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Analysis Approach

01. Understanding Business Problem

02. Data Preparation



03. Feature Correlation

04. Top Feature affecting Customer Churn

05. ActionSuggested

Understanding Business Problem





Problem Statement

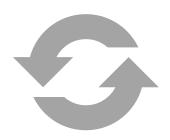
- Predict whether the customer will churn or not in Churn Phase while analysis the Data of customer in Action Phase. Churn to be predicted of High Value Customer as 80% of the revenue is contributed by these 20% of total customer.
- High value Customers are those whose recharge value is greater then 70% of average recharge value.
 Customer data is of period June to Sept, where sept period is of churn phase customers.

Understanding customer behaviour during churn



• Customers usually do not decide to switch to another competitor instantly, but rather over a period of time (this is especially applicable to high-value customers). In churn prediction, we assume that there are three phases of the customer lifecycle:.







Good' phase: In this phase, the customer is happy with the service and behaves as usual.

Action' phase: The customer experience starts to sore in this phase. In this phase, the customer usually shows different behaviour than in the 'good' months.

The **'Churn' phase:** In this phase, the customer is said to have churned.



Data Understanding

- The dataset contains customer-level information for a span of four consecutive months June, July, August and September. The months are encoded as 6, 7, 8 and 9, respectively.
- The business objective is to predict the churn in the last (i.e. the ninth) month using the data (features) from the first three months.
- To do this task well, understanding the typical customer behaviour during churn will be helpful.
- In this case, since you are working over a four-month window, the first two months are the 'good' phase, the third month is the 'action' phase, and the fourth month is the 'churn' phase.
- In this project, you will use the usage-based definition to define churn.
- In this project, you will define high-value customers based on a certain metric and predict churn only on high-value customers.



Customer Impacting Business



Total Data Available – 99999 Customers Total Columns - 226



High Value Customers (80% Revenue from 20% of the customer) **70th percentile** of the average recharge amount in the first two months (the good phase).

Data Features











Incoming and Outgoing calls

Roaming Calls

Mobile Internet Usage Volume

Different Service Schemes

Average Recharge Values



Assumptions

Dropping the Churn Phase Columns

```
Churn_Columns = HV_Data.columns[HV_Data.columns.astype('str').str.contains("_9")==True]
HV_Data=HV_Data.drop(labels=Churn_Columns,axis=1)
HV_Data.shape
```

Dropping Column having Greater than 50% Missing Values

```
HV_Data=HV_Data.drop(columns=Null_count[Null_count[0]>50].index)
```

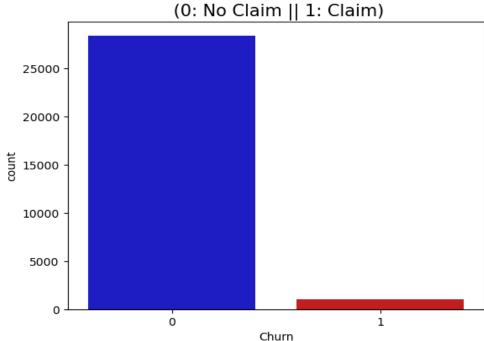
- Dropping the columns having only same values through the rows
- Dropping the Subset columns of Local, STD Incoming and Outgoing calls



Analysis

Customer Churn Distribution

Class Distributions



- We have 92% customers belong non-churn and 8% customers belong to Churn type.
 - 3.5% Customer Churn in the Month of September



arpu_6 -	1.00	0.77	0.69	0.35	0.23	0.16		0.38	0.27	0.12	0.09	0.09	0.19	0.15	0.12	0.01
arpu_7 -	0.77	1.00	0.78	0.24	0.31	0.21	0.41	0.49	0.34	0.10	0.09	0.09	0.15	0.18	0.14	0.03
arpu_8 -	0.69	0.78	1.00	0.17	0.21	0.26	0.32	0.36	0.43	0.10	0.09	0.11	0.15	0.16	0.19	0.00
onnet_mou_6 -	0.35	0.24	0.17	1.00	0.78	0.67	0.10	0.03	-0.01	0.02	0.02	0.04	0.07	0.06	0.06	0.03
onnet_mou_7 -	0.23	0.31	0.21	0.78	1.00	0.82	0.04	0.05	0.00	0.04	0.00	0.02	0.08	0.06	0.06	0.03
onnet_mou_8 -	0.16	0.21	0.26	0.67	0.82	1.00	0.01	0.01	-0.00	0.05	0.02	0.00	0.10	0.08	0.07	0.00
offnet_mou_6 -	0.55	0.41	0.32	0.10	0.04	0.01	1.00	0.76	0.62	0.05	0.05	0.05	0.13	0.11	0.10	0.01
offnet_mou_7	0.38	0.49	0.36	0.03	0.05	0.01	0.76	1.00	0.77	0.07	0.04	0.05	0.12	0.11	0.10	0.03
offnet_mou_8	0.27	0.34	0.43	-0.01	0.00	-0.00	0.62	0.77	1.00	0.07	0.04	0.03	0.12	0.09	0.10	-0.02
roam_ic_mou_6 -	0.12	0.10	0.10	0.02	0.04	0.05	0.05	0.07	0.07	1.00	0.51	0.41	0.63	0.36	0.25	0.06
mam_ic_mou_7 -	0.09	0.09	0.09	0.02	0.00	0.02	0.05	0.04	0.04	0.51	1.00	0.64	0.33	0.59	0.36	0.09
roam_ic_mou_8 -	0.09	0.09	0.11	0.04	0.02	0.00	0.05	0.05	0.03	0.41	0.64	1.00	0.25	0.38	0.58	0.13
roam_og_mou_6 -	0.19	0.15	0.15	0.07	0.08	0.10	0.13	0.12	0.12	0.63	0.33	0.25	1.00	0.55	0.41	0.06
roam_og_mou_7 -	0.15	0.18	0.16	0.06	0.06	0.08	0.11	0.11	0.09	0.36	0.59	0.38	0.55	1.00	0.61	0.12
mam_og_mou_8 -	0.12	0.14	0.19	0.06	0.06	0.07	0.10	0.10	0.10	0.25	0.36	0.58	0.41	0.61	1.00	0.16
Churn -	0.01	0.03	0.00	0.03	0.03	0.00	0.01	0.03	-0.02	0.06	0.09	0.13	0.06	0.12	0.16	1.00
	arpu_6 -	arpu_7 -	- 8 ndve	onnet_mou_6 -	onnet_mau_7 -	onnet_man_8 -	offnet_mou_6 -	offnet_mou_7 -	offnet_mau_8 -	roam_ic_mou_6 -	roam_ic_mou_7 -	roam_ic_mou_8 -	- 9_mom_go_mea	raam_og_mou_7 -	- B_mom_og_mou_8	- Whum -
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Correlation for ARPU,ONNET,OFFNET,ROAM

- Features impacting Churn
 - roam_ic_mou_8
 - roam_og_mou_7
 - roam_og_mou_8

lec_og_mou_6 -	1.00	0.83	0.75	-0.10	-0.17	-0.20	0.00	-0.00	-0.00	0.04	0.00	-0.01	0.06	0.02	0.02	0.50	0.31	0.22	-0.06
lac_og_mou_7 -	0.83	1.00	0.84	-0.11	-0.13	-0.18	0.00	-0.00	-0.00	0.03	0.01	-0.00	0.03	0.01	0.02	0.39	0.43	0.29	-0.06
lac_og_mou_8 -	0.75	0.84	1.00	-0.14	-0.17	-0.19	-0.00	-0.01	-0.01	0.02	0.00	-0.00	0.03	-0.00	0.01	0.31	0.31	0.37	-0.08
std_ag_mau_6 -	-0.10	-0.11	-0.14	1.00		0.65	-0.02	-0.02	-0.02	0.12	0.09	0.08	0.11	-0.00	-0.00	0.81			0.06
98d_og_mosi_7 -	-0.17	-0.13	-0.17	0.77	1.00	0.81	-0.02	-0.02	-0.02	0.08	0.13	0.10	0.06	-0.00	-0.00	0.57	0.83		0.07
std_ag_mau_8 -	-0.20	-0.18	-0.19	0.65	0.81	1.00	-0.02	-0.02	-0.02	0.07	0.11	0.12	0.04	-0.01	-0.01	0.44	0.63	0.84	0.01
isd_og_mou_6 -	0.00	0.00	-0.00	-0.02	-0.02	-0.02	1.00	0.95	0.95	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.06	0.05	0.04	0.00
isd_og_mou_7 -	-0.00	-0.00	-0.01	-0.02	-0.02	-0.02	0.95	1.00	0.95	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.05	0.05	0.04	0.01
isd_og_mou_6 -	-0.00	-0.00	-0.01	-0.02	-0.02	-0.02	0.95	0.95	1.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.04	0.04	0.00
spl.og.mou_6 -	0.04	0.03	0.02	0.12	0.08	0.07	-0.00	-0.00	-0.00	1.00	0.56		0.19	0.03	0.02	0.15	0.11	0.10	-0.00
spl_og_mou_7 -	0.00	0.01	0.00	0.09	0.13	0.11	-0.00	-0.00	0.00		1.00	0.58	0.18	0.08	0.05	0.10	0.16	0.12	0.01
spl_og_mou_6 -	-0.01	-0.00	-0.00	0.08	0.10	0.12	-0.00	-0.00	0.00			1.00	0.14	0.04	0.02	0.08	0.11	0.15	-0.01
og_others_6 -	0.06	0.03	0.03	0.11	0.06	0.04	0.00	0.00	0.00	0.19	0.18	0.14	1.00	0.08	0.11	0.14	0.08	0.06	0.00
og.others.7 -	0.02	0.01	-0.00	-0.00	-0.00	-0.01	0.00	0.00	0.00	0.03	0.08	0.04	0.08	1.00	0.51	0.01	0.01	-0.00	0.02
og_others_8 -	0.02	0.02	0.01	-0.00	-0.00	-0.01	0.00	0.00	0.00	0.02	0.05	0.02	0.11		1.00	0.01	0.01	0.00	0.02
total_og_mou_6 -		0.39	0.31	0.81	0.57		0.06	0.05	0.05	0.15	0.10	0.08	0.14	0.01	0.01	1.00	0.74	0.59	0.02
tetal_og_mou_7 -	0.31	0.43	0.31	0.64	0.83	0.63	0.05	0.05	0.04	0.11	0.16	0.11	0.08	0.01	0.01	0.74	1.00	0.77	0.03
total_og_mou_6 -	0.22	0.29	0.37	0.53	0.67	0.84	0.04	0.04	0.04	0.10	0.12	0.15	0.06	-0.00	0.00	0.59	0.77	1.00	-0.03
Churn -	-0.06	-0.06	-0.08	0.06	0.07	0.01	0.00	0.01	0.00	-0.00	0.01	-0.01	0.00	0.02	0.02	0.02	0.03	-0.03	1.00
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Correlation for Outgoing Calls

No Features are impacting Churn in this heatmap

lac_ic_mou_6 -	1.00	0.84	0.76	0.08	0.04	0.02	0.04	0.03	0.04	0.04	-0.02	-0.07	0.05	0.03	0.04	0.89	0.73	0.67	-0.06
lac_ic_mou_7	0.84	1.00	0.84	0.06	0.06	0.03	0.03	0.04	0.04	0.02	-0.01	-0.06	0.03	0.04	0.04	0.74	0.88		-0.06
lac_ic_mou_8 -	0.76	0.84	1.00	0.06	0.04	0.04	0.03	0.04	0.04	0.02	-0.00	-0.06	0.03	0.04	0.04	0.68	0.74	0.88	-0.09
std_k_mau_6 -	0.08	0.06	0.06	1.00	0.76		0.06	0.05	0.06	0.01	-0.02	-0.01	0.04	0.03	0.03	0.46	0.37	0.33	0.01
skiljic_masi_7 -	0.04	0.06	0.04	0.76	1.00		0.05	0.06	0.07	-0.01	-0.00	-0.01	0.04	0.03	0.04	0.33	0.46	0.36	0.01
std ic mau 8	0.02	0.03	0.04	0.67	0.76	1.00	0.06	0.06	0.06	-0.01	-0.01	0.01	0.03	0.03	0.05	0.29	0.34	0.45	-0.02
isd_ic_mou_6 -	0.04	0.03	0.03	0.06	0.05	0.06	1.00	0.77	0.54	0.01	-0.00	-0.01	0.12	0.17	0.10	0.29	0.23	0.16	-0.01
isd_ic_mou_7 •	0.03	0.04	0.04	0.05	0.06	0.06	0.77	1.00	0.70	0.00	0.00	-0.00	0.11	0.18	0.14	0.22	0.29	0.20	-0.00
isd_ic_mou_8 -	0.04	0.04	0.04	0.06	0.07	0.06	0.54	0.70	1.00	0.00	0.01	-0.01	0.11	0.16	0.19	0.18	0.22	0.27	-0.01
splik mau 8 -	0.04	0.02	0.02	0.01	-0.01	-0.01	0.01	0.00	0.00	1.00	0.11	0.18	0.04	0.03	0.03	0.04	0.02	0.01	-0.00
aplic.max.7	-0.02	-0.01	-0.00	-0.02	-0.00	-0.01	-0.00	0.00	0.01	0.11	1.00	0.05	0.00	0.01	0.01	-0.03	-0.01	-0.00	-0.00
spl.jk_mou_8 -	-0.07	-0.06	-0.06	-0.01	-0.01	0.01	-0.01	-0.00	-0.01	0.18	0.05	1.00	0.01	0.02	0.02	-0.07	-0.06	-0.05	-0.02
ic_others_6 -	0.05	0.03	0.03	0.04	0.04	0.03	0.12	0.11	0.11	0.04	0.00	0.01	1.00	0.67	0.61	0.12	0.09	0.08	-0.01
ic_others_7 -	0.03	0.04	0.04	0.03	0.03	0.03	0.17	0.18	0.16	0.03	0.01	0.02	0.67	1.00		0.11	0.12	0.10	-0.01
ic_others_8 -	0.04	0.04	0.04	0.03	0.04	0.05	0.10	0.14	0.19	0.03	0.01	0.02	0.61	0.64	1.00	0.09	0.10	0.13	-0.01
tetal_ic_mou_6 -	0.89	0.74	0.68	0.46	0.33	0.29	0.29	0.22	0.18	0.04	-0.03	-0.07	0.12	0.11	0.09	1.00	0.82	0.74	-0.05
total_ic_mou_7 -		0.88		0.37	0.46	0.34	0.23	0.29	0.22	0.02	-0.01	-0.06	0.09	0.12	0.10	0.82	1.00	0.82	-0.05
tstal_ic_mou_8 -			0.88	0.33	0.36	0.45	0.16	0.20	0.27	0.01	-0.00	-0.05	0.08	0.10	0.13	0.74	0.82	1.00	-0.08
Churn -	-0.06	-0.06	-0.09	0.01	0.01	-0.02	-0.01	-0.00	-0.01	-0.00	-0.00	-0.02	-0.01	-0.01	-0.01	-0.05	-0.05	-0.08	1.00
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Correlation for Incoming Calls

No Features are impacting Churn in this heatmap

total_rech_num_6 -	1.00	0.73	0.62		0.27	0.17	-0.13	-0.15	-0.22	-0.14	-0.13	-0.19	0.06	0.04	0.02	0.05	0.02	0.00	0.01
total_rech_num_7 -		1.00	0.78	0.19	0.34	0.17	-0.23	-0.20	-0.28	-0.22	-0.18	-0.24	0.02	0.06	0.04	0.00	0.03	-0.01	0.02
total_rech_num_8 -	0.62	0.78	1.00	0.08	0.15	0.22	-0.28	-0.27	-0.33	-0.25	-0.24	-0.30	0.01	0.03	0.05	-0.04	-0.03	-0.01	-0.01
total_rech_amt_6 -		0.19	0.08	1.00	0.74				0.29		0.30	0.18	0.06	0.03	-0.00	0.23	0.18	0.15	0.02
total_rech_amt_7 -	0.27	0.34	0.15	0.74	1.00		0.30		0.26	0.25		0.18	0.03	0.05	0.01	0.17	0.24	0.16	0.03
total_rech_amt_8 -	0.17	0.17	0.22	0.68		1.00	0.33			0.27	0.29	0.30	0.02	0.02	0.02	0.14	0.15	0.20	-0.00
max_rech_amt_6 -	-0.13	-0.23	-0.28	0.49	0.30	0.33	1.00	0.64					0.07	0.04	0.01	0.25	0.21	0.19	0.00
max_rech_amt_7 -	-0.15	-0.20	-0.27					1.00					0.05	0.05	0.02	0.23	0.27	0.23	0.01
max_rech_amt_8 -	-0.22	-0.28	-0.33	0.29	0.26				1.00	0.46		0.66	0.02	0.01	0.01	0.17	0.18	0.20	0.02
est_day_rch_amt_6 -	-0.14	-0.22	-0.25		0.25	0.27				1.00		0.36	0.01	-0.00	-0.02	0.16	0.14	0.13	0.01
sst_day_rch_amt_7 -	-0.13	-0.18	-0.24	0.30		0.29					1.00	0.34	0.00	0.00	-0.01	0.14	0.15	0.14	0.01
sot_doy_rch_amt_8 -	-0.19	-0.24	-0.30	0.18	0.18	0.30				0.36	0.34	1.00	-0.01	-0.02	-0.03	0.10	0.09	0.10	-0.02
wol_2g_mb_6 -	0.06	0.02	0.01	0.06	0.03	0.02	0.07	0.05	0.02	0.01	0.00	-0.01	1.00	0.66		0.07	0.10	0.11	-0.01
wol_3g_mb_7 -	0.04	0.06	0.03	0.03	0.05	0.02	0.04	0.05	0.01	-0.00	0.00	-0.02	0.66	1.00	0.68	0.04	0.05	0.06	-0.00
val_2g_mb_0 -	0.02	0.04	0.05	-0.00	0.01	0.02	0.01	0.02	0.01	-0.02	-0.01	-0.03	0.52	0.68	1.00	0.04	0.04	0.03	-0.00
vol_3g_mb_6 -	0.05	0.00	-0.04	0.23	0.17	0.14	0.25	0.23	0.17	0.16	0.14	0.10	0.07	0.04	0.04	1.00	0.72	0.66	-0.00
vol_3q_mb_7 -	0.02	0.03	-0.03	0.18	0.24	0.15	0.21	0.27	0.18	0.14	0.15	0.09	0.10	0.05	0.04	0.72	1.00	0.74	0.00
vol_3g_mb_8 -	0.00	-0.01	-0.01	0.15	0.16	0.20	0.19	0.23	0.20	0.13	0.14	0.10	0.11	0.06	0.03		0.74	1.00	-0.02
Chum -	0.01	0.02	-0.01	0.02	0.03	-0.00	0.00	0.01	0.02	0.01	0.01	-0.02	-0.01	-0.00	-0.00	-0.00	0.00	-0.02	1.00
	Jrech num_6 -	Jednum.7 -	Jechnum.	Unchange.	(red_amt) -	Uretum(t) -	URC) and 6 -	mehamt 7 -	CROUNCO.	y,rd,amt.6 -	wydamcy -	- FJANG PAGE	. 2g mb 6	vol.2g.mb.7 -	w(zg_mb_8 -	vol. Sg_mb_6 .	a a mp 7	- 0, dr. (c) a	chum -



Correlation for Recharge

No Features are impacting Churn in this heatmap

monthly_2g_6 -	1.00	1.00	1.00	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.02	-0.02	-0.02	0.04	0.19	0.19	0.20	-0.02
monthly_2g_6 -	1.00	1.00	1.00	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.02	-0.02	-0.02	0.04	0.19	0.19	0.20	-0.02
monthly_2g_6 -	1.00	1.00	1.00	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.02	-0.02	-0.02	0.04	0.19	0.19	0.20	-0.02
sachet_2g_6 -	-0.03	-0.03	-0.03	1.00	1.00	1.00	-0.03	-0.03	-0.03	0.24	0.24	0.24	-0.05	0.04	0.05	0.05	-0.01
sachet_2g_6 -	-0.03	-0.03	-0.03	1.00	1.00	1.00	-0.03	-0.03	-0.03	0.24	0.24	0.24	-0.05	0.04	0.05	0.05	-0.01
sachet_2g_6 -	-0.03	-0.03	-0.03	1.00	1.00	1.00	-0.03	-0.03	-0.03	0.24	0.24	0.24	-0.05	0.04	0.05	0.05	-0.01
monthly_3g_6 -	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	1.00	1.00	1.00	0.05	0.05	0.05	0.02	0.37	0.42	0.51	0.00
monthly_3g_6 -	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	1.00	1.00	1.00	0.05	0.05	0.05	0.02	0.37	0.42	0.51	0.00
monthly_3g_6 -	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	1.00	1.00	1.00	0.05	0.05	0.05	0.02	0.37	0.42	0.51	0.00
sachet_3g_6 -	-0.02	-0.02	-0.02	0.24	0.24	0.24	0.05	0.05	0.05	1.00	1.00	1.00	-0.04	0.08	0.09	0.09	-0.00
sachet_3g_6 -	-0.02	-0.02	-0.02	0.24	0.24	0.24	0.05	0.05	0.05	1.00	1.00	1.00	-0.04	0.08	0.09	0.09	-0.00
sachet_3g_6 -	-0.02	-0.02	-0.02	0.24	0.24	0.24	0.05	0.05	0.05	1.00	1.00	1.00	-0.04	0.08	0.09	0.09	-0.00
aon -	0.04	0.04	0.04	-0.05	-0.05	-0.05	0.02	0.02	0.02	-0.04	-0.04	-0.04	1.00	0.01	0.02	0.02	-0.06
aug_vbc_3g -	0.19	0.19	0.19	0.04	0.04	0.04	0.37	0.37	0.37	0.08	0.08	0.08	0.01	1.00	0.72	0.62	-0.03
jul_vbc_3g -	0.19	0.19	0.19	0.05	0.05	0.05	0.42	0.42	0.42	0.09	0.09	0.09	0.02	0.72	1.00	0.70	-0.02
jun_vbc_3g -	0.20	0.20	0.20	0.05	0.05	0.05	0.51	0.51	0.51	0.09	0.09	0.09	0.02	0.62	0.70	1.00	-0.02
Churn -	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.06	-0.03	-0.02	-0.02	1.00
	onthly_2g_6 ·	nonthly_2g_6 ·	onthly_2g_6 -	sachet_2g_6 -	sachet_2g_6	sachet 2g 6	onthly 3g.6	onthly 3g.6	onthly 3g.6	sachet 3g 6	sachet 3g 6	sachet 3g_6	ioe	aug_vbc_3g -	Jul_vbc_3g.	jun_vbc_3g	Chum

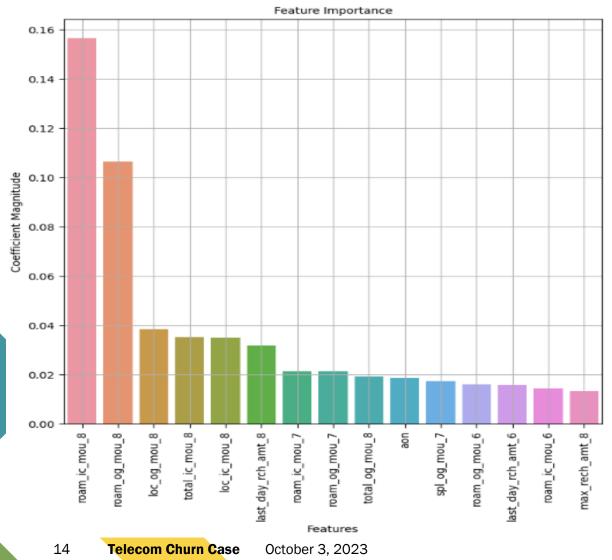




No Features are impacting
 Churn in this heatmap

Top Features Impacting Churn





Hyperparamter Tuning using Randomised Search CV

Random Forest produced the Best prediction results

Roaming Incoming calls in the month of Aug is the Top feature impacting churn.



Conclusion

To reduce the Churn of customer

- Roaming calls to be monitored continuously and service provided
- In the Action phase only customer reducing the calls to be given attractive offer on their next recharges
- Last recharge amount to be compared to the last 3 months average

Conclusions from Random Forest

 Local Incoming for Month 8, Average Revenue Per Customer for Month 8 and Max Recharge Amount for Month 8 are the most important predictor variables to predict churn.

Factor Most affecting the Churn

- Roaming calls in the month of Aug
- Local Incoming and Outgoing calls in Aug
- Last recharge in Aug
- Max Recharge Amount is a strong feature to predict churn.
- Local calls minutes of usage has also impact on churn





Thank you