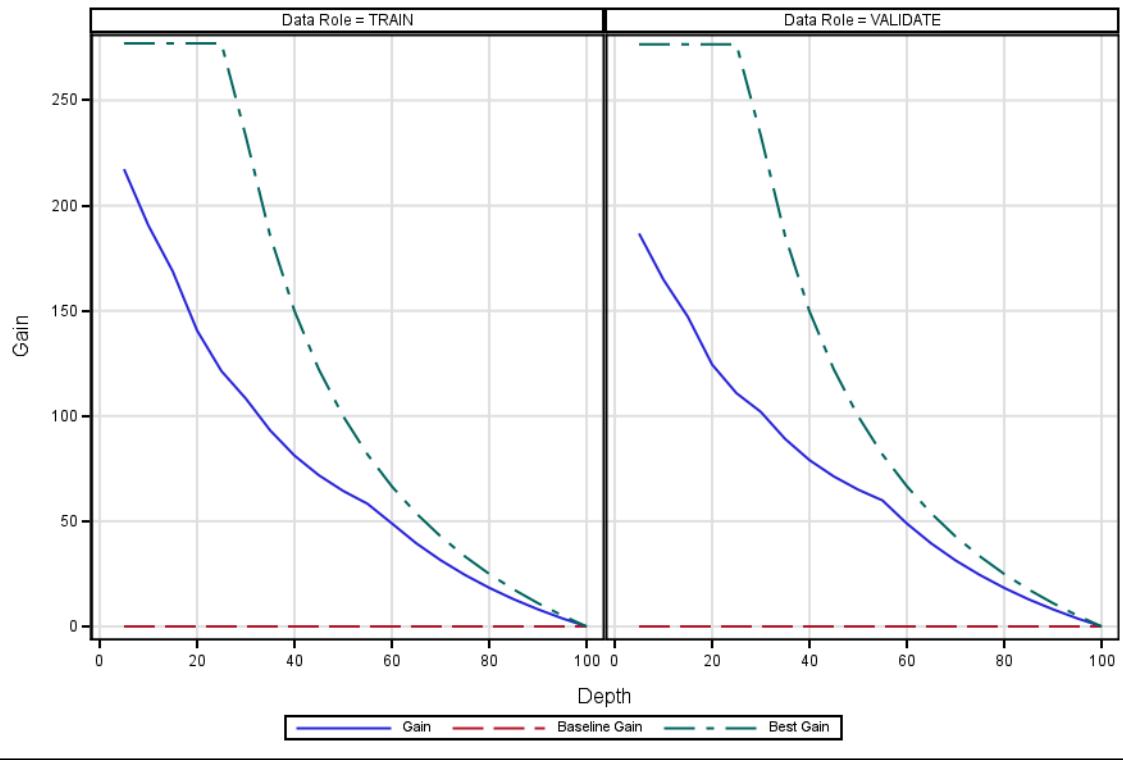
SAS Enterprise Miner Report
Node=Decision Tree (B2D6)
Treemap



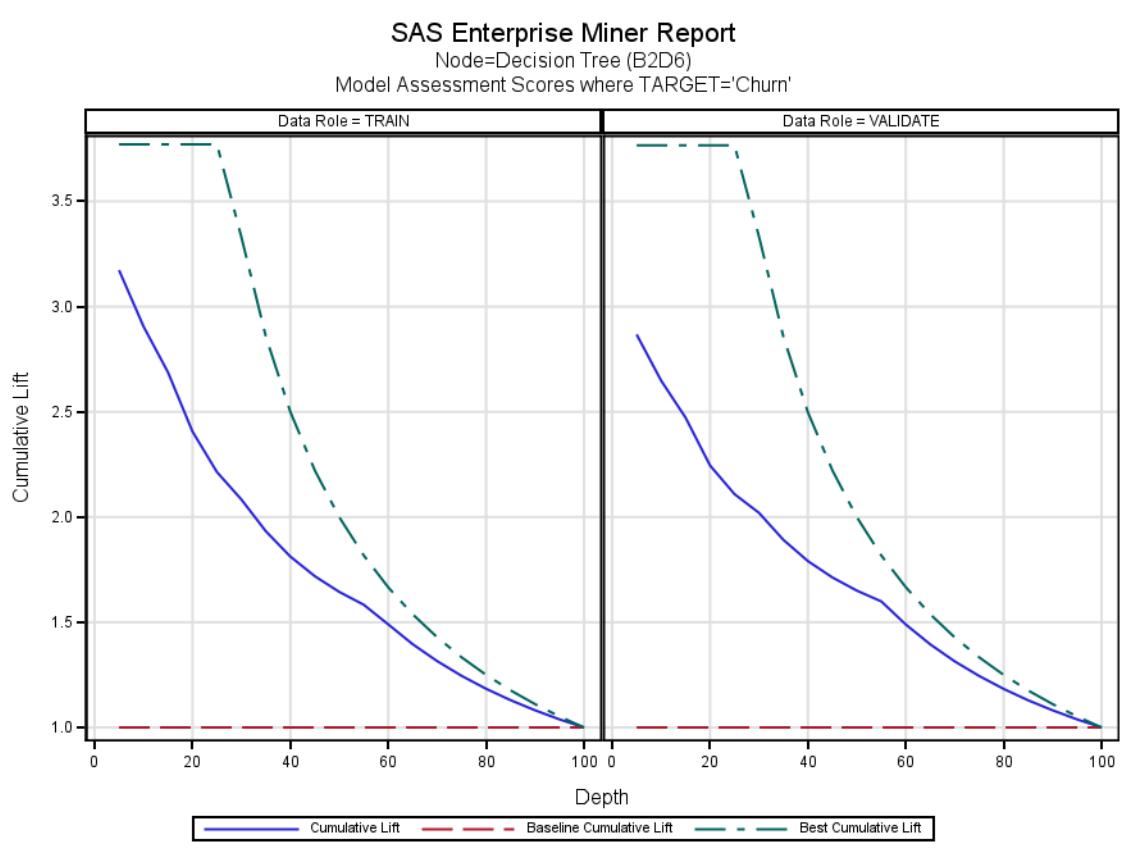
SAS Enterprise Miner Report
Node=Decision Tree (B2D6)
Model Iteration Plots

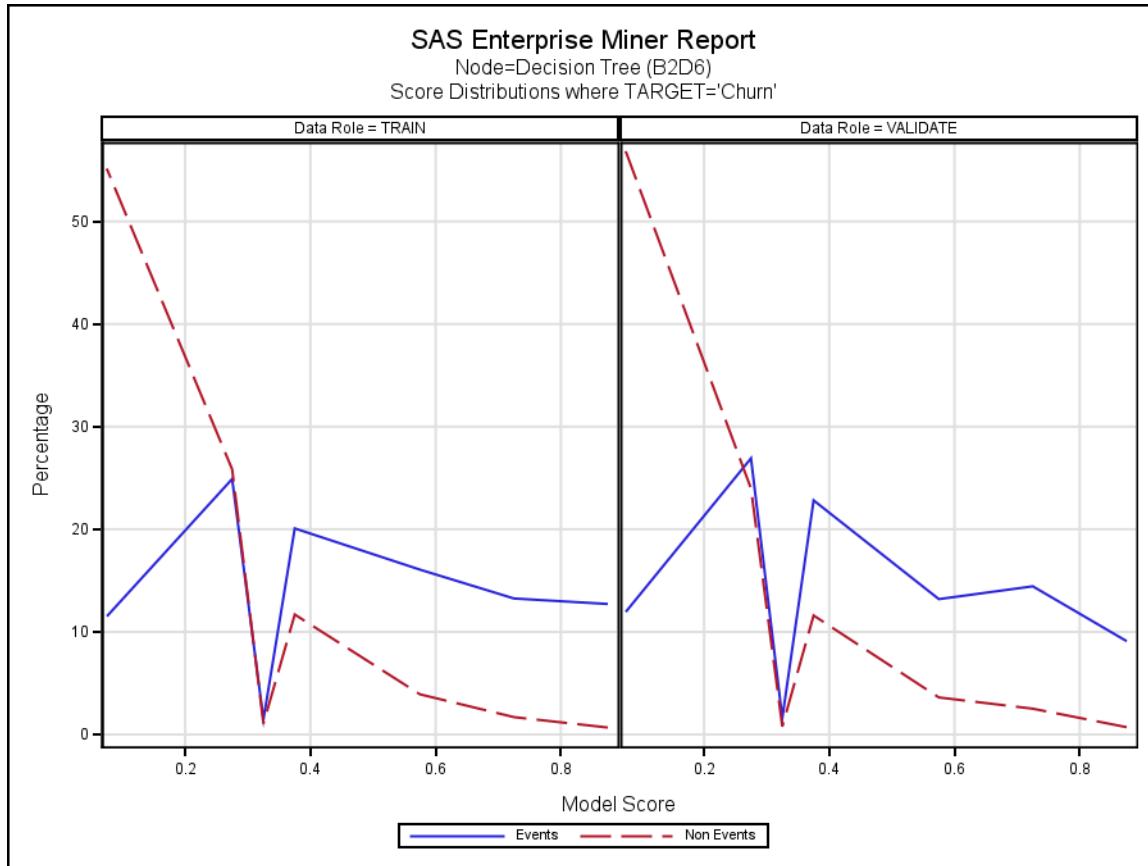
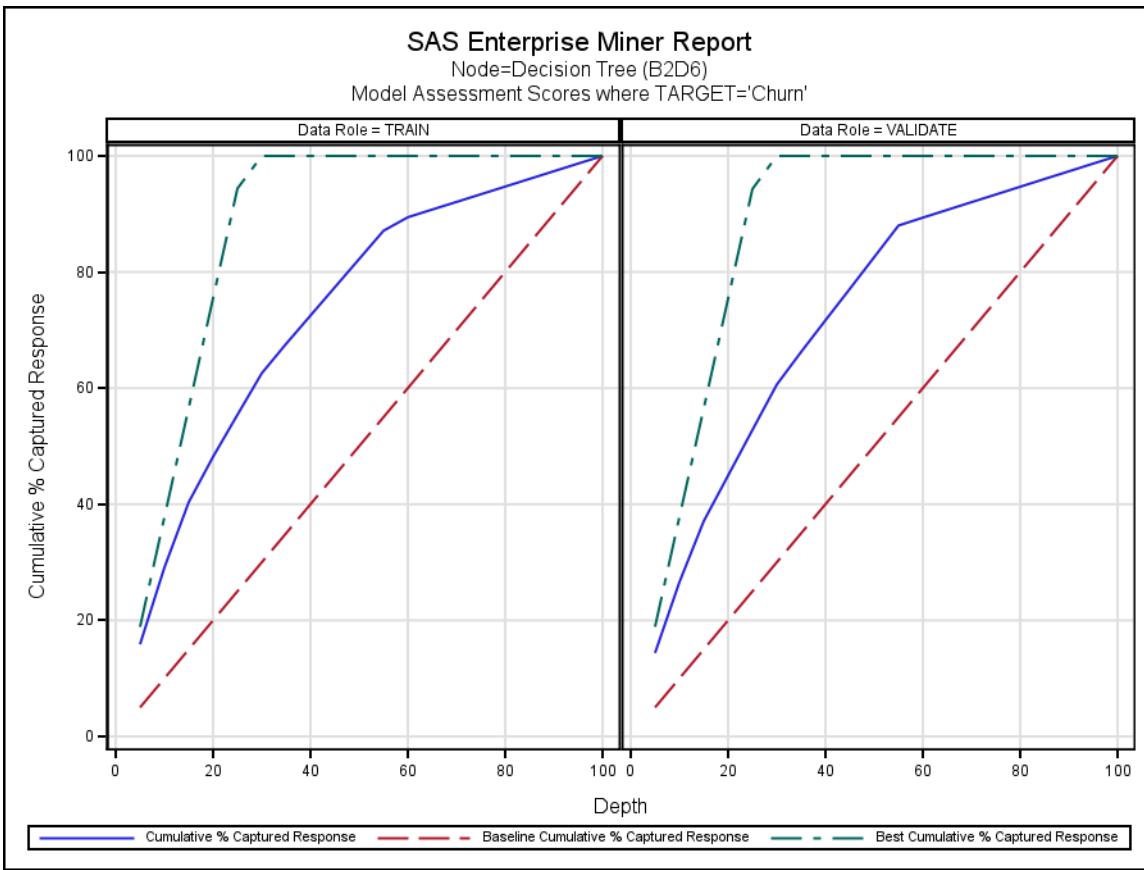


SAS Enterprise Miner Report
 Node=Decision Tree (B2D6)
 Model Assessment Scores where TARGET='Churn'

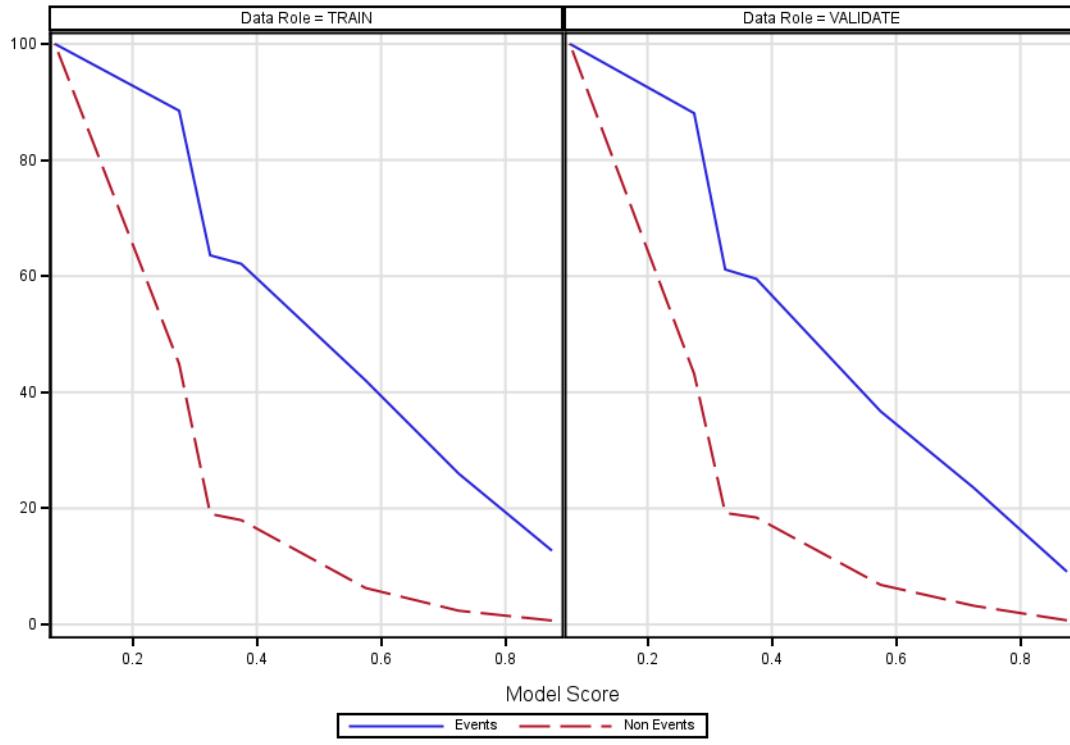


SAS Enterprise Miner Report
 Node=Decision Tree (B2D6)
 Model Assessment Scores where TARGET='Churn'





SAS Enterprise Miner Report
 Node=Decision Tree (B2D6)
 Score Distributions where TARGET='Churn'



Node=Decision Tree (B2D6)

Score Distributions

Target Variable=Churn Data Role=TRAIN

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	95	12.7175	0.6763	12.718	0.676
0.70-0.75	99	13.2530	1.6908	25.971	2.367
0.55-0.60	120	16.0643	3.9130	42.035	6.280
0.35-0.40	150	20.0803	11.6908	62.115	17.971
0.30-0.35	11	1.4726	1.0628	63.588	19.034
0.25-0.30	186	24.8996	25.8454	88.487	44.879
0.05-0.10	86	11.5127	55.1208	100.000	100.000

Target Variable=Churn Data Role=VALIDATE

Posterior Probability Range	Number of Events	Percentage of Events	Percentage of Nonevents	Cumulative Percentage of Events	Cumulative Percentage of Nonevents
0.85-0.90	51	9.0909	0.7088	9.091	0.709
0.70-0.75	81	14.4385	2.5129	23.529	3.222
0.55-0.60	74	13.1907	3.6082	36.720	6.830
0.35-0.40	128	22.8164	11.5979	59.537	18.428
0.30-0.35	9	1.6043	0.7732	61.141	19.201
0.25-0.30	151	26.9162	23.9691	88.057	43.170
0.05-0.10	67	11.9430	56.8299	100.000	100.000

SAS Enterprise Miner Report

Node=Model Comparison Summary

Node id = MdlComp4
 Node label = Model Comparison
 Meta path = Ids => Part => Neural => MdlComp4
 Notes =

Node=Model Comparison Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	ModelCompare		NumberOfReportedLevels	1E-6		SelectionData	DEFAULT	
AssessAllTargetLevels	N		NumberofBins	20		SelectionDepth	10	
DecileBin	20		ProfitEpsilon	1E-6		SelectionTable	TRAIN	TABLE
HPCriteria	DEFAULT		RecomputeAssess	N		StatisticUsed	_VMISC_	
LiftEpsilon	1E-6		RocChart	Y		TargetLabel		
ModelCriteria	Valid: Misclassification Rate		RocEpsilon	0.01		TargetName	Churn	
ModelDescription	Neural Network		RoiEpsilon	1E-6		classViyaCriteria	DEFAULT	
ModelId	Neural		ScoreDistBin	20		intervalViyaCriteria	DEFAULT	
NormalizeReportingVariables	Y		SelectionCriteria	DEFAULT				

Node=Model Comparison Variable Summary

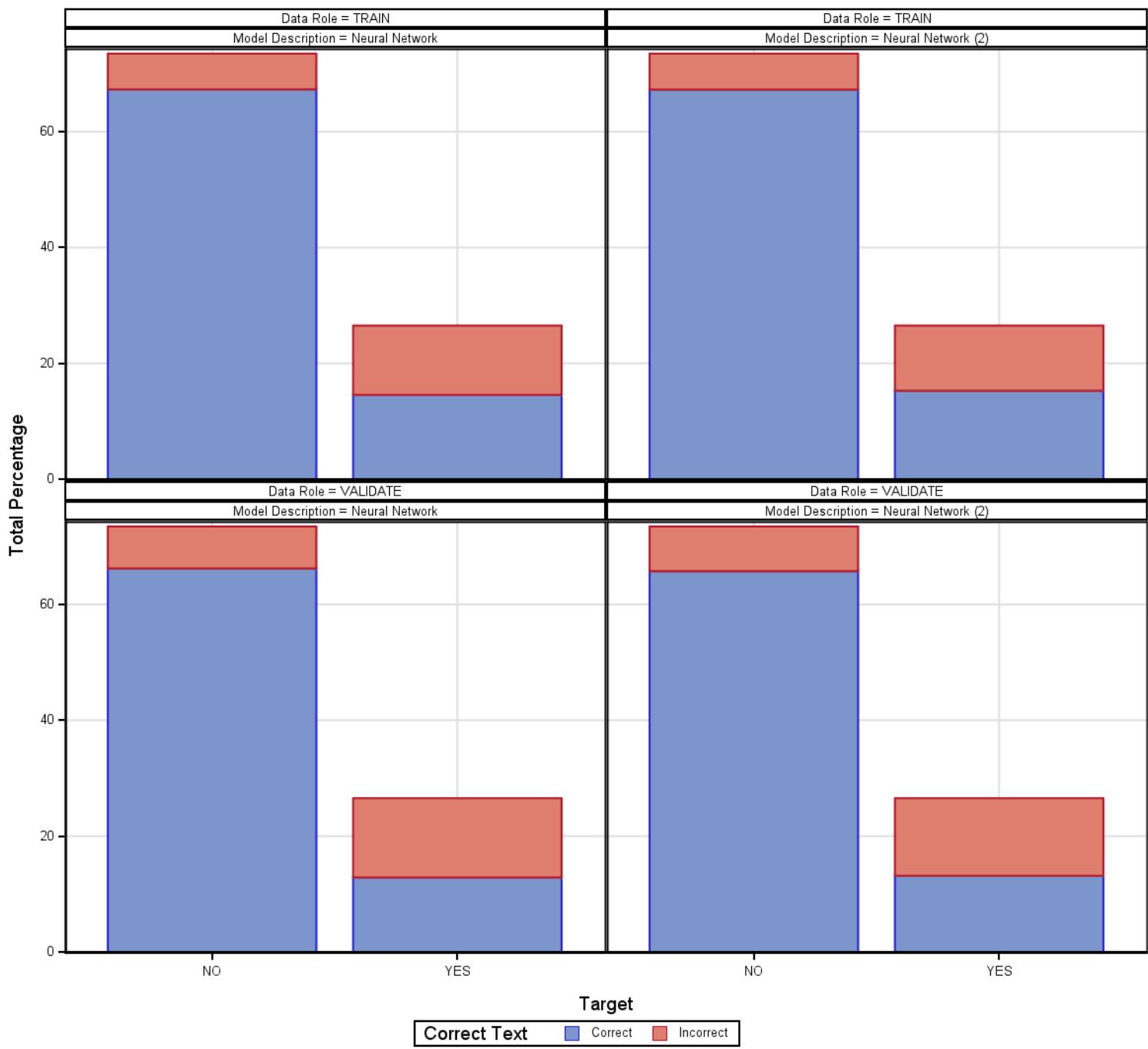
Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn

Node=Model Comparison Fit Statistics Table

Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Train: Average Squared Error	Train: Misclassification Rate	Train: Kolmogorov-Smirnov Statistic
Y	Neural	Neural	Neural Network	Churn		0.20918	0.12650	0.18140	0.587
	Neural2	Neural2	Neural Network (2)	Churn		0.21107	0.12489	0.17465	0.588

Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Valid: Average Squared Error	Valid: Misclassification Rate	Valid: Kolmogorov-Smirnov Statistic
Y	Neural	Neural	Neural Network	Churn		0.20918	0.14404	0.20918	0.487
	Neural2	Neural2	Neural Network (2)	Churn		0.21107	0.14173	0.21107	0.500

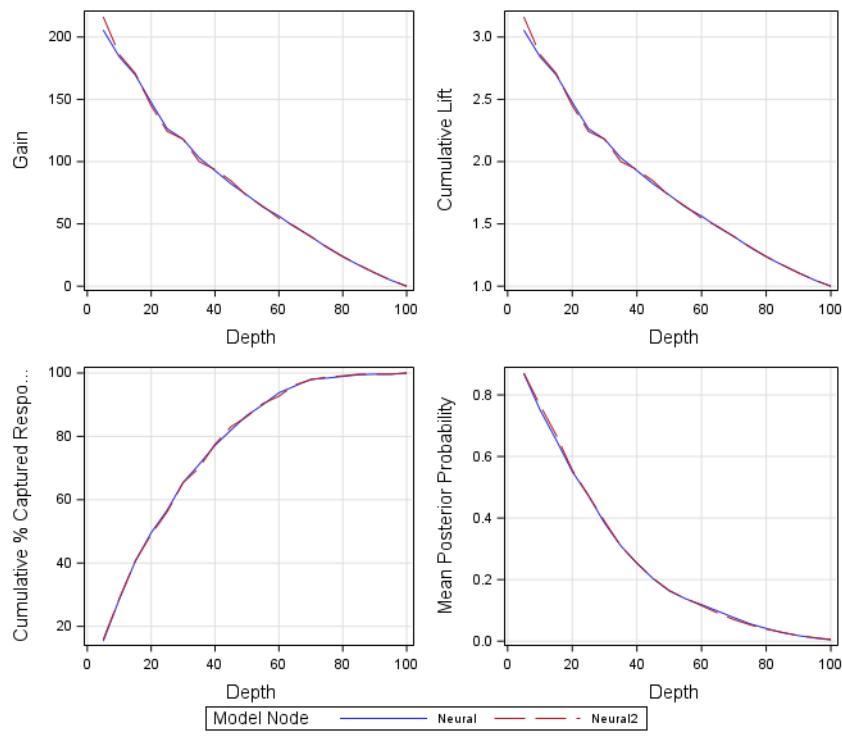
SAS Enterprise Miner Report
Node=Model Comparison
Classification Chart
TARGET='Churn' and _TYPE_='PREDICTION'



SAS Enterprise Miner Report

Node=Model Comparison

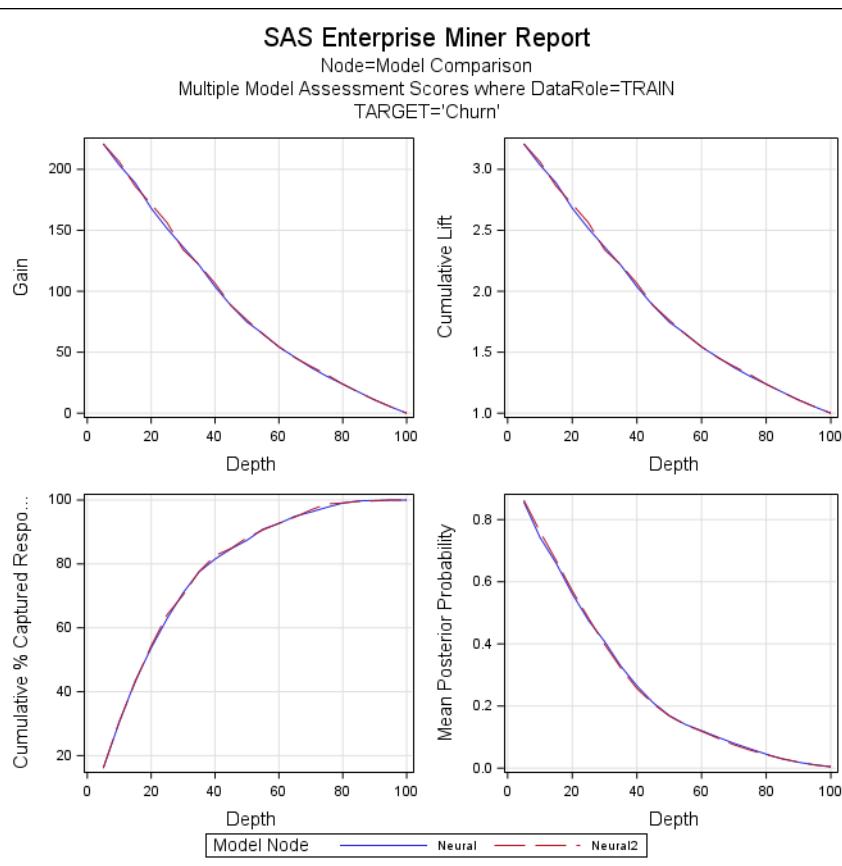
Multiple Model Assessment Scores where DataRole=TEST
TARGET='Churn'



SAS Enterprise Miner Report

Node=Model Comparison

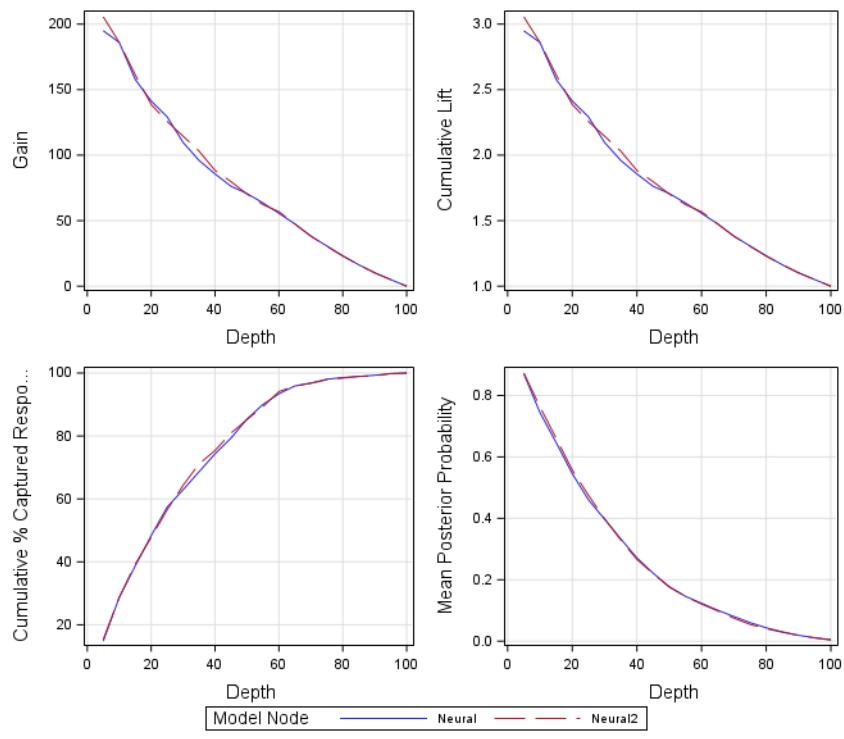
Multiple Model Assessment Scores where DataRole=TRAIN
TARGET='Churn'



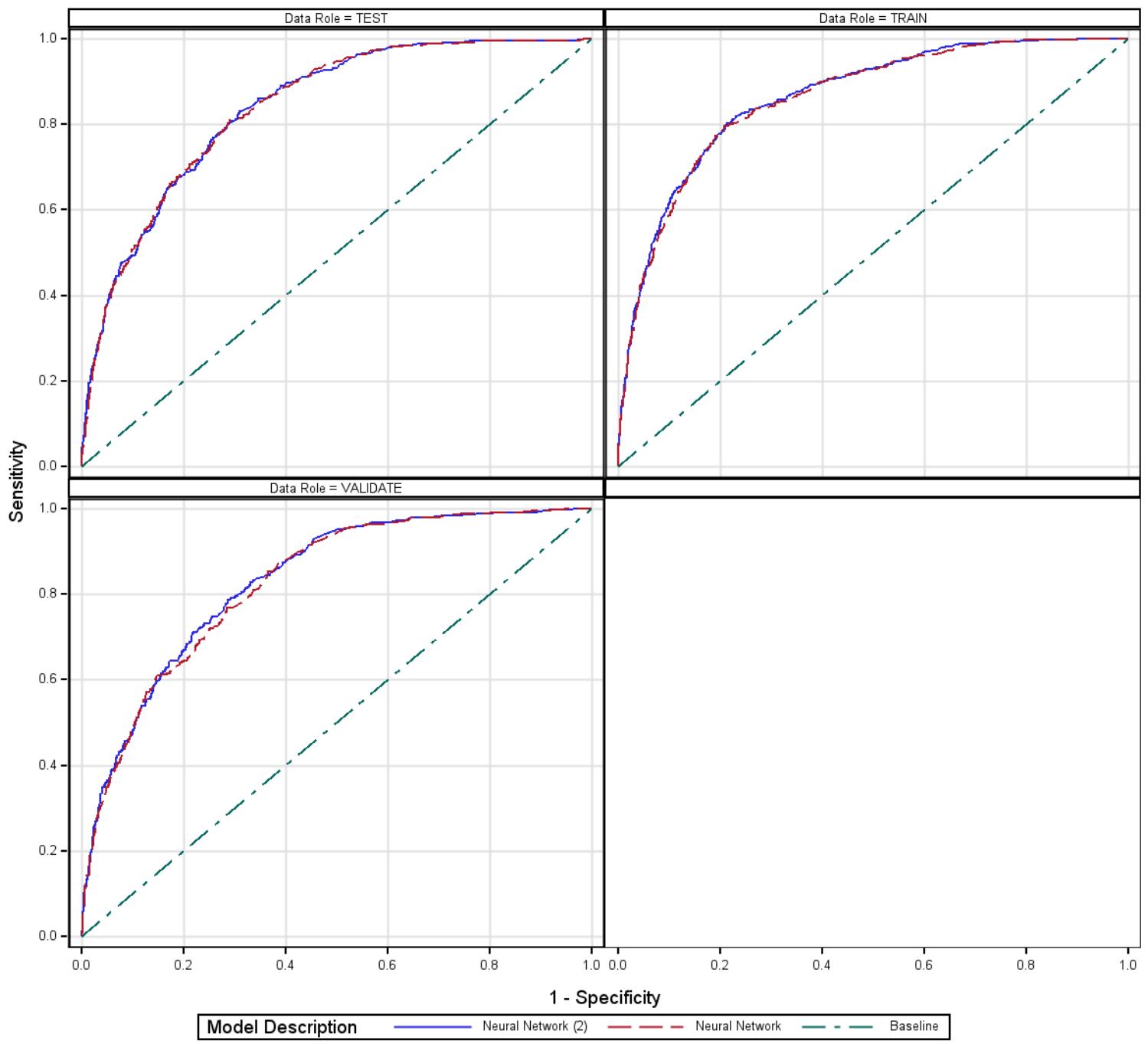
SAS Enterprise Miner Report

Node=Model Comparison

Multiple Model Assessment Scores where DataRole=VALIDATE
TARGET='Churn'



SAS Enterprise Miner Report
Node=Model Comparison
ROC Chart
TARGET='Churn' and EVENT='YES'



SAS Enterprise Miner Report

Node=Logical Model Comparison Summary

Node id = MdlComp3
 Node label = Logical Model Comparison
 Meta path = Ids => Part => Reg => MdlComp3
 Notes =

Node=Logical Model Comparison Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	ModelCompare		NumberOfReportedLevels	1E-6		SelectionData	DEFAULT	
AssessAllTargetLevels	N		NumberofBins	20		SelectionDepth	10	
DecileBin	20		ProfitEpsilon	1E-6		SelectionTable	TRAIN	TABLE
HPCriteria	DEFAULT		RecomputeAssess	N		StatisticUsed	_VMISC_	
LiftEpsilon	1E-6		RocChart	Y		TargetLabel		
ModelCriteria	Valid: Misclassification Rate		RocEpsilon	0.01		TargetName	Churn	
ModelDescription	Exhaustive Regression		RoiEpsilon	1E-6		classViyaCriteria	DEFAULT	
ModelId	Reg		ScoreDistBin	20		intervalViyaCriteria	DEFAULT	
NormalizeReportingVariables	Y		SelectionCriteria	DEFAULT				

Node=Logical Model Comparison Variable Summary

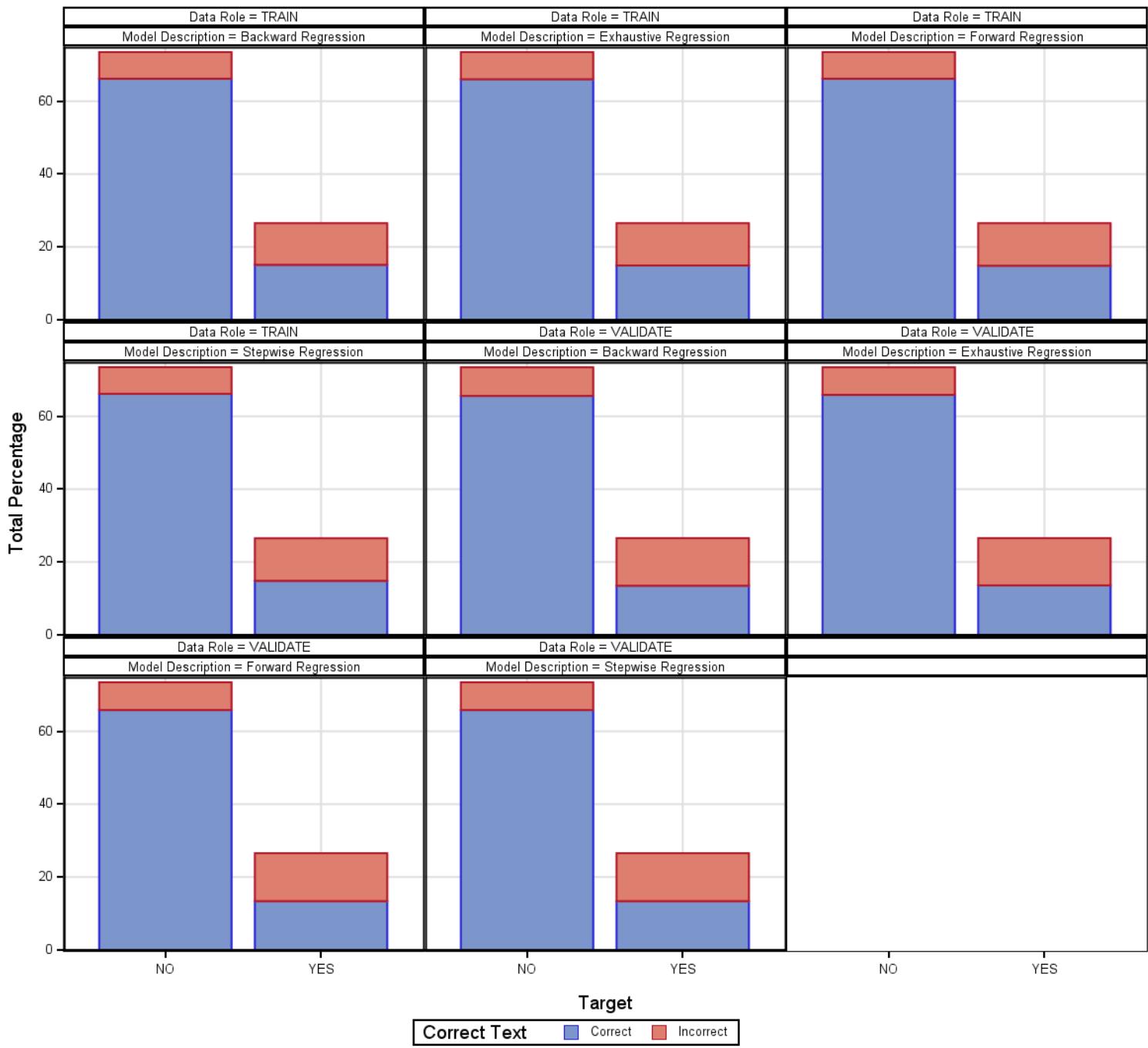
Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn

Node=Logical Model Comparison Fit Statistics Table

Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Train: Average Squared Error	Train: Misclassification Rate	Train: Kolmogorov-Smirnov Statistic
Y	Reg	Reg	Exhaustive Regression	Churn		0.20540	0.13272	0.19063	0.555
	Reg2	Reg2	Forward Regression	Churn		0.20776	0.13368	0.18992	0.547
	Reg4	Reg4	Stepwise Regression	Churn		0.20776	0.13368	0.18992	0.547
	Reg3	Reg3	Backward Regression	Churn		0.20918	0.13302	0.18743	0.552

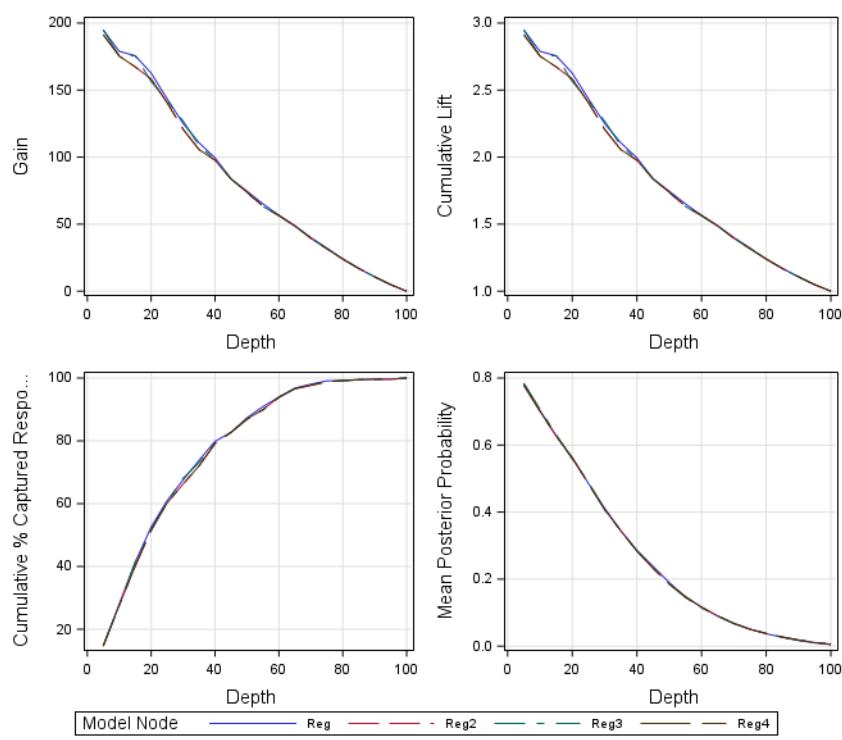
Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Valid: Average Squared Error	Valid: Misclassification Rate	Valid: Kolmogorov-Smirnov Statistic
Y	Reg	Reg	Exhaustive Regression	Churn		0.20540	0.14114	0.20540	0.503
	Reg2	Reg2	Forward Regression	Churn		0.20776	0.14205	0.20776	0.501
	Reg4	Reg4	Stepwise Regression	Churn		0.20776	0.14205	0.20776	0.501
	Reg3	Reg3	Backward Regression	Churn		0.20918	0.14175	0.20918	0.503

SAS Enterprise Miner Report
Node=Logical Model Comparison
Classification Chart
TARGET='Churn' and _TYPE_='PREDICTION'



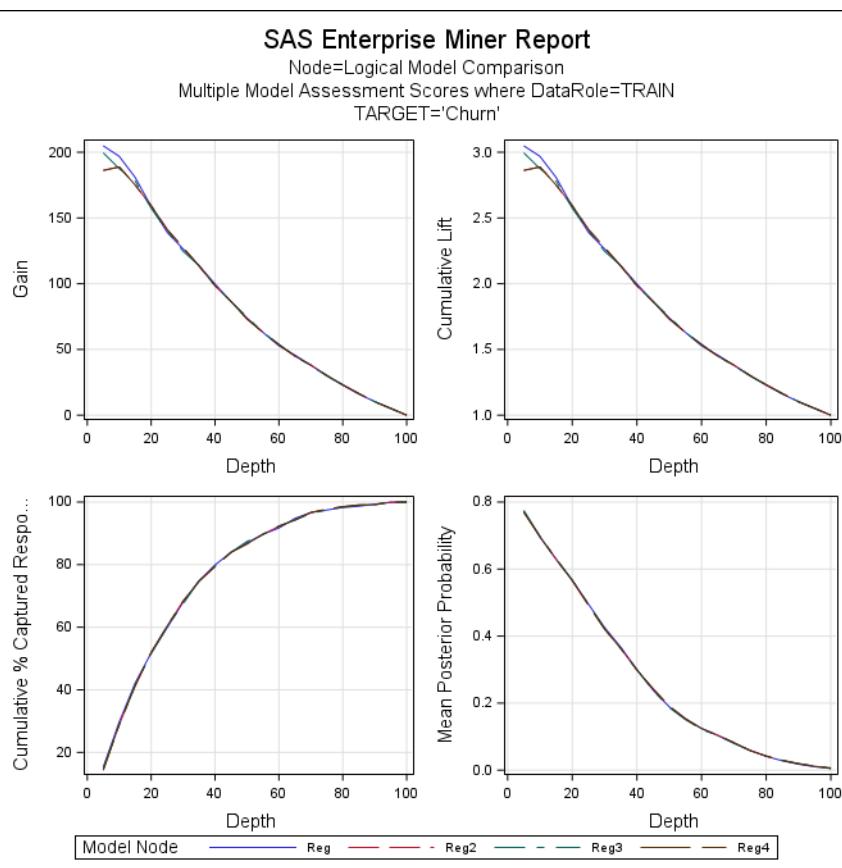
SAS Enterprise Miner Report

Node=Logical Model Comparison
 Multiple Model Assessment Scores where DataRole=TEST
 TARGET='Churn'



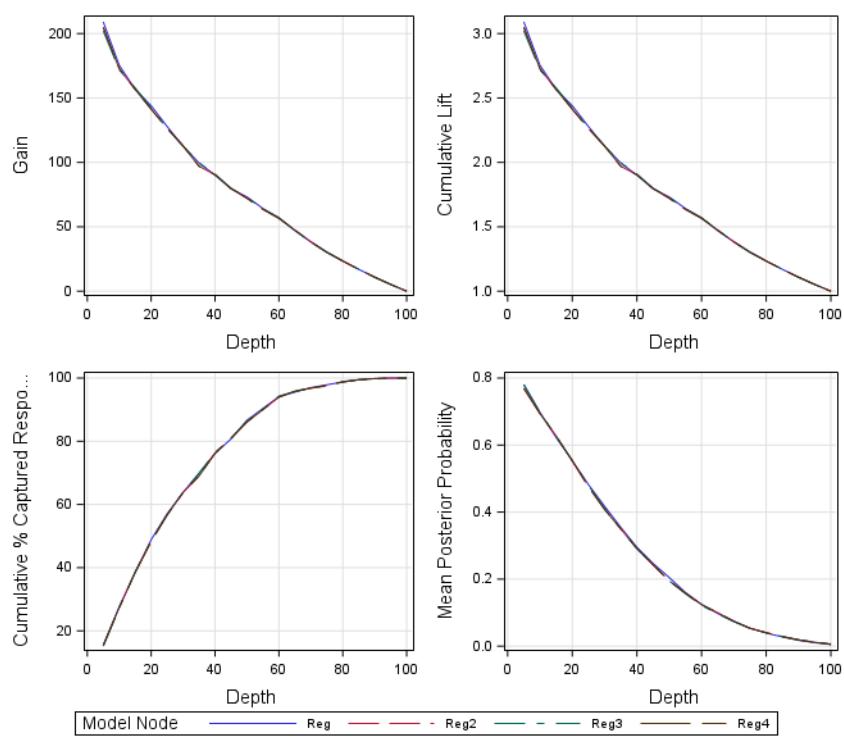
SAS Enterprise Miner Report

Node=Logical Model Comparison
 Multiple Model Assessment Scores where DataRole=TRAIN
 TARGET='Churn'

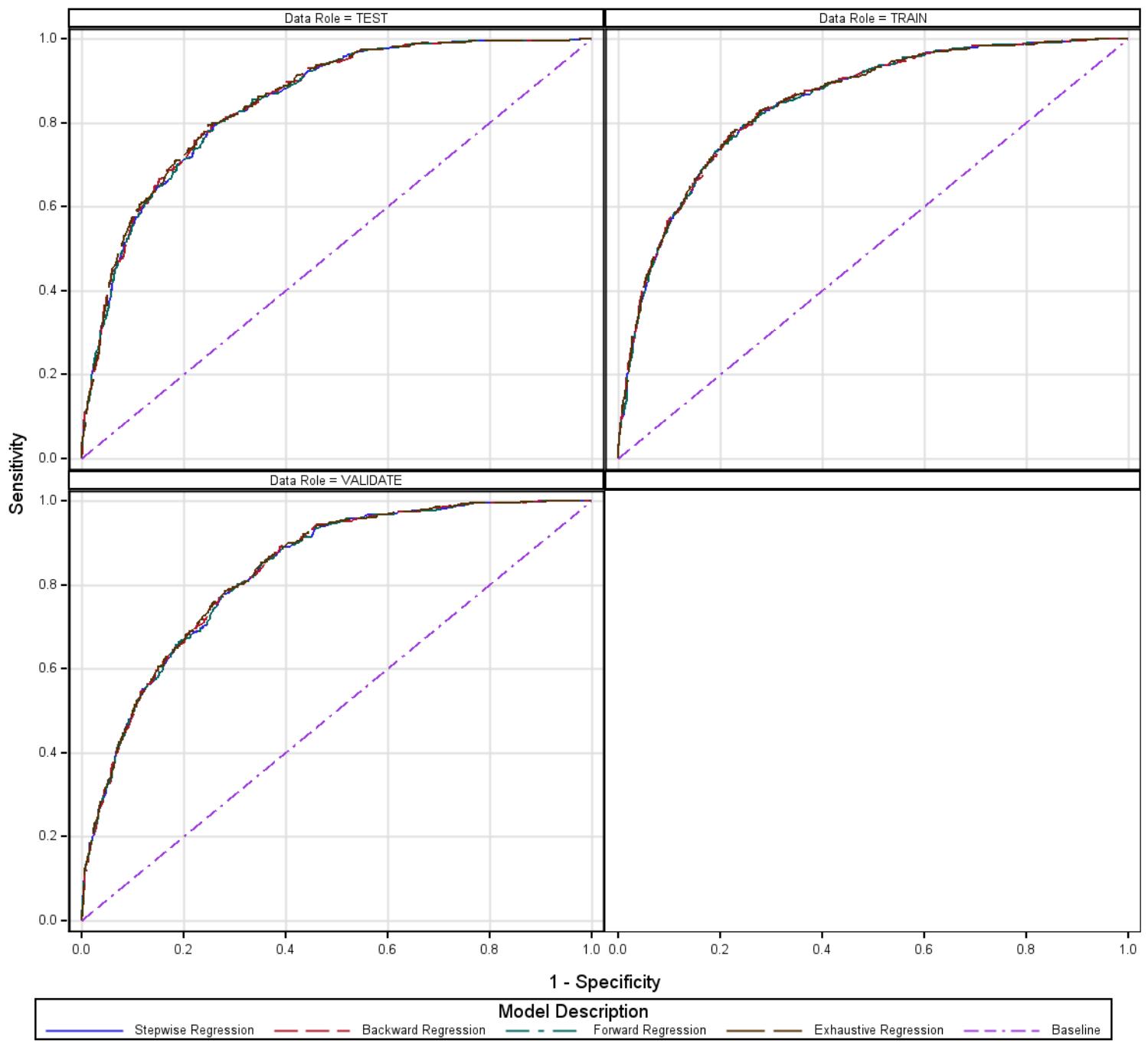


SAS Enterprise Miner Report

Node=Logical Model Comparison
Multiple Model Assessment Scores where DataRole=VALIDATE
TARGET='Churn'



SAS Enterprise Miner Report
Node=Logical Model Comparison
ROC Chart
TARGET='Churn' and EVENT='YES'



SAS Enterprise Miner Report

Node=DecisionTree Model Comparison Summary

Node id = MdlComp
 Node label = DecisionTree Model Comparison
 Meta path = Ids => Part => Tree4 => MdlComp
 Notes =

Node=DecisionTree Model Comparison Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	ModelCompare		NumberOfReportedLevels	1E-6		SelectionData	DEFAULT	
AssessAllTargetLevels	N		NumberofBins	20		SelectionDepth	10	
DecileBin	20		ProfitEpsilon	1E-6		SelectionTable	TRAIN	TABLE
HPCriteria	DEFAULT		RecomputeAssess	N		StatisticUsed	_VMISC_	
LiftEpsilon	1E-6		RocChart	Y		TargetLabel		
ModelCriteria	Valid: Misclassification Rate		RocEpsilon	0.01		TargetName	Churn	
ModelDescription	Decision Tree B3D6		RoiEpsilon	1E-6		classViyaCriteria	DEFAULT	
ModelId	Tree4		ScoreDistBin	20		intervalViyaCriteria	DEFAULT	
NormalizeReportingVariables	Y		SelectionCriteria	DEFAULT				

Node=DecisionTree Model Comparison Variable Summary

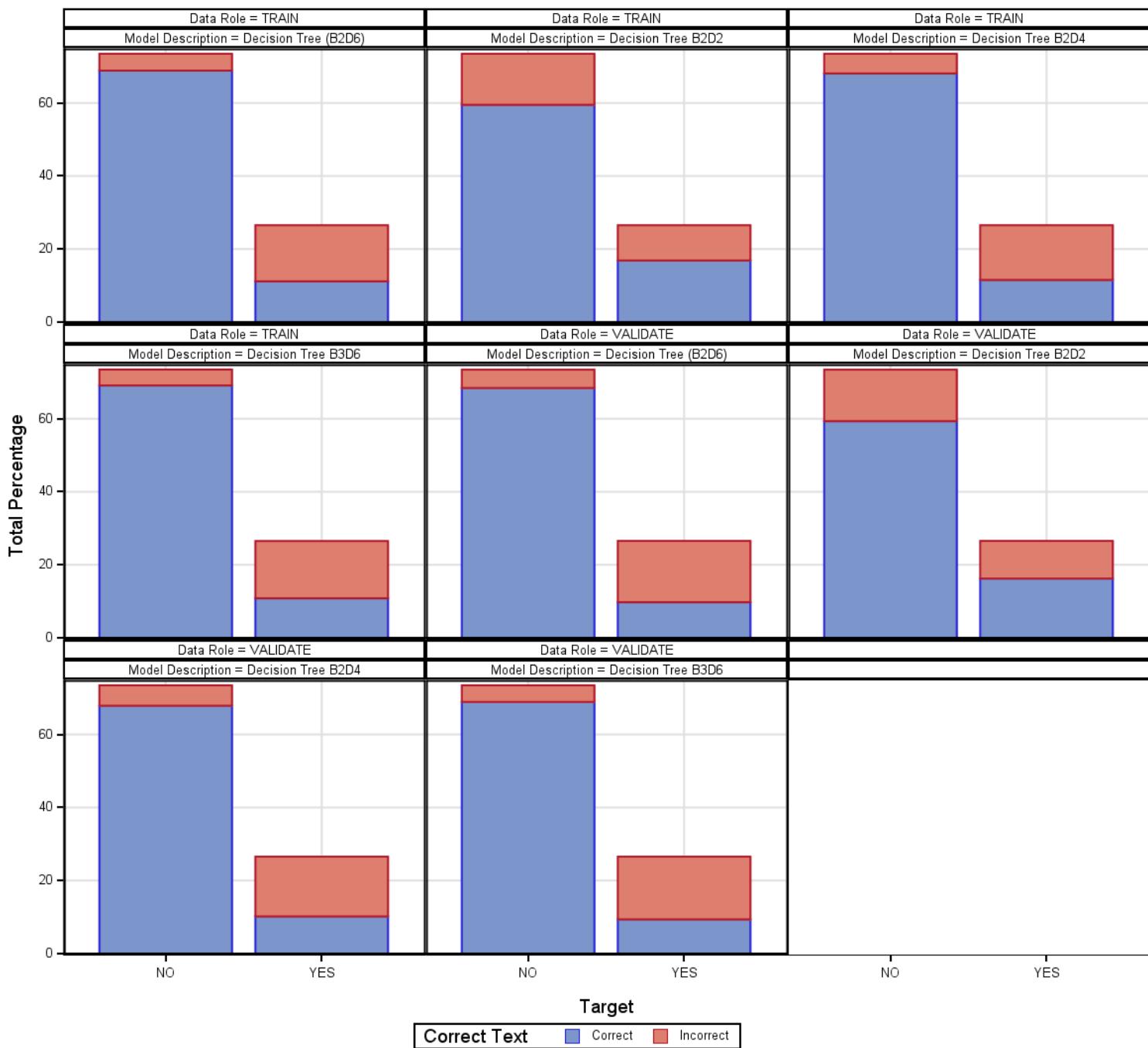
Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn

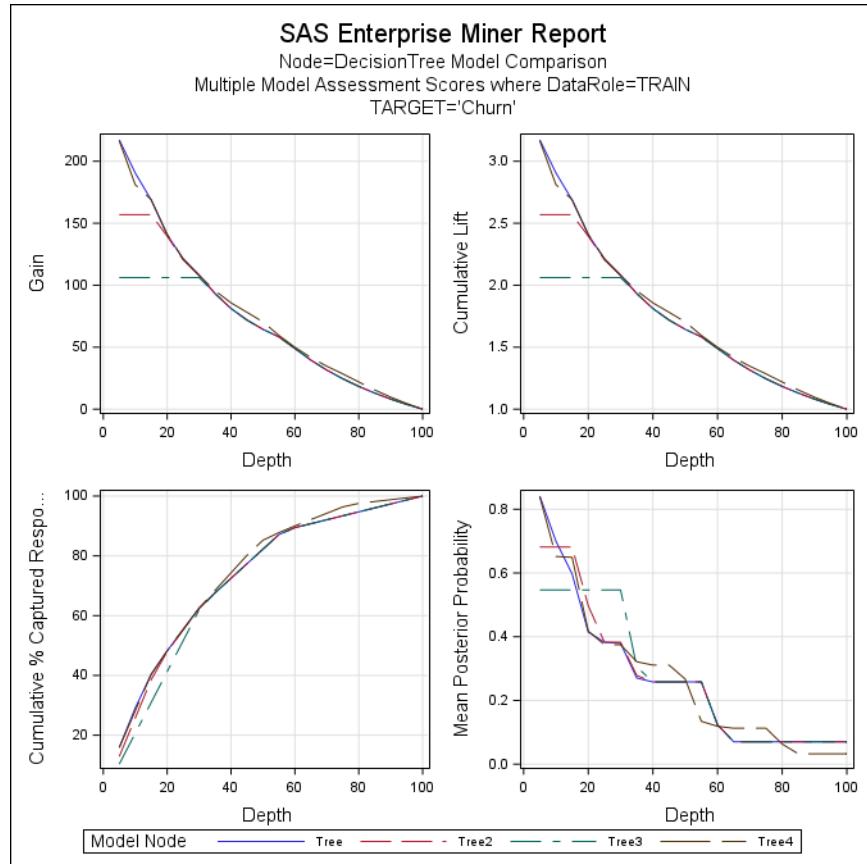
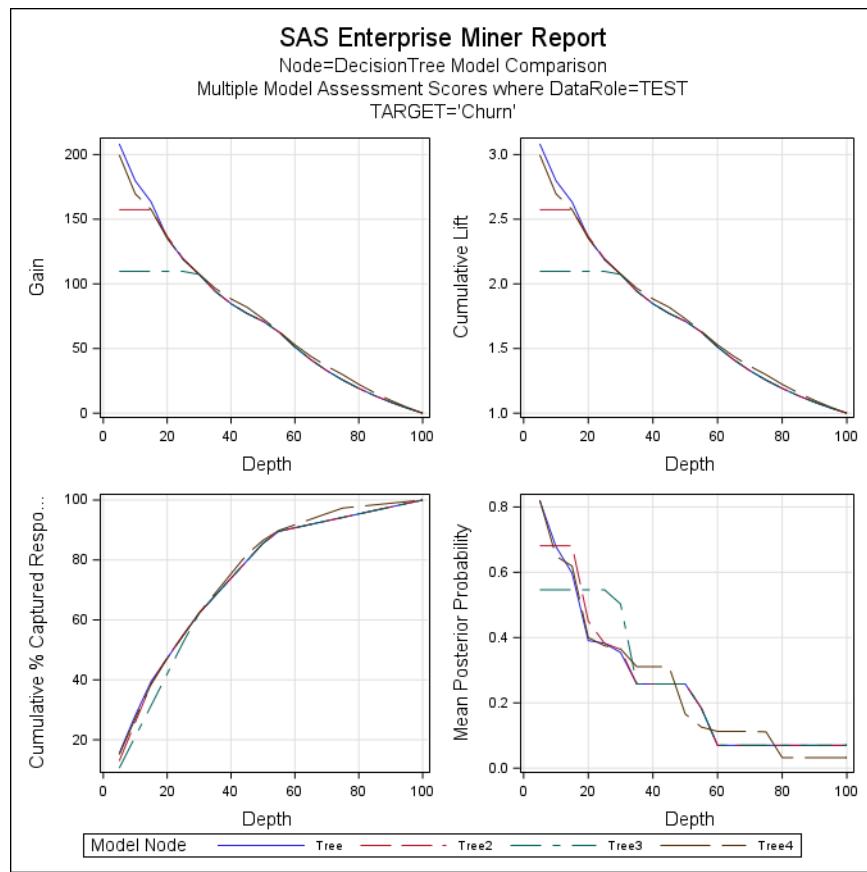
Node=DecisionTree Model Comparison Fit Statistics Table

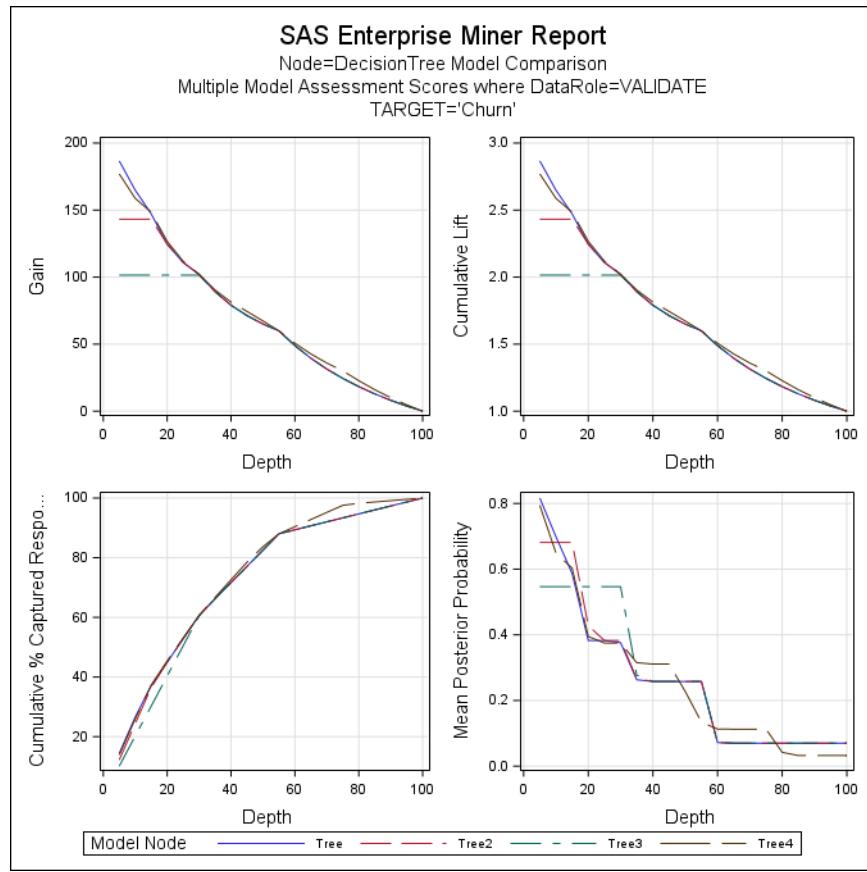
Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Train: Average Squared Error	Train: Misclassification Rate	Train: Kolmogorov-Smirnov Statistic
Y	Tree4	Tree4	Decision Tree B3D6	Churn		0.21723	0.14190	0.20057	0.488
	Tree	Tree	Decision Tree (B2D6)	Churn		0.21817	0.14354	0.19986	0.446
	Tree2	Tree2	Decision Tree B2D4	Churn		0.21959	0.14702	0.20376	0.446
	Tree3	Tree3	Decision Tree B2D2	Churn		0.24420	0.15383	0.23642	0.446

Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Valid: Average Squared Error	Valid: Misclassification Rate	Valid: Kolmogorov-Smirnov Statistic
Y	Tree4	Tree4	Decision Tree B3D6	Churn		0.21723	0.14983	0.21723	0.463
	Tree	Tree	Decision Tree (B2D6)	Churn		0.21817	0.15079	0.21817	0.449
	Tree2	Tree2	Decision Tree B2D4	Churn		0.21959	0.15235	0.21959	0.449
	Tree3	Tree3	Decision Tree B2D2	Churn		0.24420	0.15604	0.24420	0.449

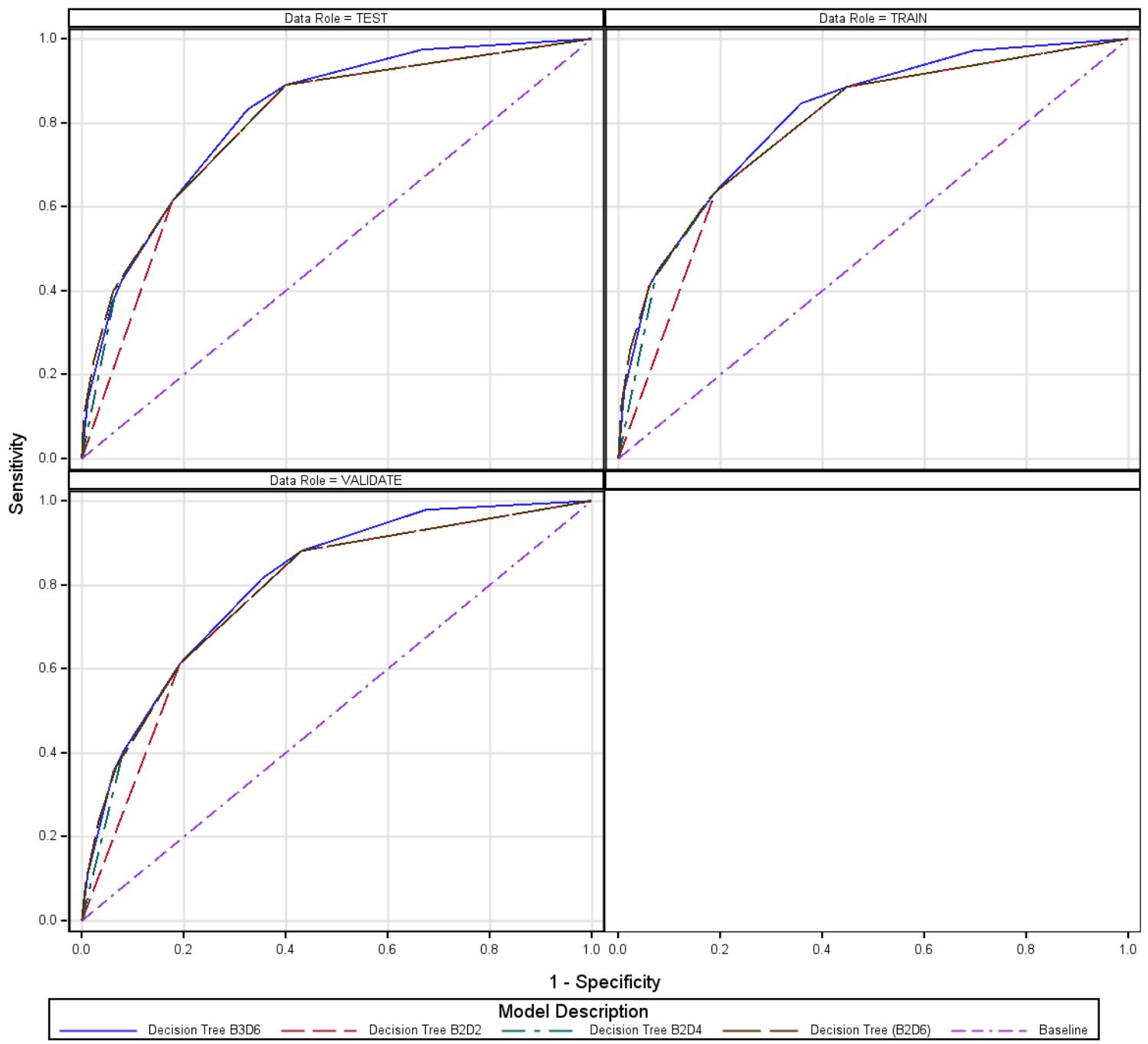
SAS Enterprise Miner Report
Node=DecisionTree Model Comparison
Classification Chart
TARGET='Churn' and _TYPE_='PREDICTION'







SAS Enterprise Miner Report
Node=DecisionTree Model Comparison
ROC Chart
TARGET='Churn' and EVENT='YES'



SAS Enterprise Miner Report

Node=SCORECHURNDATA Summary

Node id = lds2
 Node label = SCORECHURNDATA
 Meta path = lds2
 Notes =

Node=SCORECHURNDATA Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	DataSource		DsCreatedBy	vvish2		NBytes	1770496	.
ApplyIntervalLevelLowerLimit	Y		DsId	scorechurndata		NCols	21	.
ApplyMaxClassLevels	Y		DsModifiedBy	vvish2		NObs	7043	.
ApplyMaxPercentMissing	Y		DsModifyDate	2012928919.4		NewTable		
CMeta	WORK.M2F8ZC58		DsSampleName			NewVariableRole	REJECT	
ComputeStatistics	N		DsSampleSize			OutputType	VIEW	
DBPassThrough	Y		DsSampleSizeType			Role	SCORE	TRAIN
Data	SASUSER.SCORECHURNDATA		DsScope	LOCAL		Sample	D	
DataSelection	DATASOURCE		IdentifyEmptyColumns	Y		SampleSizeObs	10000	
DataSource	scorechurndata		IntervalLowerLimit	20		SampleSizePercent	20	
DataSourceRole	RAW		Library	SASUSER		SampleSizeType	PERCENT	
Description			MaxClassLevels	20		Scope	LOCAL	
DropMapVariables	Y		MaxPercentMissing	50		Segment		
DsCreateDate	2012928919.1		MetaAdvisor	BASIC		Table	SCORECHURNDATA	

Node=SCORECHURNDATA Data Attributes

Attribute	Value	Attribute	Value	Attribute	Value
Data Name	SCORECHURNDATA	Date Created	14Oct2023:16:52:11	Data Size	1770496
Data Type	DATA	Date Modified	14Oct2023:16:52:11	Role	RAW
Data Label		Number Rows	7043	Segment	
Engine	V9	Number Columns	21	Data Library	SASUSER

Node=SCORECHURNDATA Variables List

Name	Label	Role	Level	Type	Length	Format	Creator
Churn		INPUT	BINARY	C	3	\$3.	
Contract		INPUT	NOMINAL	C	14	\$14.	
Dependents		INPUT	BINARY	C	3	\$3.	
DeviceProtection		INPUT	NOMINAL	C	19	\$19.	
InternetService		INPUT	NOMINAL	C	11	\$11.	
MonthlyCharges		INPUT	INTERVAL	N	8	BEST12.0	
MultipleLines		INPUT	NOMINAL	C	16	\$16.	
OnlineBackup		INPUT	NOMINAL	C	19	\$19.	
OnlineSecurity		INPUT	NOMINAL	C	19	\$19.	
PaperlessBilling		INPUT	BINARY	C	3	\$3.	
Partner		INPUT	BINARY	C	3	\$3.	

Name	Label	Role	Level	Type	Length	Format	Creator
PaymentMethod		INPUT	NOMINAL	C	25	\$25.	
PhoneService		INPUT	BINARY	C	3	\$3.	
SeniorCitizen		INPUT	BINARY	N	8	BEST12.0	
StreamingMovies		INPUT	NOMINAL	C	19	\$19.	
StreamingTV		INPUT	NOMINAL	C	19	\$19.	
TechSupport		INPUT	NOMINAL	C	19	\$19.	
TotalCharges		INPUT	INTERVAL	N	8	BEST12.0	
customerID		REJECTED	NOMINAL	C	10	\$10.	
gender		INPUT	BINARY	C	6	\$6.	
tenure		INPUT	INTERVAL	N	8	BEST12.0	

SAS Enterprise Miner Report

Node=Class Model Comparison Summary

Node id = MdlComp2
 Node label = Class Model Comparison
 Meta path = Ids => Part => Reg => MdlComp3 => MdlComp2
 Notes =

Node=Class Model Comparison Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	ModelCompare		NumberOfReportedLevels	1E-6		SelectionData	DEFAULT	
AssessAllTargetLevels	N		NumberofBins	20		SelectionDepth	10	
DecileBin	20		ProfitEpsilon	1E-6		SelectionTable	TRAIN	TABLE
HPCriteria	DEFAULT		RecomputeAssess	N		StatisticUsed	_VMISC_	
LiftEpsilon	1E-6		RocChart	Y		TargetLabel		
ModelCriteria	Valid: Misclassification Rate		RocEpsilon	0.01		TargetName	Churn	
ModelDescription	Exhaustive Regression		RoiEpsilon	1E-6		classViyaCriteria	DEFAULT	
ModelId	Reg		ScoreDistBin	20		intervalViyaCriteria	DEFAULT	
NormalizeReportingVariables	Y		SelectionCriteria	DEFAULT				

Node=Class Model Comparison Variable Summary

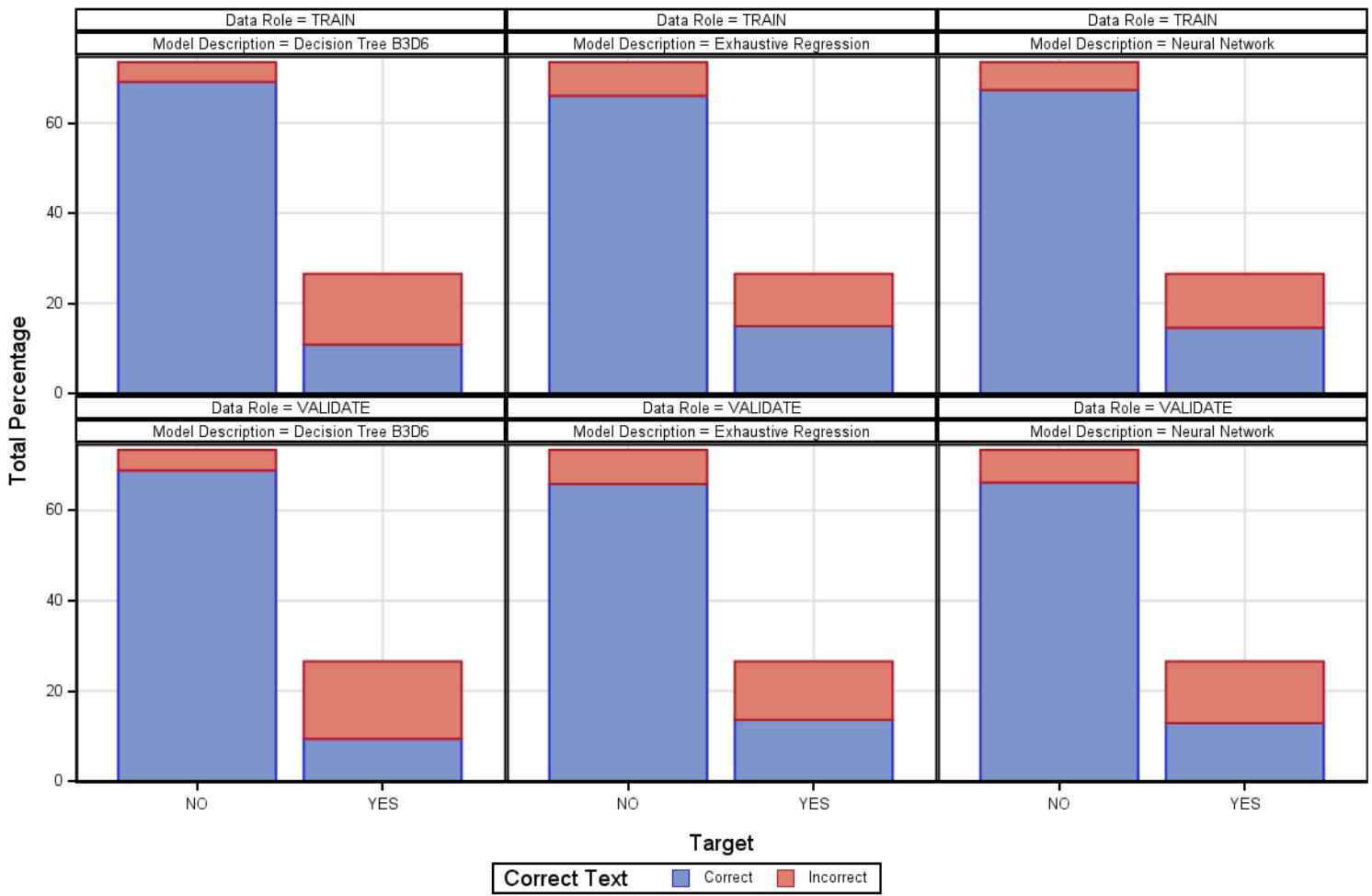
Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn

Node=Class Model Comparison Fit Statistics Table

Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Train: Average Squared Error	Train: Misclassification Rate	Train: Kolmogorov-Smirnov Statistic
Y	MdlComp3	Reg	Exhaustive Regression	Churn		0.20540	0.13272	0.19063	0.555
	MdlComp4	Neural	Neural Network	Churn		0.20918	0.12650	0.18140	0.587
	MdlComp	Tree4	Decision Tree B3D6	Churn		0.21723	0.14190	0.20057	0.488

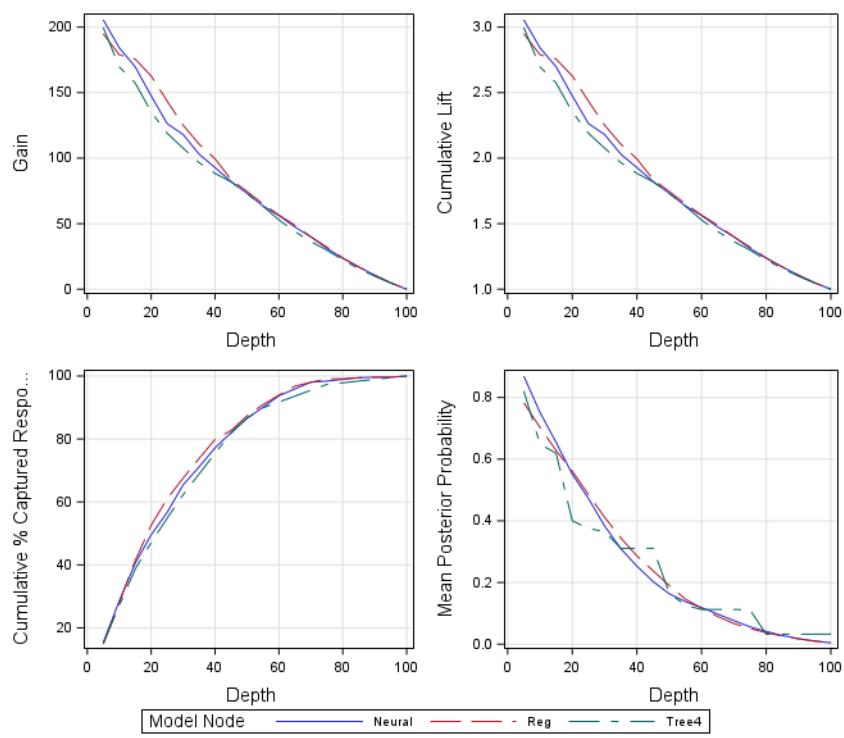
Selected Model	Predecessor Node	Model Node	Model Description	Target Variable	Target Label	Selection Criterion: Valid: Misclassification Rate	Valid: Average Squared Error	Valid: Misclassification Rate	Valid: Kolmogorov-Smirnov Statistic
Y	MdlComp3	Reg	Exhaustive Regression	Churn		0.20540	0.14114	0.20540	0.503
	MdlComp4	Neural	Neural Network	Churn		0.20918	0.14404	0.20918	0.487
	MdlComp	Tree4	Decision Tree B3D6	Churn		0.21723	0.14983	0.21723	0.463

SAS Enterprise Miner Report
Node=Class Model Comparison
Classification Chart
TARGET='Churn' and _TYPE_='PREDICTION'



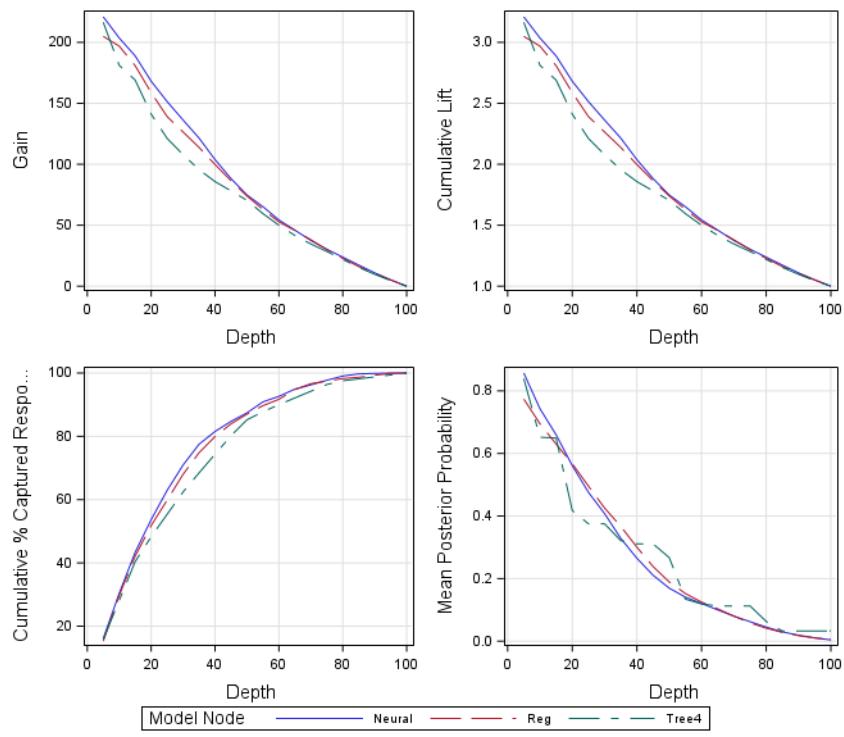
SAS Enterprise Miner Report

Node=Class Model Comparison
 Multiple Model Assessment Scores where DataRole=TEST
 TARGET='Churn'



SAS Enterprise Miner Report

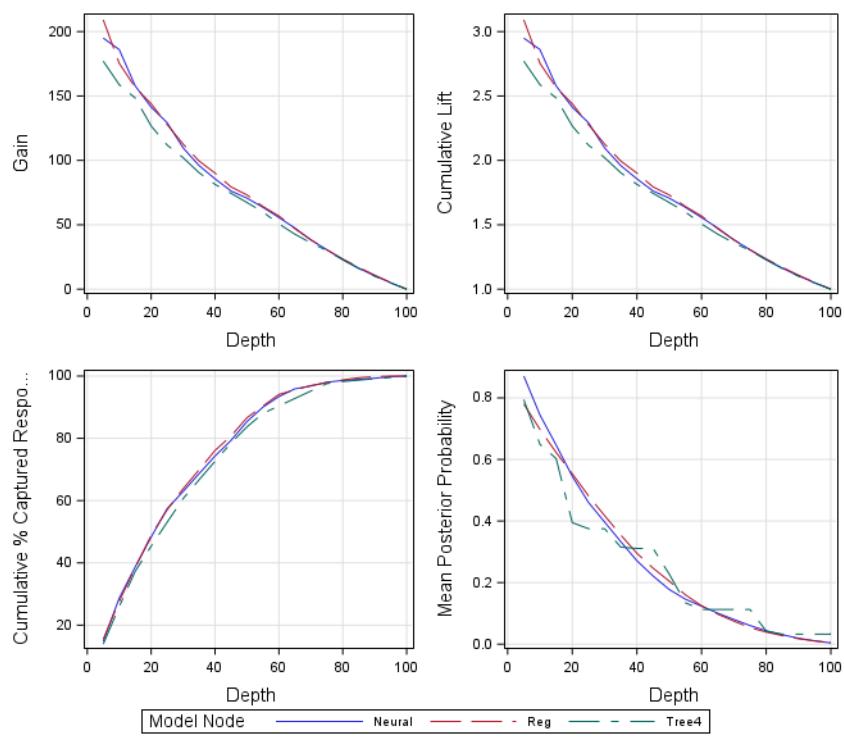
Node=Class Model Comparison
 Multiple Model Assessment Scores where DataRole=TRAIN
 TARGET='Churn'



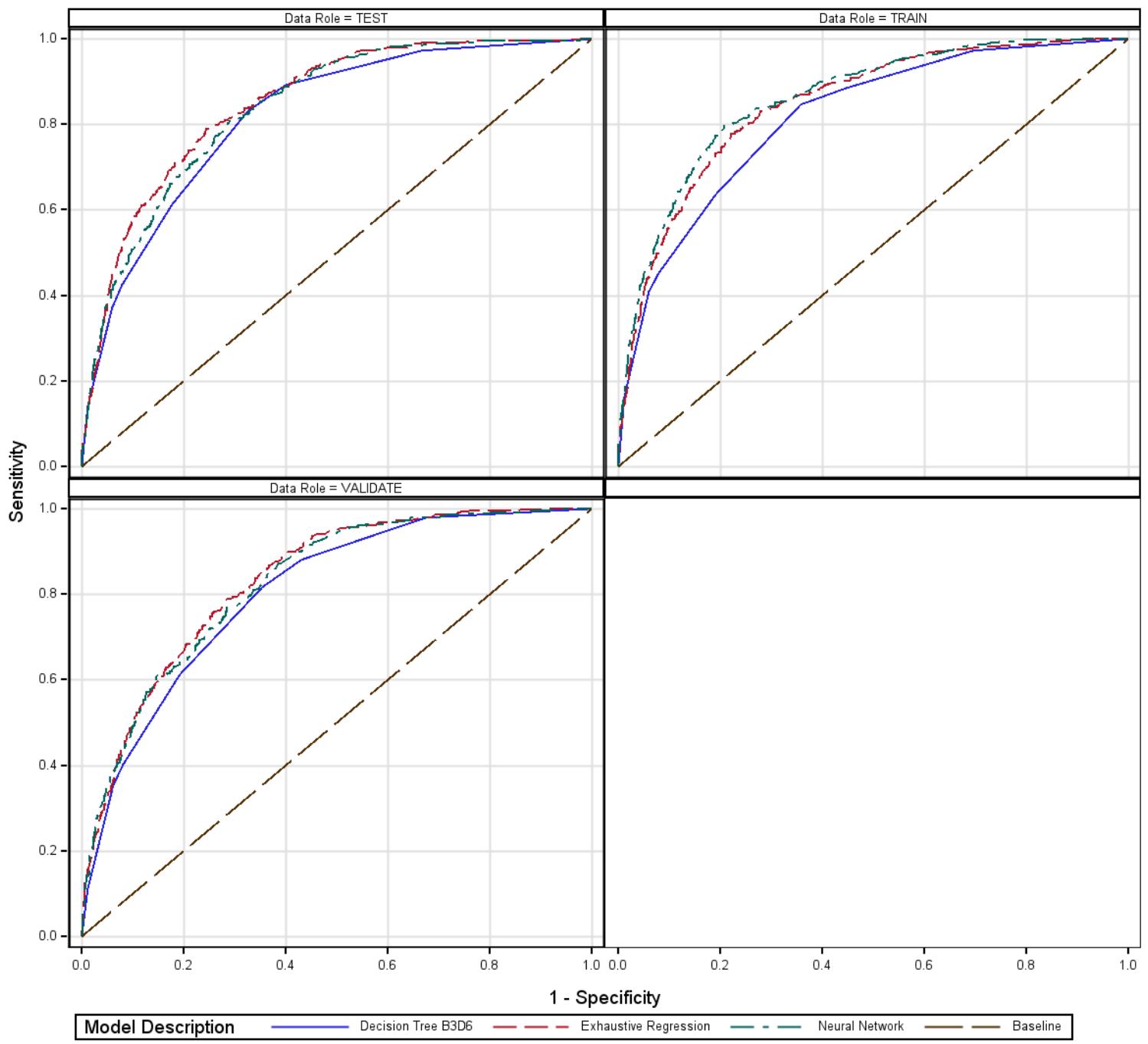
SAS Enterprise Miner Report

Node=Class Model Comparison

Multiple Model Assessment Scores where DataRole=VALIDATE
TARGET='Churn'



SAS Enterprise Miner Report
 Node=Class Model Comparison
 ROC Chart
 TARGET='Churn' and EVENT='YES'



SAS Enterprise Miner Report

Node=Score Summary

Node id = Score
 Node label = Score
 Meta path = Ids => Part => Reg => MdlComp3 => MdlComp2 => Score
 Notes =

Node=Score Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	Score		HideInput	Y		JScore	N	
CScore	N		HideOther	Y		OptimizedCode	Y	
FixedOutputNames	Y		HidePredict	Y		OutputType	VIEW	
GraphReports	Y		HideRejected	Y		PackageName	DEFAULT	
HideAssess	Y		HideResidual	Y		PreferenceName		
HideClassification	Y		HideTarget	Y		ScoreTest	N	
HideFreq	Y		HideVariables	N		ScoreValidate	Y	N

Node=Score Variable Summary

Role	Level	Frequency Count	Name
TARGET	BINARY	1	Churn
SEGMENT	NOMINAL	1	b_Churn

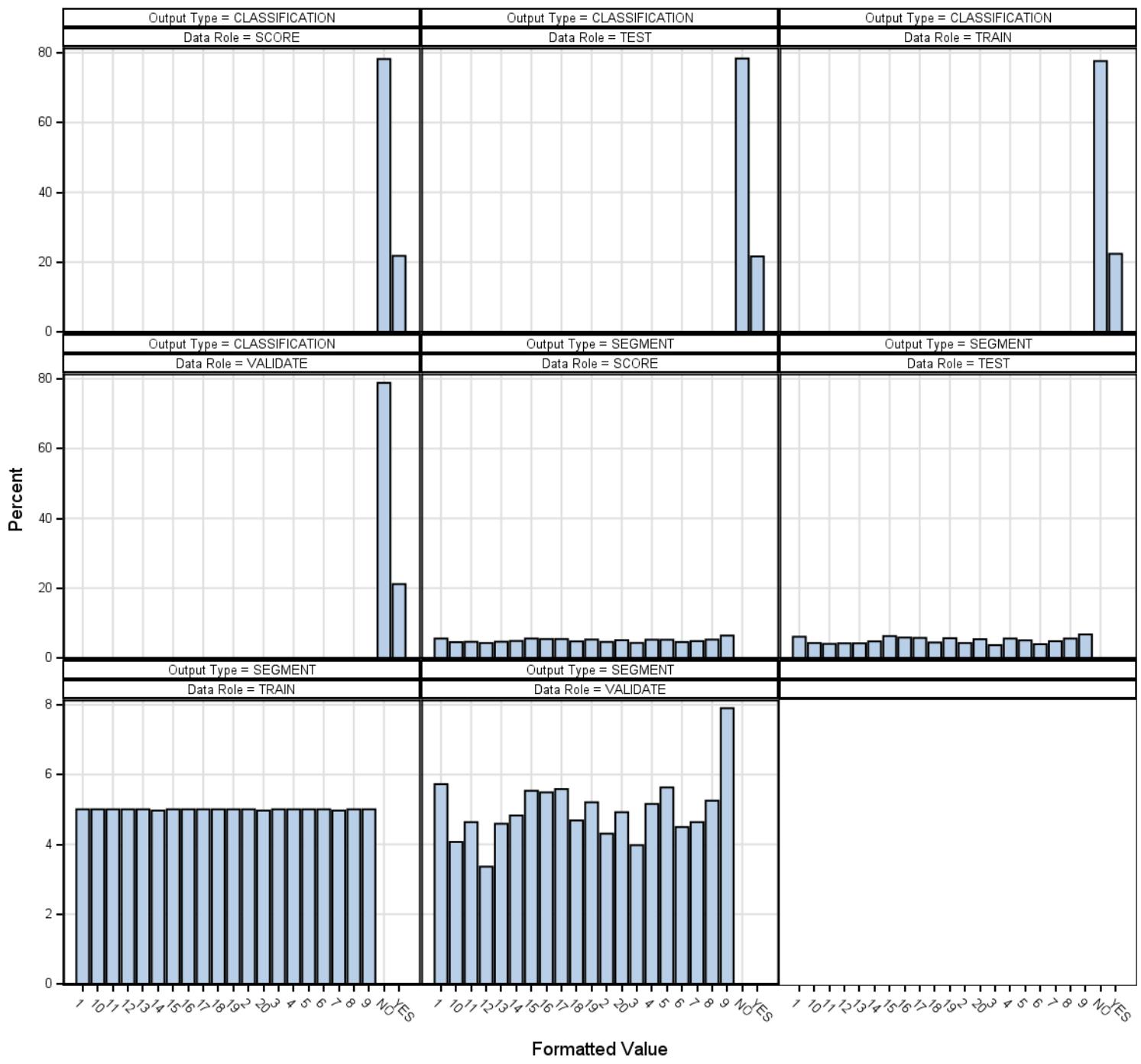
Node=Score Output Variables

Variable Name	Creator	Variable Label	Function	Type
EM_CLASSIFICATION	Score	Prediction for Churn	CLASSIFICATION	C
EM_EVENTPROBABILITY	Score	Probability for level YES of Churn	PREDICT	N
EM_PROBABILITY	Score	Probability of Classification	PREDICT	N
EM_SEGMENT	Score	Segment	TRANSFORM	N
I_Churn	Reg	Into: Churn	CLASSIFICATION	C
P_ChurnNo	Reg	Predicted: Churn=No	PREDICT	N
P_ChurnYes	Reg	Predicted: Churn=Yes	PREDICT	N
U_Churn	Reg	Unnormalized Into: Churn	CLASSIFICATION	C
WARN	Reg	Warnings	ASSESS	C
b_Churn	MdlComp3		TRANSFORM	N

SAS Enterprise Miner Report

Node=Score

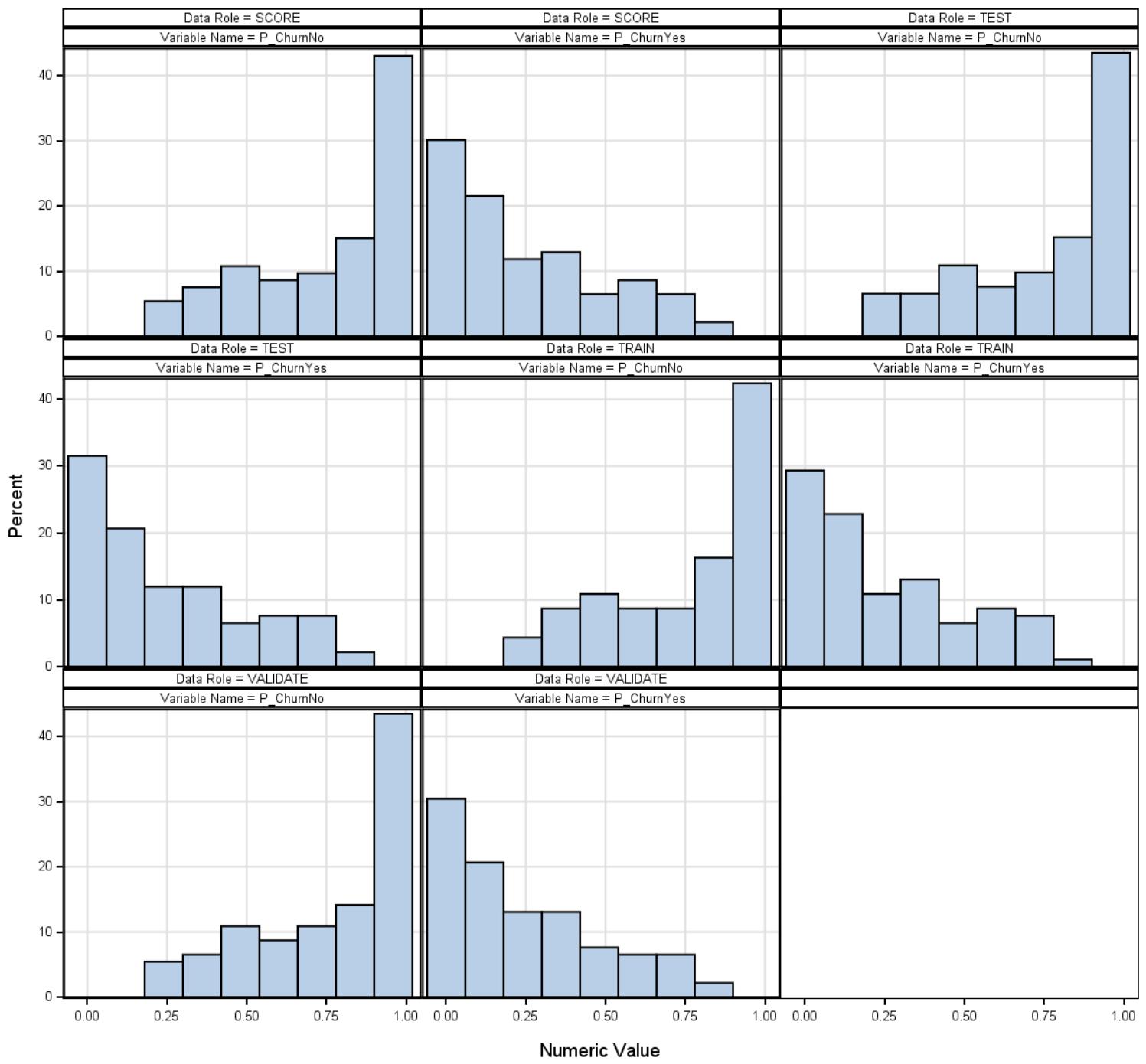
Bar Chart



SAS Enterprise Miner Report

Node=Score

Histogram



SAS Enterprise Miner Report

Node=Save Data Summary

Node id = EMSave
 Node label = Save Data
 Meta path = Ids => Part => Reg => MdlComp3 => MdlComp2 => Score => EMSave
 Notes =

Node=Save Data Properties

Property	Value	Default	Property	Value	Default	Property	Value	Default
Component	EMSave		Name			Train	Y	
AllObs	Y		OutObs	1000		Transaction	Y	
AllRoles	Y		Replace	Y		Type	SAS7BDAT	SAS7DBAT
DirectorySelector			Score	Y		Validate	Y	
Lib			Test	Y				

Node=Save Data Variable Summary

Role	Level	Frequency Count	Name
INPUT	BINARY	6	Dependents PaperlessBilling Partner PhoneService SeniorCitizen gender
INPUT	INTERVAL	3	MonthlyCharges TotalCharges tenure
INPUT	NOMINAL	10	Contract DeviceProtection InternetService MultipleLines OnlineBackup OnlineSecurity PaymentMethod StreamingMovies StreamingTV TechSupport

Node=Save Data Data

Data Library	Output Location	Total Observations	Saved Observations	Number of Variables
_em_save	\uisnutvdiprof1a\redirected\$\vvish2\Documents\vvish2576\DataMiningProject\Workspaces\EMWS2\EMSave\em_save_TRAIN.sas7bdat	2817	MAX	32
_em_save	\uisnutvdiprof1a\redirected\$\vvish2\Documents\vvish2576\DataMiningProject\Workspaces\EMWS2\EMSave\em_save_VALIDATE.sas7bdat	2113	MAX	32
_em_save	\uisnutvdiprof1a\redirected\$\vvish2\Documents\vvish2576\DataMiningProject\Workspaces\EMWS2\EMSave\em_save_TEST.sas7bdat	2113	MAX	32
_em_save	\uisnutvdiprof1a\redirected\$\vvish2\Documents\vvish2576\DataMiningProject\Workspaces\EMWS2\EMSave\em_save_SCORE.sas7bdat	7043	MAX	27

End of Report