CUSTOMER CHURN PROJECT

CHAITRA HOSMANI

NAMITA JAGGI

NOHA SEDDIK

SHALINI VARANASI

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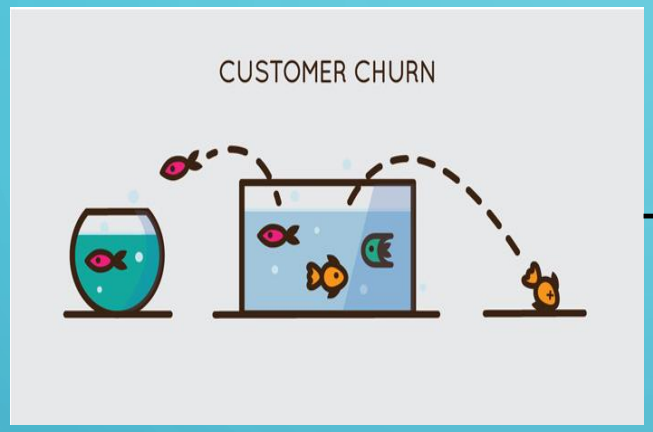
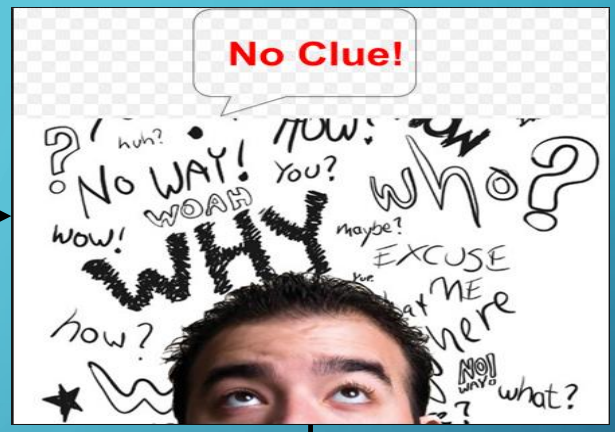
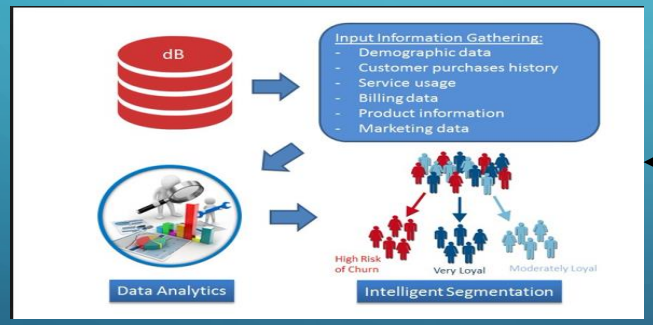
RESEARCH QUESTION: WHY DO CUSTOMERS CHURN?





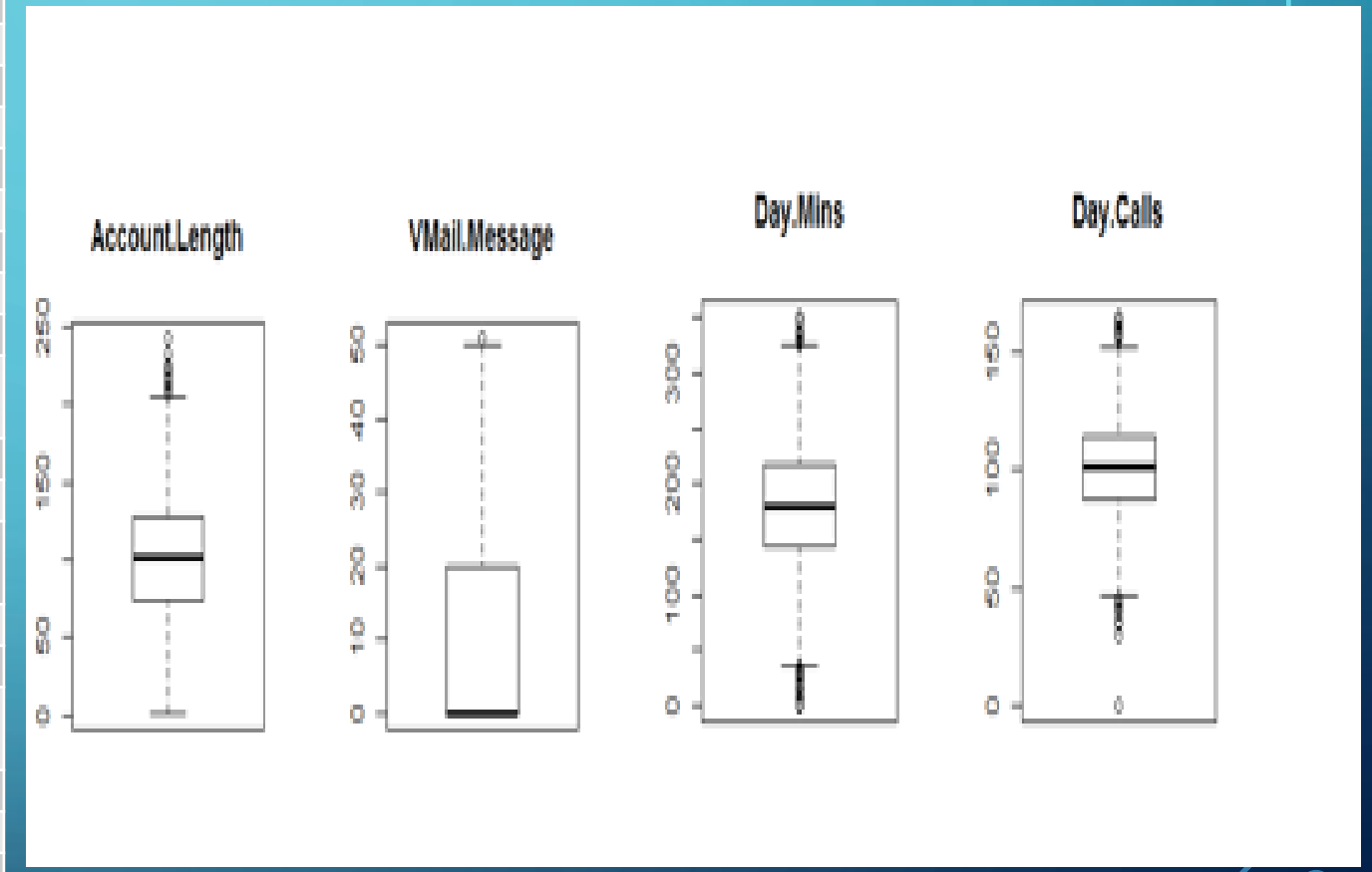


DATA PREPARATION

ATTRIBUTES

Attributes	Type	Status
State	Categorical	Removed
Account Length	Quantitative discrete	
Area Code	Categorical	Removed
Phone	Categorical	Removed
Intl Plan	Categorical	
VMail Plan	Categorical	
VMail Message	Quantitative discrete	Removed
Day Mins	Quantitative continuous	Removed -Used in Total Local Mins
Day Calls	Quantitative discrete	Removed -Used in Total Local Calls
Day Charge	Quantitative continuous	Removed -Used in Total Local Charge
Eve Mins	Quantitative continuous	Removed -Used in Total Local Min
Eve Calls	Quantitative discrete	Removed -Used in Total Local Calls
Eve Charge	Quantitative continuous	Removed -Used in Total Local Charge
Night Mins	Quantitative continuous	Removed -Used in Total Local Min
Night Calls	Quantitative discrete	Removed -Used in Total Local Calls
Night Charge	Quantitative continuous	Removed -Used in Total Local Charge
Intl Mins	Quantitative continuous	
Intl Calls	Quantitative discrete	
Intl Charge	Quantitative continuous	
Cust-Service Calls	Quantitative discrete	
Total Local Mins	Quantitative continuous	New
Total Local Calls	Quantitative discrete	New
Total Local Charge	Quantitative continuous	New
Churn?	Categorical (Class attribute)	

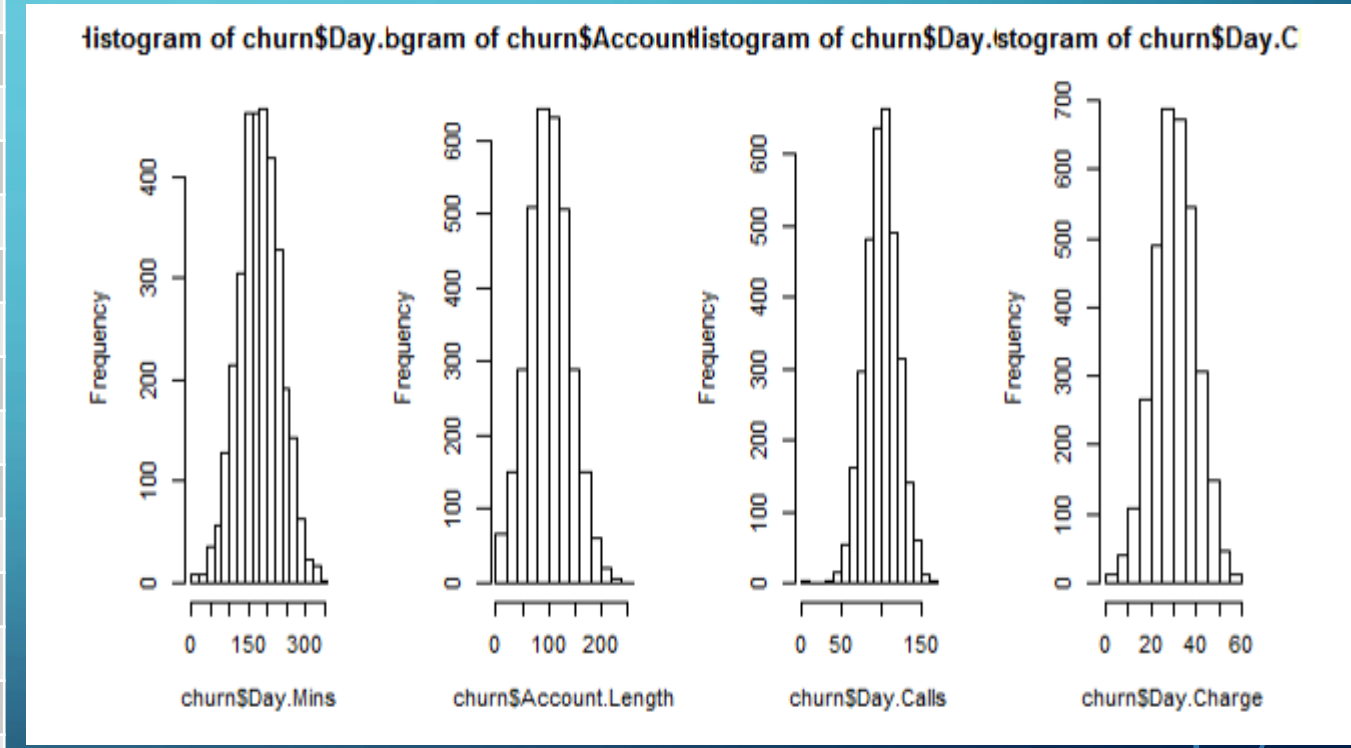
ANY OUTLIERS?



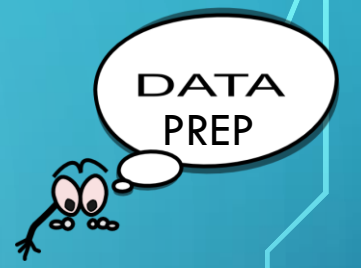
BASIC STATS FOR ATTRIBUTES

Attributes	Mean	STD	Min	Max
State	…….	…….	…….	…….
Account Length	101.0648	39.82211	1	243
Area Code	…….	…….	…….	…….
Phone	…….	…….	…….	…….
Intl Plan	…….	…….	…….	…….
VMail Plan	…….	…….	…….	…….
VMail Message	8.09901	13.68837	0	51
Day Mins	179.7751	54.46739	0	350.8
Day Calls	100.4356	20.06908	0	165
Day Charge	30.56231	9.259435	0	59.64
Eve Mins	200.9803	50.71384	0	363.7
Eve Calls	100.1143	19.92263	0	170
Eve Charge	17.08354	4.310668	0	30.91
Night Mins	200.872	50.57385	23.2	395
Night Calls	100.1077	19.56861	33	175
Night Charge	9.039325	2.275873	1.04	17.77
Intl Mins	10.23729	2.79184	0	20
Intl Calls	4.479448	2.461214	0	20
Intl Charge	2.764581	0.753773	0	5.4
CustServ Calls	1.562856	1.315491	0	9
Total Local Mins				
Total Local Calls				
Total Local Charge				
Churn?				

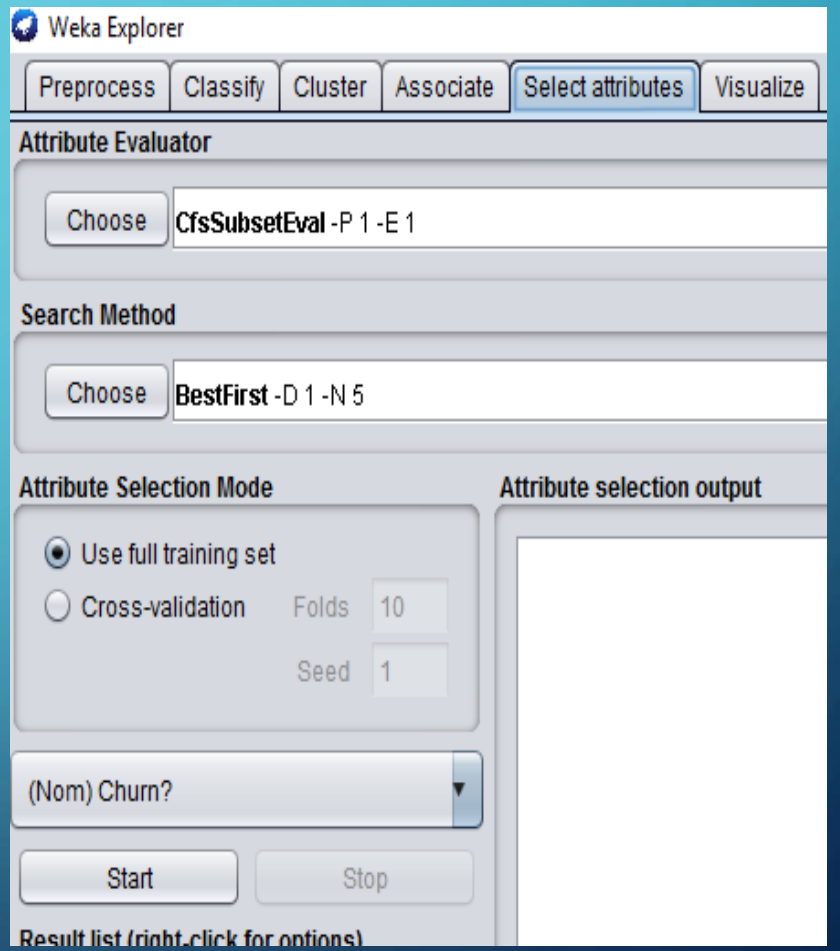
NORMALITY OF ATTRIBUTES



ATTRIBUTE SELECTION



Attribute evaluator	Attribute selected	Excluded attribute	
Best first + cfsubseteval	Phone Number, Inter Plan, Total Day Min, No of Calls Customer Service		
Ranker-Correlation		State, total day call, account length, phone no, total evening call, total night call, area code	Based on correlation ranking
Ranker-gain ratio attribute eval		Account, total night call, night min, day call, evening call, night charges	Based on gain ratio ranking
Ranker-information gain		Account, night mint, day call, evening call, night call, night charges	Information gain ranking

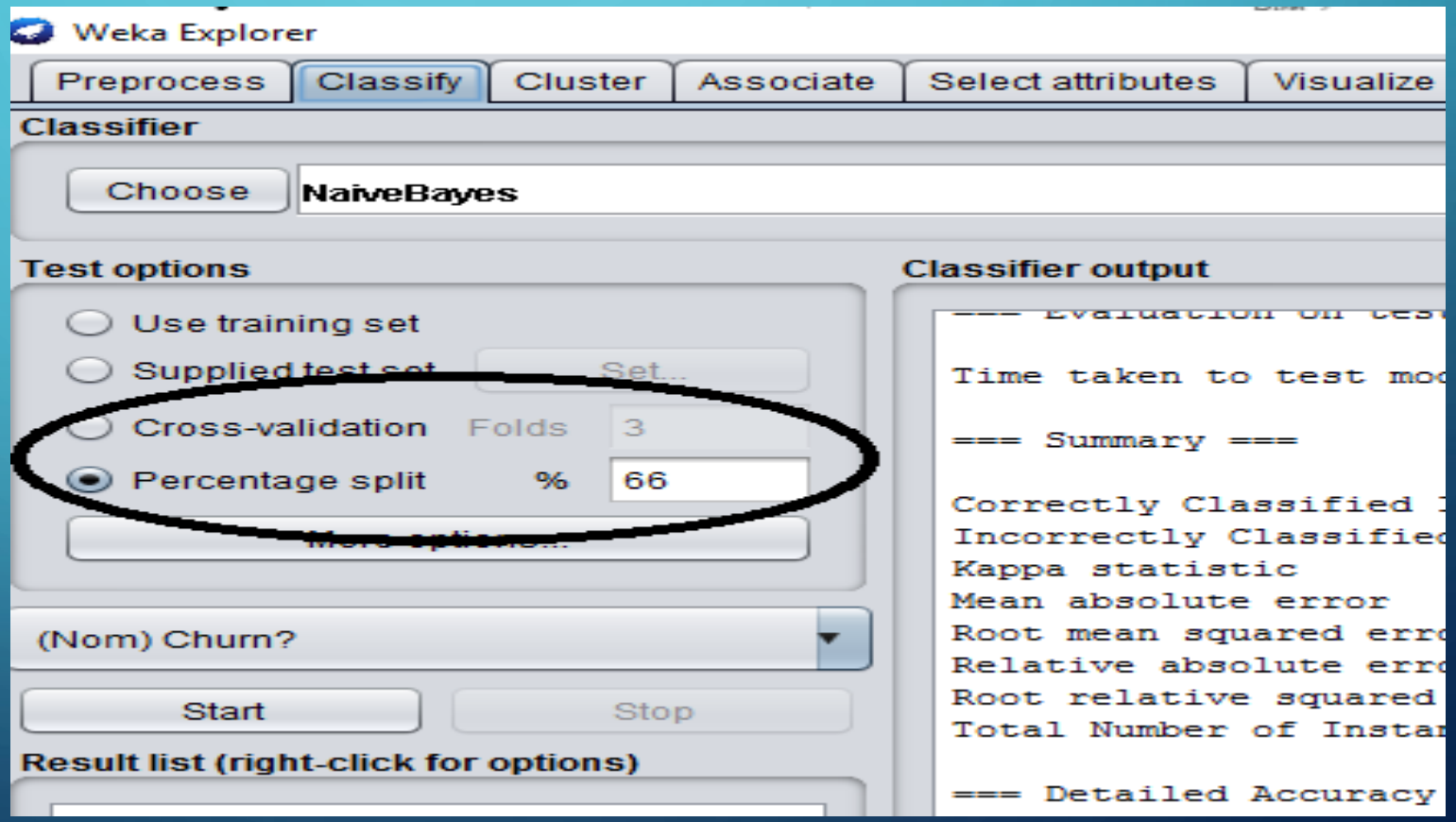


PREDICTIVE MODELLING / CLASSIFICATION

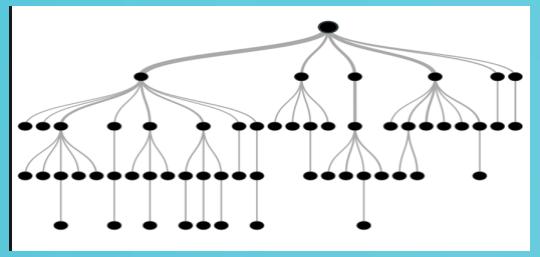
PREDICTIVE MODELING/CLASSIFICATION

Data Set division used

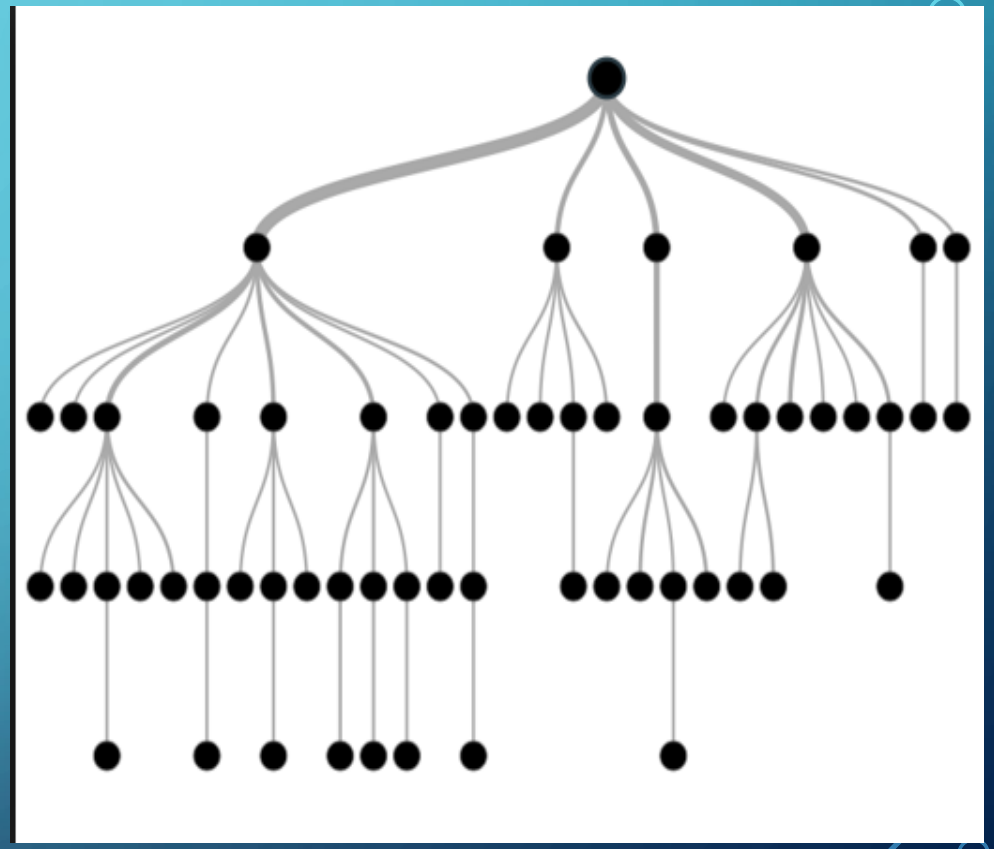
- 10 fold cross validation
- 3 fold cross validation
- Percentage split(66%)



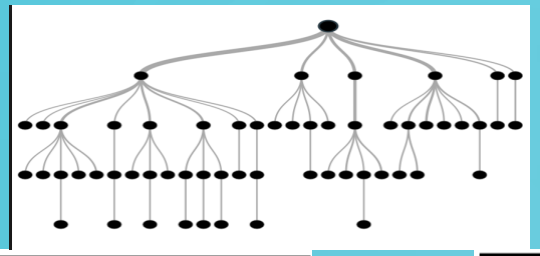
DECISION TREE

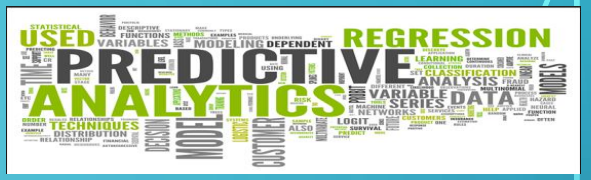


- **First analysis using all attributes**
- **Second analysis using 14 attributes:**
  - Excluding state, account, area, phone, day call, even call, night call
- **Third analysis using 9 attributes:**
  - Int plan, vmail plan, int min, int calls, int charge, Cust calls, total min, total charge, churn
- **Forth analysis using 9 attributes without outliers**



DECISION TREE





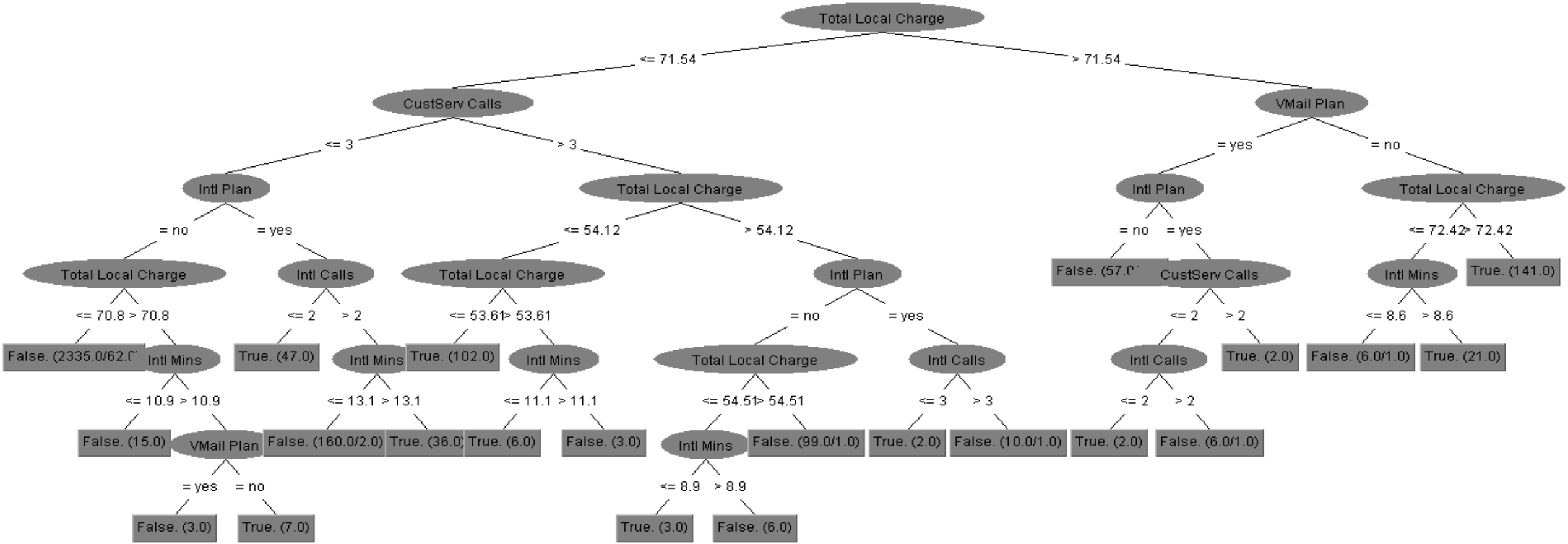
	All Attributes					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.981	0.352	0.994	0.463	0.98	0.36
Correctly classified instances	93.28%		92.76%		93.07%	

	9 Attributes (Int plan,vmail plan,int min,int calls,int charge,cust calls,total min,Total charge,churn)					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.996	0.182	0.994	0.14	0.995	0.178
Correctly classified instances	96.99%		97.17%		96.97%	

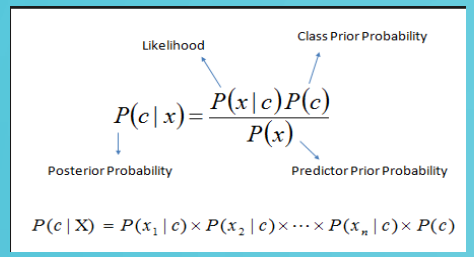
	14 Attributes(remove[State,acount,area,phone,day call,even call,night call])					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.978	0.296	0.994	0.366	0.977	0.286
Correctly classified instances	93.82%		94.17%		93.91%	

	9 Attributes-Excluding outliers					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.995	0.192	0.98	0.32	0.993	0.158
Correctly classified instances	96.87%		93.61%		97.31%	

DECISION TREE



NAÏVE BAYES



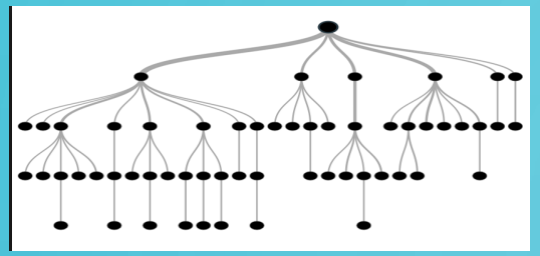
	All Attributes					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.935	0.466	0.93	0.48	0.94	0.47
Correctly classified instances	87.66%		87.66%		87.93%	

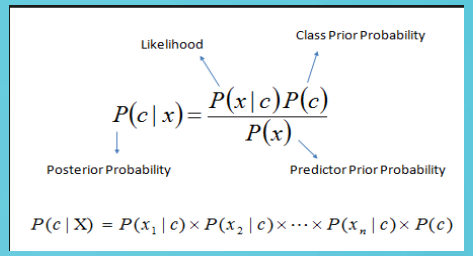
	9 Attributes (Int plan,vmail plan,int min,int calls,int charge,cust calls,total min,Total charge,churn)					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.98	0.69	0.97	0.69	0.98	0.71
Correctly classified instances	87.91%		86.05%		87.52%	

	14 Attributes (remove[State,acount,area,phone,day call,even call,night call])					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.96	0.56	0.95	0.543	0.96	0.55
Correctly classified instances	88.24%		87.91%		88.33%	

	9 Attributes-Excluding outliers					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.97	0.6	0.96	0.56	0.97	0.64
Correctly classified instances	88.66%		89.26%		88.07%	

PART





	9 Attributes (Int plan, vmail plan, int min, int calls, int charge, Cust calls, total min, Total charge, churn)					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.996	0.164	0.995	0.14	0.995	0.188
Correctly classified instances	97.26%		97.26%		96.82%	

	9 Attributes-Excluding outliers					
	Cross validation Folders 10		Split 66%		Cross validation Folders 3	
Class	TP	FP	TP	FP	TP	FP
FALSE	0.995	0.194	0.998	0.21	0.998	0.187
Correctly classified instances	96.84%		97.02%		97.13%	

POST-PREDICTIVE ANALYSIS

POST-PREDICTION ANALYSIS

K-means Algorithm

3 Clusters,9 Attributes, Test mode: split 66% train, remainder test.

Attribute	Full Data	0	1	2
Intl Plan	no	no	no	no
VMail Plan	no	no	no	no
Intl Mins	10.7733	10.8885	8.0909	**13.1289**
Intl Calls	4.1258	3.5862	4.1	4.5372
Intl Charge	2.9092	2.9403	2.1851	3.5451
CustServ Calls	2.2862	**4.4023**	1.5545	1.4298
Total Calls	303.5723	297.8046	302.6	308.6033
Total Charge	62.6373	47.2477	**68.1117**	**68.7258**
Churn	True.	True.	True.	True.

POST-PREDICTION ANALYSIS

K-means Algorithm

3 Clusters,9 Attributes, Test mode: split 66% train, remainder test.

Group 1: High Customer service call

Group 2: High Local Cost

Group 3: High International and Local Cost

POST-PREDICTION ANALYSIS

K-means Algorithm

Recommendation:

Group 1: customers should get speedy access and solution to their issues.

Group 2: Alert customer on their usage and allow to set limit

Group 3: create special international package and alerts for high usage

CONCLUSION

1. Selecting Attributes is very important to produce more accurate result in classification.

2.The best algorithm in this dataset is Decision Tree or PART as shown below: