



Statistics Datathon

2024

Enhancing IVR Systems to Minimize Call Transfers

By Team Init To Win It



Our Team



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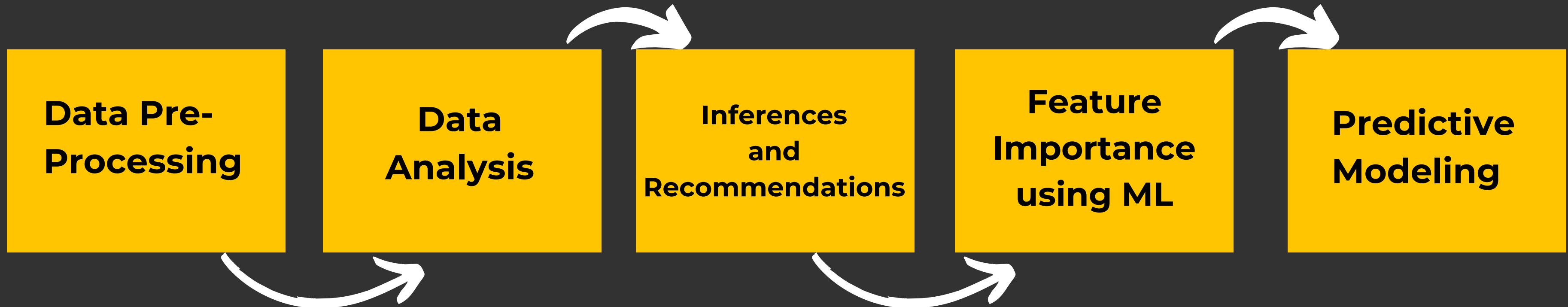


Urmi Gori



Tanmoy
Debnath

Our Approach



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Pre-Processing

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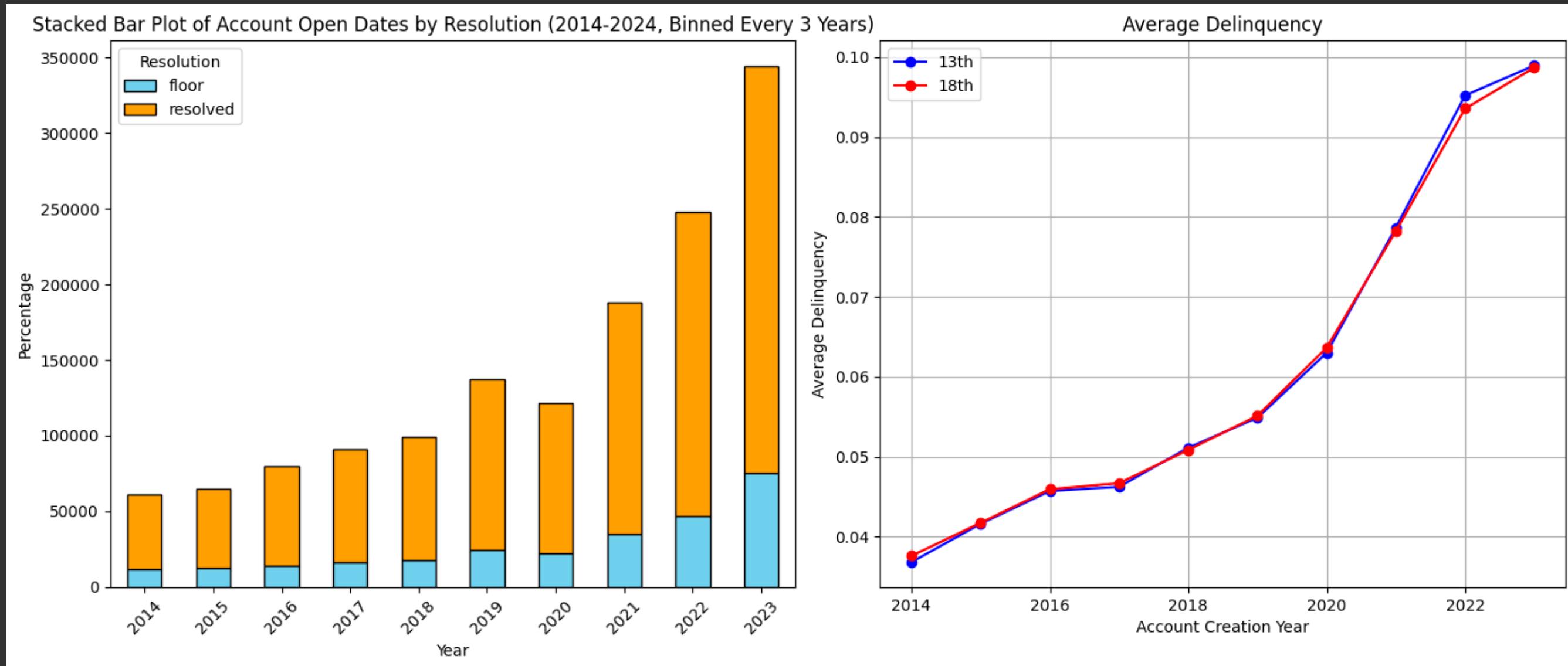


- Merging similar mos codes
 - Extraction of date and time from Timestamp_key Column
 - Retailer code from lowercase to uppercase
 - Additional Mapping for Ebill, Card Activation and Account Status
 - Adding TR to mos code when TR is not given when resolution of the call is floor
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Analysis

Account_Creation Date



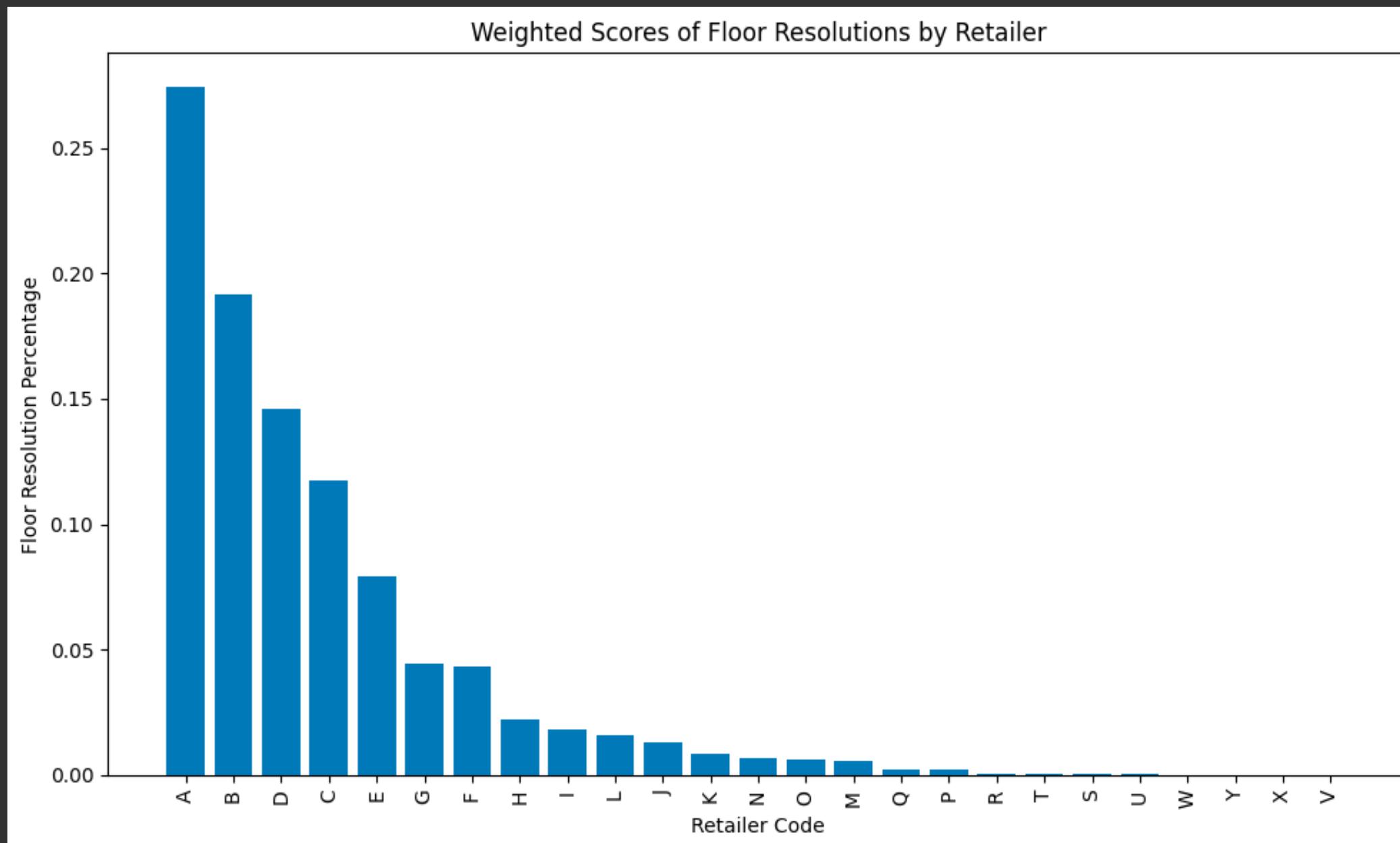
Observations:

We observe Direct Correlation Between Average Delinquency and Floor Call Percentage

Recommendation: Customize Different Call Sequence for customers with more Delinquent History

Analysis

Retailer Code Analysis



Observations:

Retailer A has a significant weighted score when compared to the other retailers.

• • • **Recommendation: Possibly discuss setting up a better IVR system integration with Retailer A**



People and Status Change

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**People with Status change between 13th
and 18th March 2024**



Floor Call ratio on account_status change = 70.8%

Floor Call ratio EBill stat change = 40.7%

Floor ratio activation change = 36.2%

**Where average floor call rate for the entire dataset
is ~20%**

Observations:

**People with status
change are
experiencing much
higher floor call rate.**

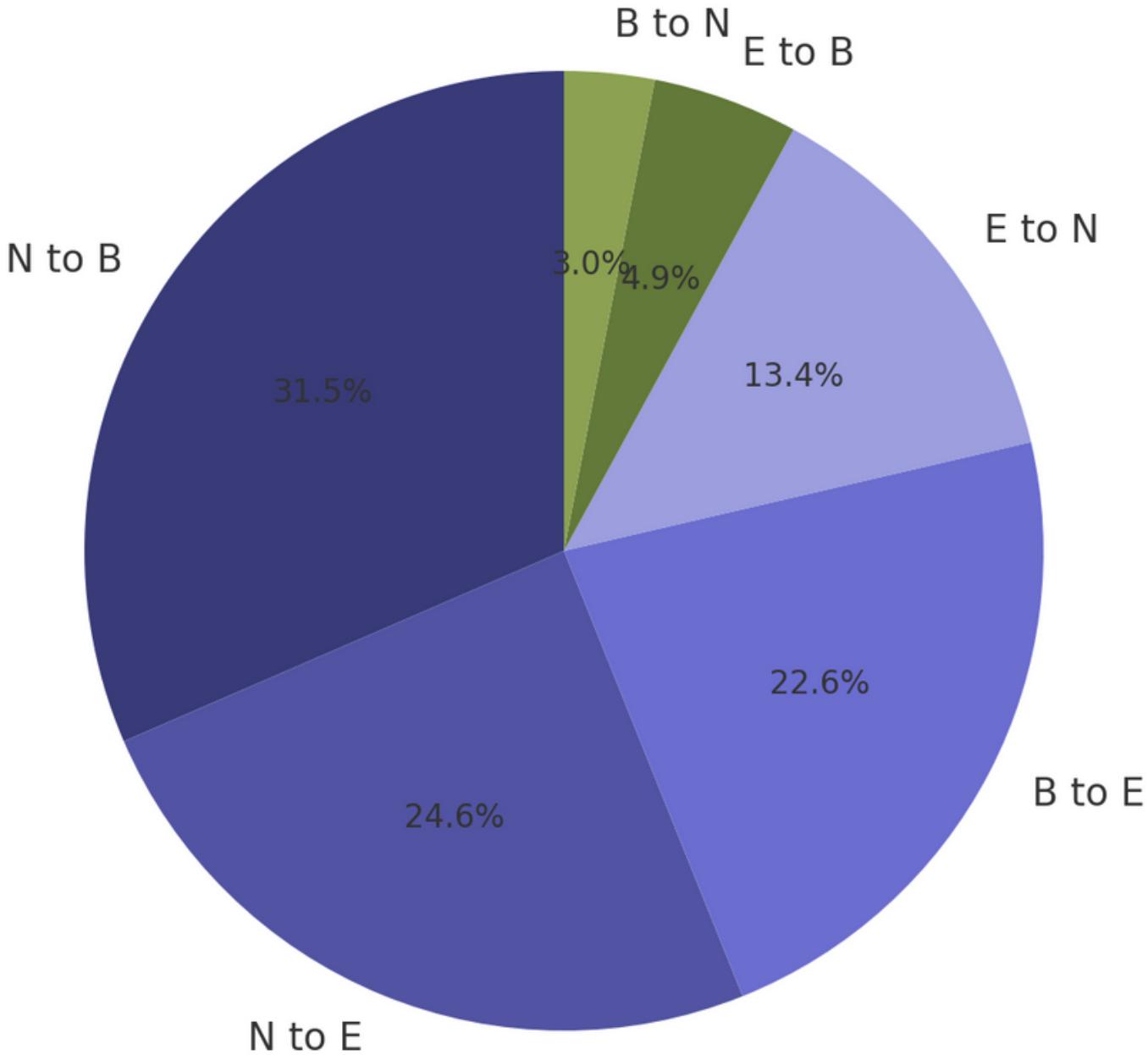
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People and Status change

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Floored Call Change in EBill Enrolled Status



Recommendation: People want to sign up for e-Bill , will save a lot of floor calls introducing a new automation system that does this

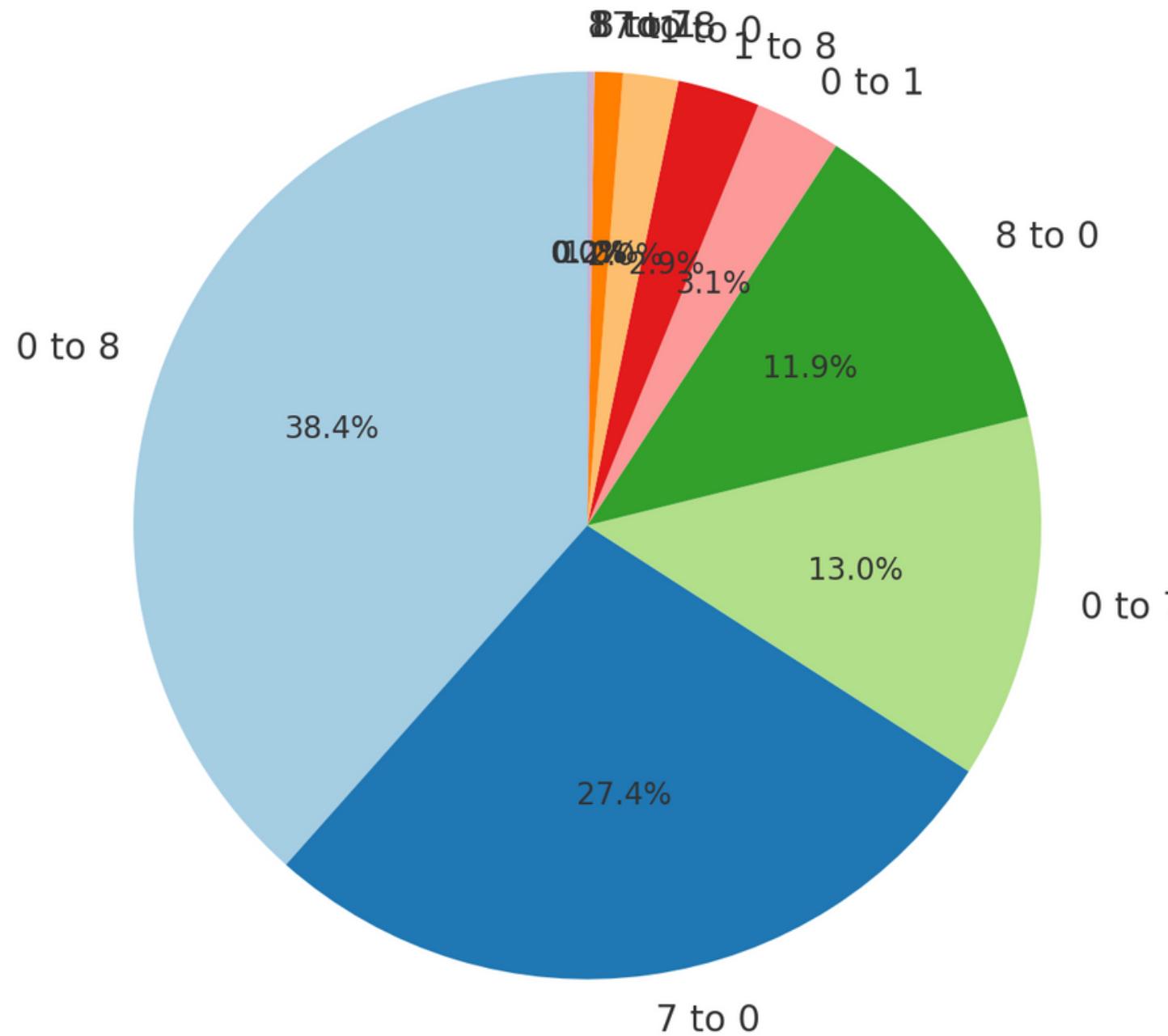
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People and Status change

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Floored Call Change in Activation Status



Recommendation: A lot of people converted from 0 to 8: Give them more notifications when sending new plastic. Possibly introduce automated for 7 to 0

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People and Balance Change

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**People with balance change
between 13th and 18th March
from (+) to (-)**

Floor Call ratio = 42.5%

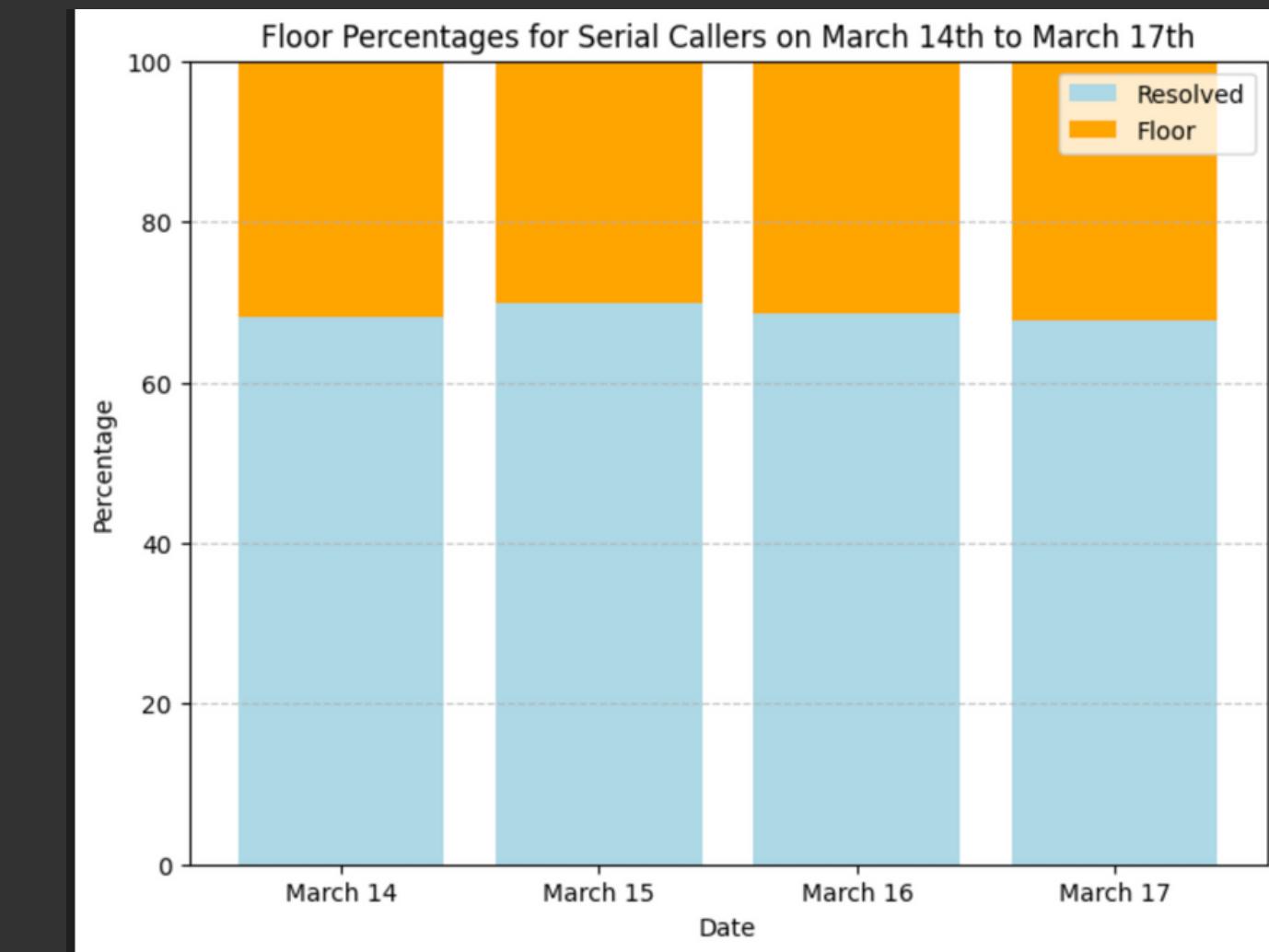
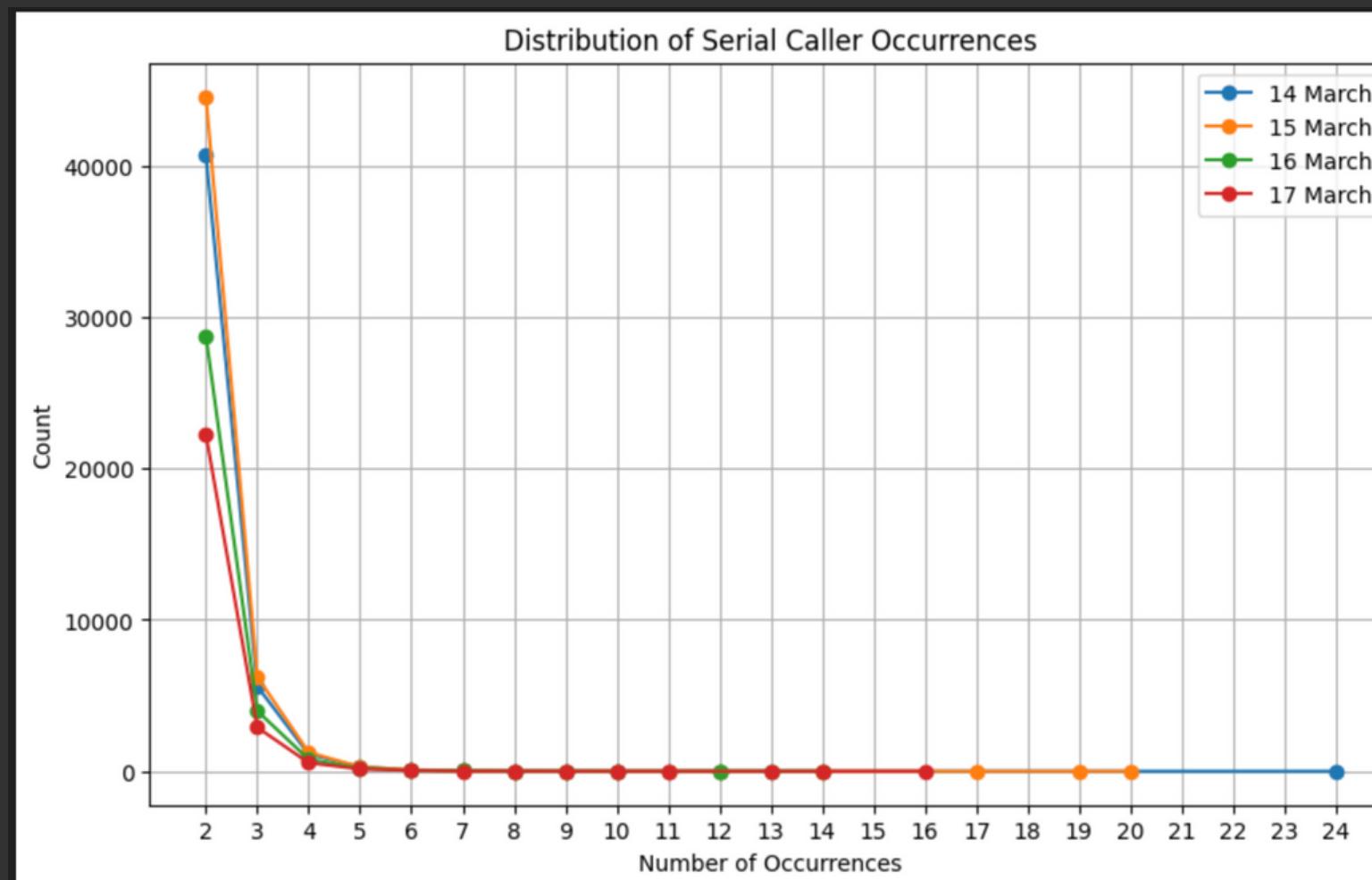
**Where average floor call rate for the entire dataset
is ~20%**

Observations:
It is better to provide email notification when there is refund on the account balance to avoid customer confusion.

Analysis

Serial Callers

Assumption: If a call is made about the same serial account number more than 4 times in a day, we classify it as a Serial Caller



Observations:

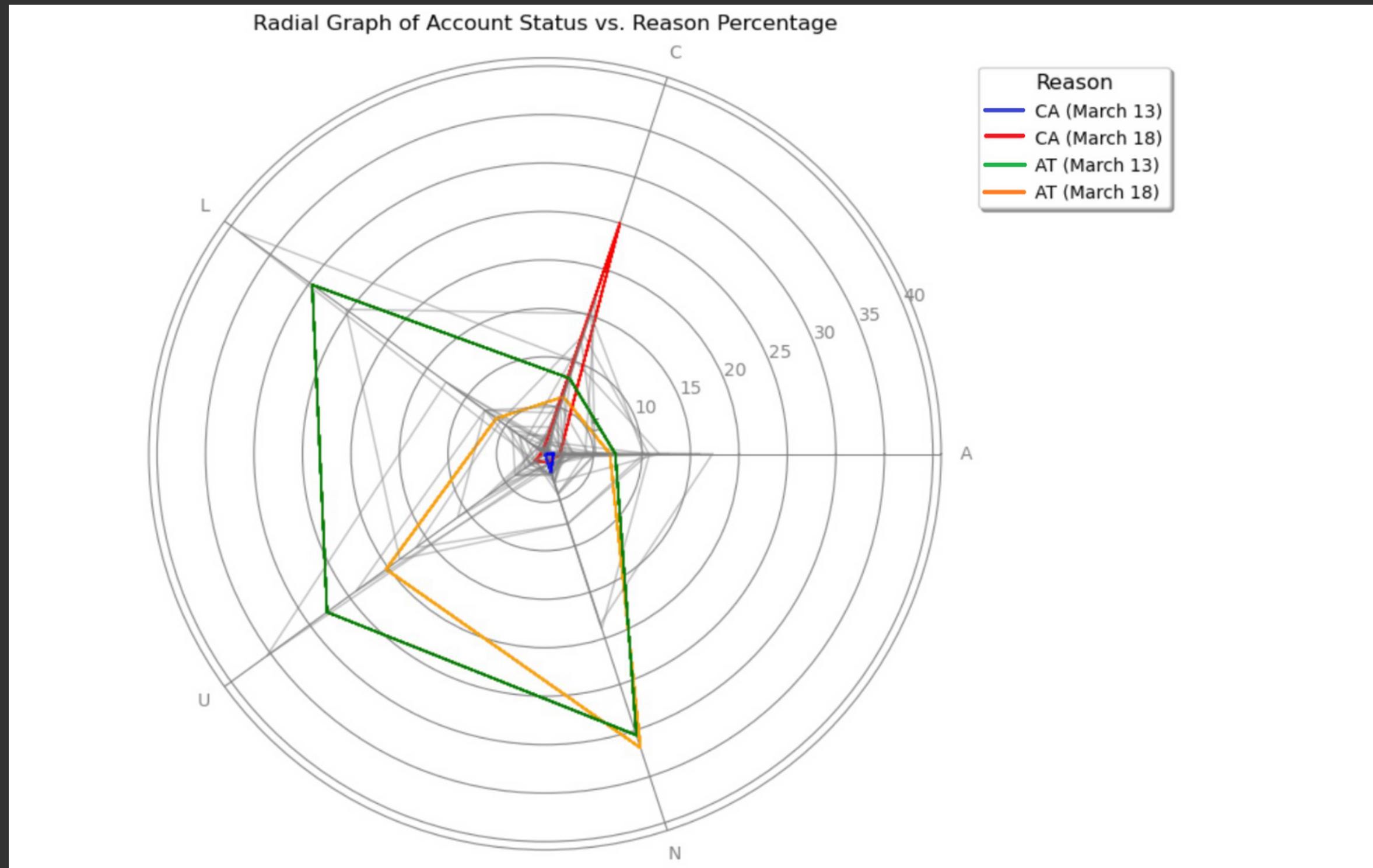
We see that most number of times when a serial number is called about, it is usually follow up calls (2-3). However, we notice extreme cases like 24 calls in a day as well

Observations:

We see that floor and resolved percentages are usually uniform in the span of the 4 days (March 13th was not included as it considered calls only from 11:00-11:59pm



Our Contender for the Best Visualization



Feature Importance - MOS Analysis



MI Models Considered:
Logistic Regression

	Feature	Coefficient	Absolute Coefficient
39	RS	10.079166	10.079166
47	TN	-5.391877	5.391877
42	TB	-5.041593	5.041593
29	PC	4.310617	4.310617
36	RC	4.281609	4.281609
..
59	eS	0.045563	0.045563
30	PI	-0.044125	0.044125
69	iT	0.024342	0.024342
56	eB	-0.021953	0.021953
48	TP	-0.009868	0.009868

**Linear Support Vector
Machine (SVM) with Linear Kernel**

	Feature	Coefficient	Absolute Coefficient
39	RS	2.589569	2.589569
47	TN	-1.857296	1.857296
10	DE	1.735202	1.735202
42	TB	-1.667842	1.667842
4	BL	1.517775	1.517775
36	RC	1.513772	1.513772
14	FI	1.468856	1.468856
15	FM	1.456148	1.456148
29	PC	1.453462	1.453462
66	iP	1.447207	1.447207
9	CT	1.419551	1.419551
25	NU	1.406764	1.406764
44	TD	-1.397162	1.397162
68	iS	1.357198	1.357198
43	TC	-1.301690	1.301690
21	LS	1.284685	1.284685
71	me	1.281550	1.281550
8	CD	1.246708	1.246708
35	Pd	1.234342	1.234342
46	TL	-1.228536	1.228536

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Feature Importance - MOS Analysis



Ridge Classifier (with L2 Regularization)

	Feature	Coefficient	Absolute Coefficient
39	RS	2.026062	2.026062
47	TN	-1.779387	1.779387
42	TB	-1.631254	1.631254
10	DE	1.562741	1.562741
4	BL	1.497005	1.497005
14	FI	1.473131	1.473131
66	iP	1.452929	1.452929
29	PC	1.452430	1.452430
36	RC	1.449985	1.449985
15	FM	1.419483	1.419483
68	iS	1.388167	1.388167
44	TD	-1.387542	1.387542
43	TC	-1.277350	1.277350
21	LS	1.266163	1.266163
71	me	1.263555	1.263555
8	CD	1.239214	1.239214
35	Pd	1.228700	1.228700
46	TL	-1.214026	1.214026
60	eY	1.141885	1.141885
20	LC	1.063283	1.063283

A	B	
1	Feature	
2	Average Coefficient	
3	RS	1
4	TN	-0.710141166
5	TB	-0.649798667
6	DE	0.59754029
7	RC	0.575009963
8	PC	0.56860819
9	FI	0.552151567
10	FM	0.549374102
11	TD	-0.541157284
12	TC	-0.517804604

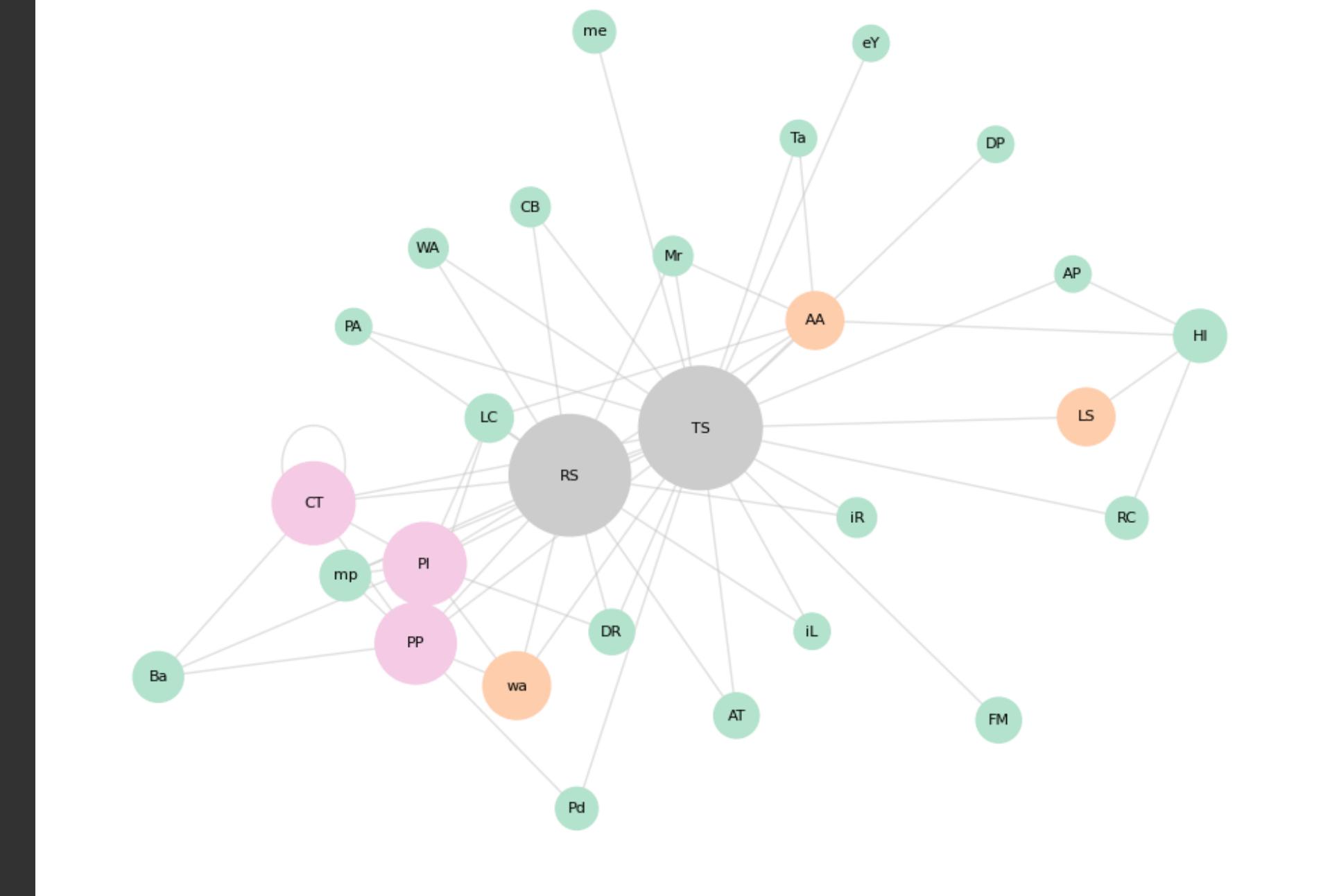
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Feature importance



A	B	C	D	E	F	G	H	I
1	MOS Sequence	Total Occ	Number o	Number o	Floor Perc	weighted_score	normalized_weighted_score	
2	TS RS	34083	113	33970	99.66846	167.4510451	1	
3	RS	12855	37	12818	99.71217	166.9815498	0.997175	
4	PP TS RS	11711	38	11673	99.67552	166.836455	0.996302	
5	PI TS RS	12053	43	12010	99.64324	166.8102309	0.996144	
6	PP RS	8680	17	8663	99.80415	166.7163012	0.995579	
7	PI RS	4886	19	4867	99.61113	165.4149031	0.987749	
8	TS CT RS	3150	10	3140	99.68254	164.3042706	0.981066	
9	CT RS	2732	8	2724	99.70717	163.8209115	0.978158	

MOS Codes which lead to greater Floor calls

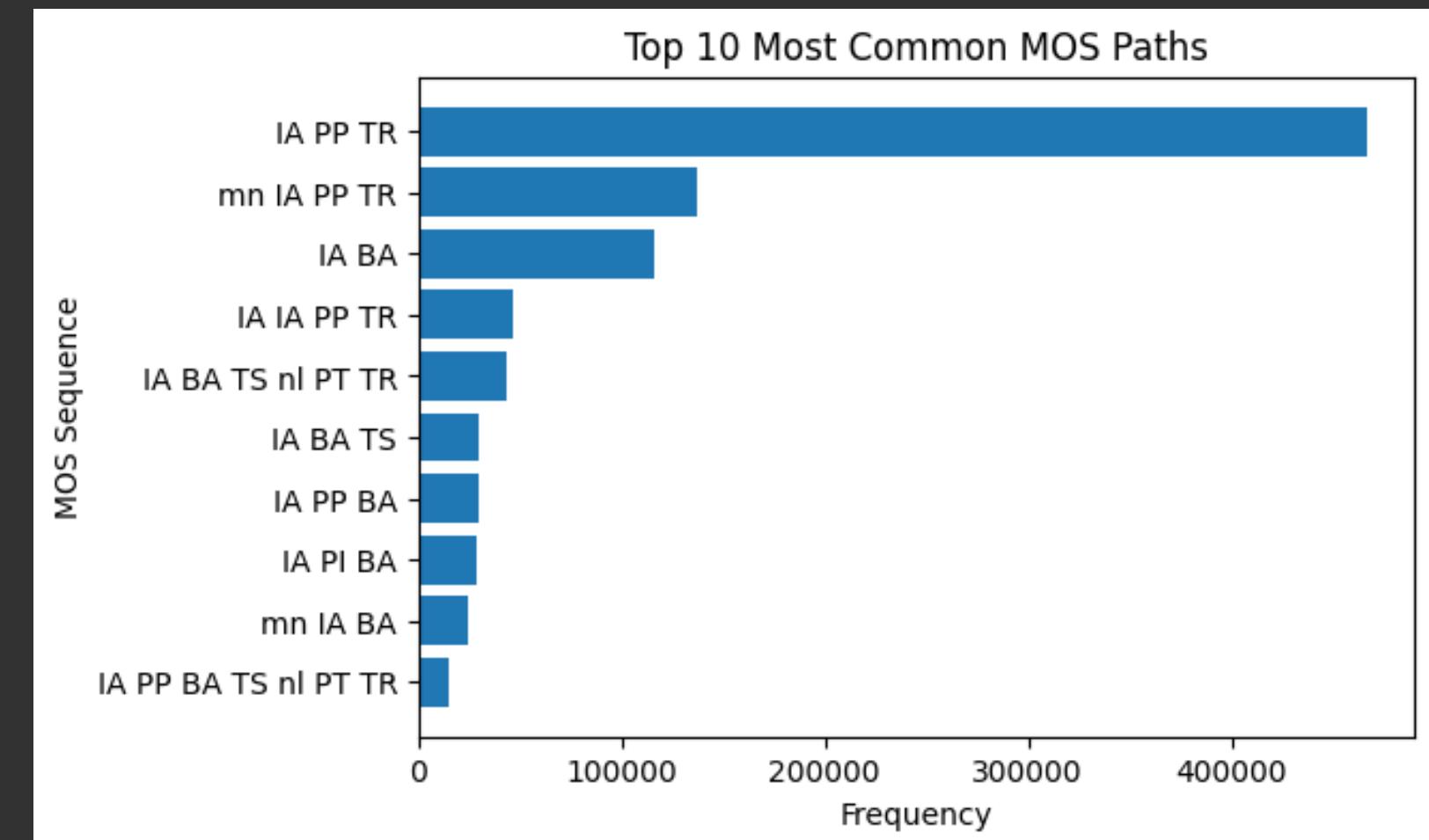


Predictive Modeling



Deep Learning Models:

- Long Short-Term Memory Network
- Transformer



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Predictive Modeling

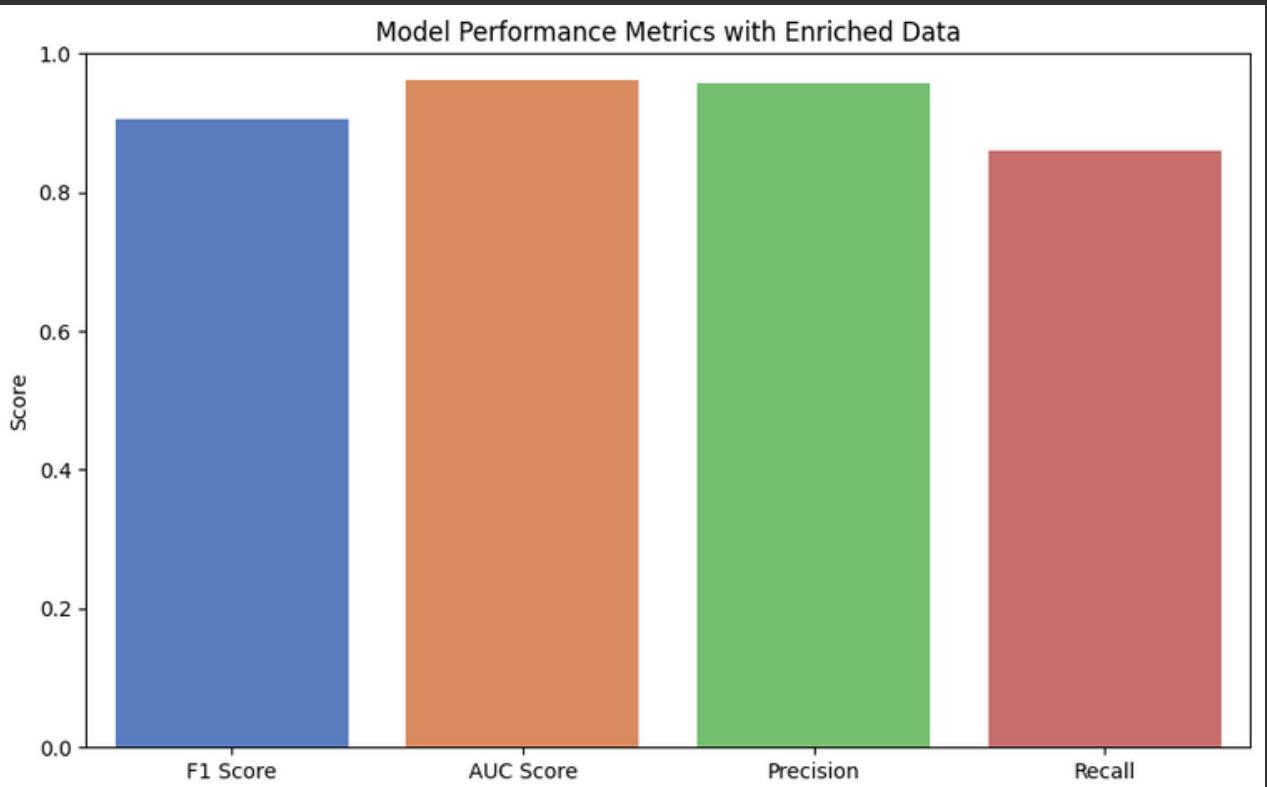
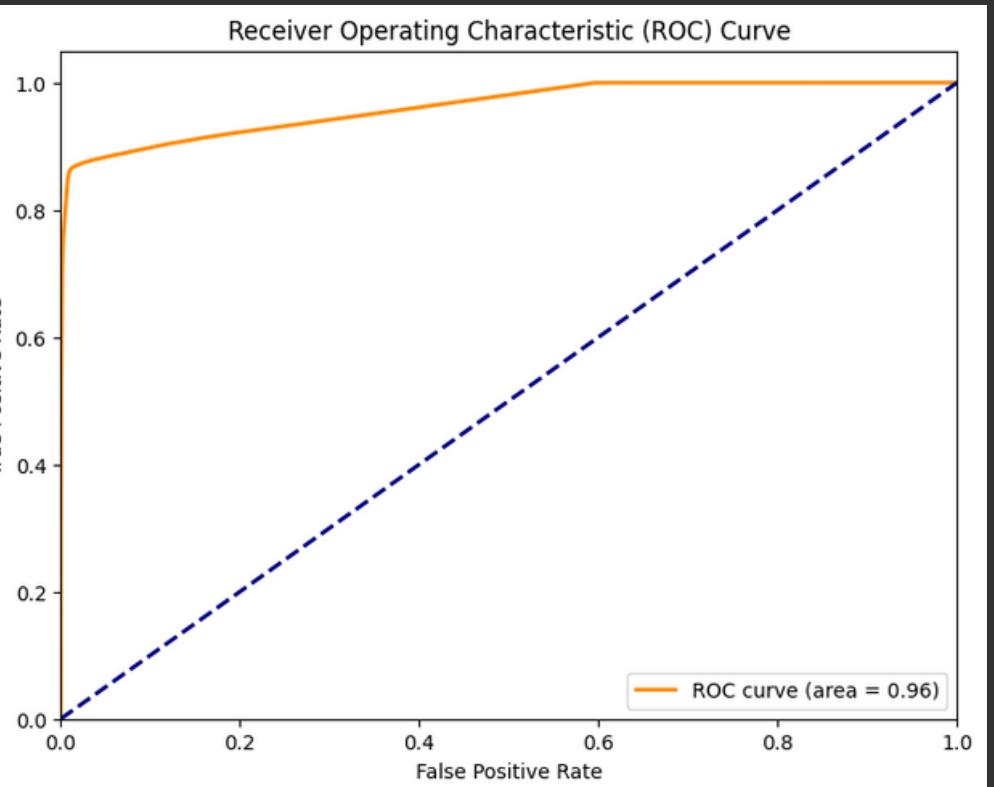


Model enrichment with weighted scores for MOS Sequences

Weighted Score = $w_{fp} + w_{to} / ((w_{fp}/fp + 1) + (w_{to}/to + 1))$

Where, $w_{fp} = 0.6$, $w_{to} = 0.4$

fp denotes "Floor Percentage" to denotes "Total Occurrences"



	A	B	C	D	E	F
1	MOS Sequence	Floor Call P	Total Occ	Number of	Number of Floor Calls	weighted_score
2	IA BA TS nl mt RS TR	99.669754	12415	41	12374	166.8808698
3	IA BA nl mt RS TR	99.768188	5608	13	5595	165.959292
4	IA PP BA nl mt RS TR	99.798894	3978	8	3970	165.2080438
5	IA BA nl TR	99.088624	6364	58	6306	165.0837617
6	IA PP BA TS nl mt RS TR	99.698417	3979	12	3967	165.0467833
7	IA PI BA TS nl mt RS TR	99.690482	3877	12	3865	164.9620285
8	IA BA TS nl TR	98.465335	12967	199	12768	164.9321986

```
accuracy: 0.9609 - loss: 0.1405 - val_accuracy: 0.9635 - val_loss: 0.1331
```

```
accuracy: 0.9635 - loss: 0.1328 - val_accuracy: 0.9638 - val_loss: 0.1310
```

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accuracy: 0.9638 - loss: 0.1315 - val_accuracy: 0.9636 - val_loss: 0.1306
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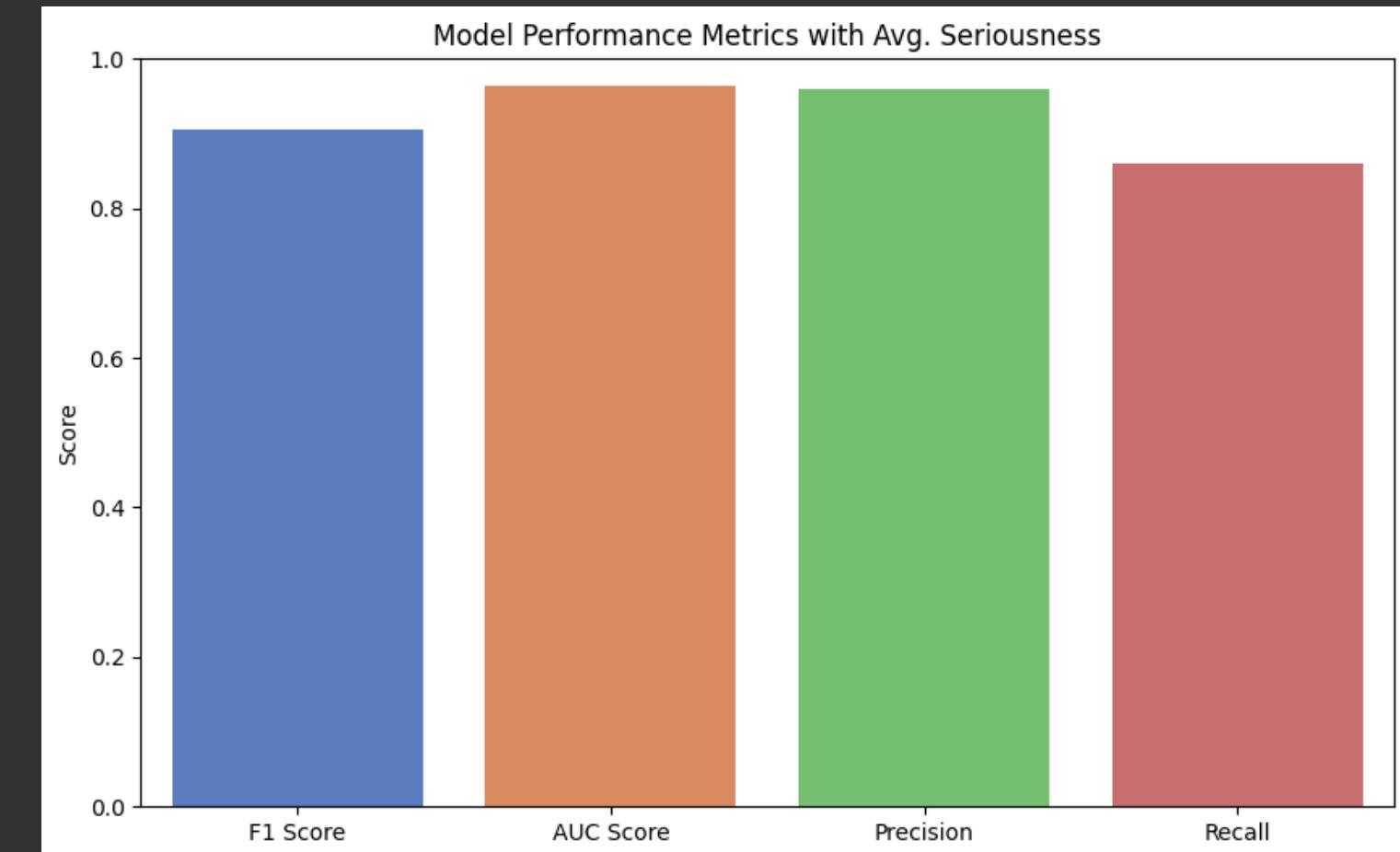
Predictive Modeling



LLMs

OpenAI's GPT-3.5 Turbo

	code	status	seriousness_score
1	AA	Activation	2
2	AG	Transferred from agent	9
3	AL	Account lookup	3
4	AP	Address phone change	4



```
accuracy: 0.9611 - loss: 0.1400 - val_accuracy: 0.9635 - val_loss: 0.1321  
  
accuracy: 0.9636 - loss: 0.1324 - val_accuracy: 0.9636 - val_loss: 0.1311  
  
• • accuracy: 0.9635 - loss: 0.1324 - val_accuracy: 0.9638 - val_loss: 0.1311  
  
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```



Thank you!

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