synchrony

Sandia National Laboratories

College of Liberal Arts & Sciences
Department of Statistics

Optimizing IVR: Machine Learning for Smarter Voice Interactions

Team members:

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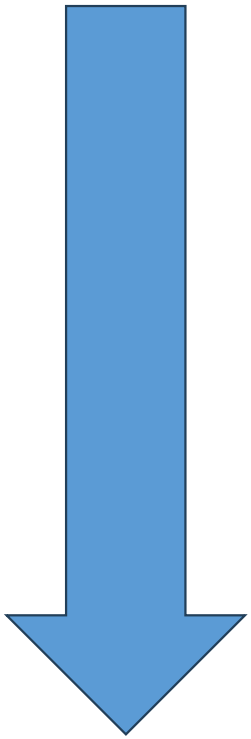
Main Topics



1. EDA & Pattern Discovery
2. ML – Understand `resolve`
3. ML – Understand `reason`
4. Suggestions & ROI Analysis

Before EDA - Feature Engineering (1/2)

We have 2 snapshot time -> March 13 March 18

Concerns: multicollinearity (corr > 0.99), similar distribution

Our solution

- March 13 — Keep this to explore account information
- March 18 – March 13 — Get the dynamic change

- Plus, we add length_of_mos -> represent customers who struggling with the IVR menu

Before EDA - Feature Engineering (2/2)

serial	mos
1	IA PP TR

One-hot Encode

Capture the mos code frequencies

serial	IA	PP	TR
1	1	1	1

Bigram

Capture mos code relations

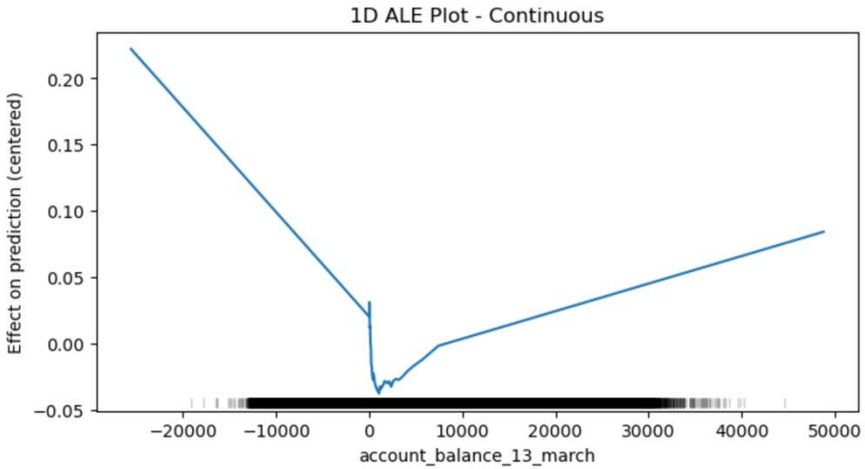
serial	IA PP	PP TR
1	1	1

192 additional new binary features

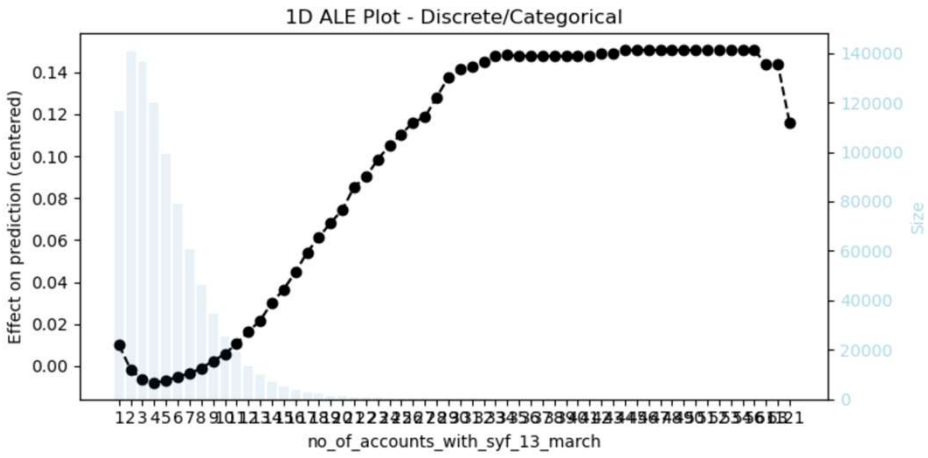
EDA – why linear models are not trustworthy

ALE (Accumulated Local Effects) plot

- SOTA machine learning interpretation method.
- It is unbiased - more robust to multicollinearity compared to PD plot.
- You can read the relative effect of changing the feature on the prediction.



Non-linear relationship

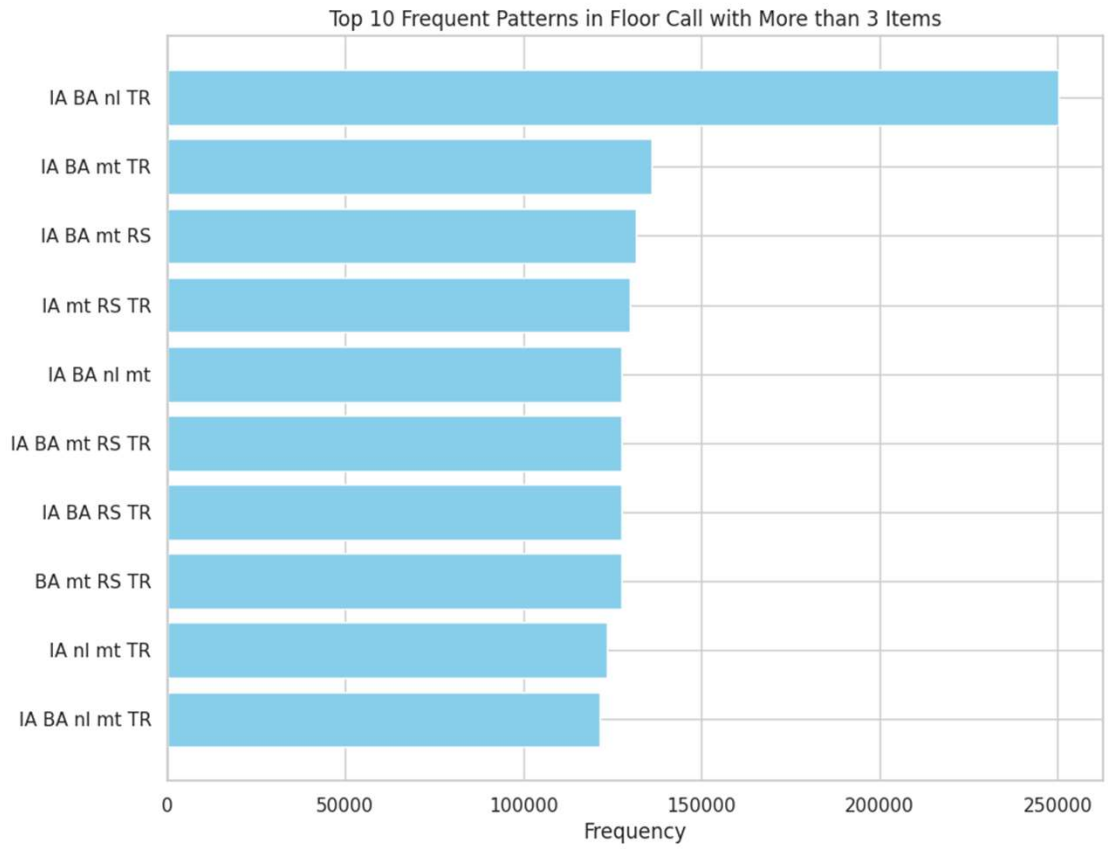


linear relationship

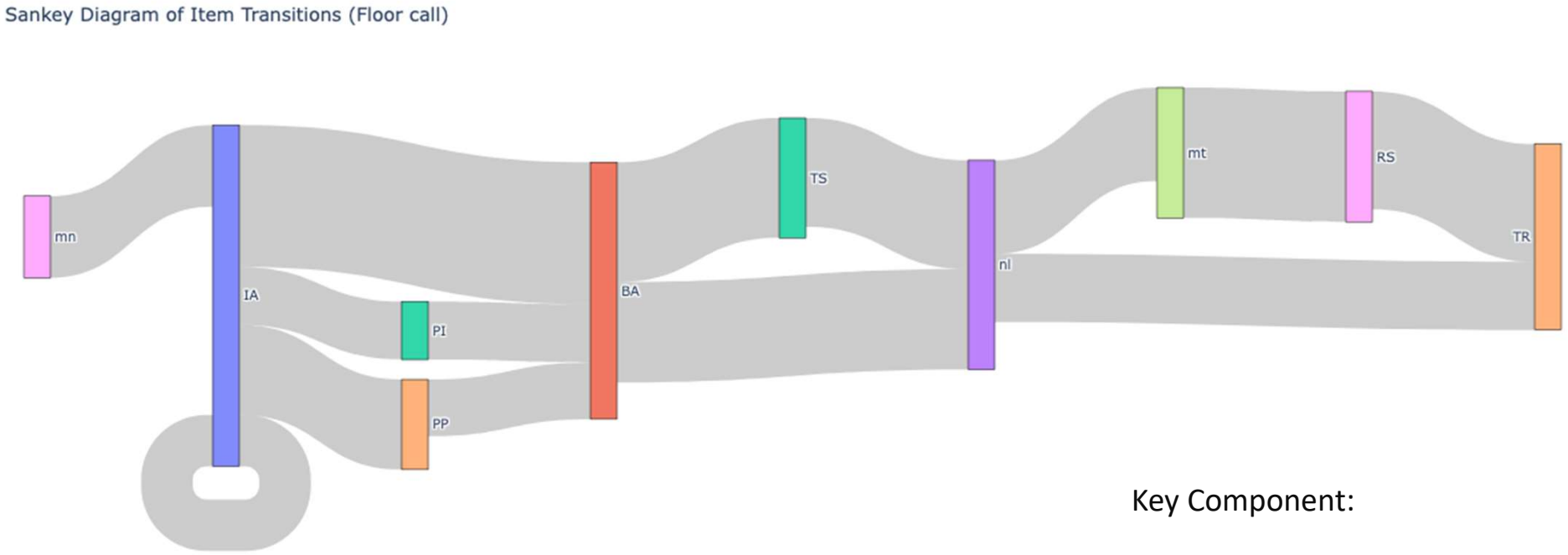
EDA - Association Mining Rule

MOS path:

- **Length & Items**
- **Hard to Feature Engineering**



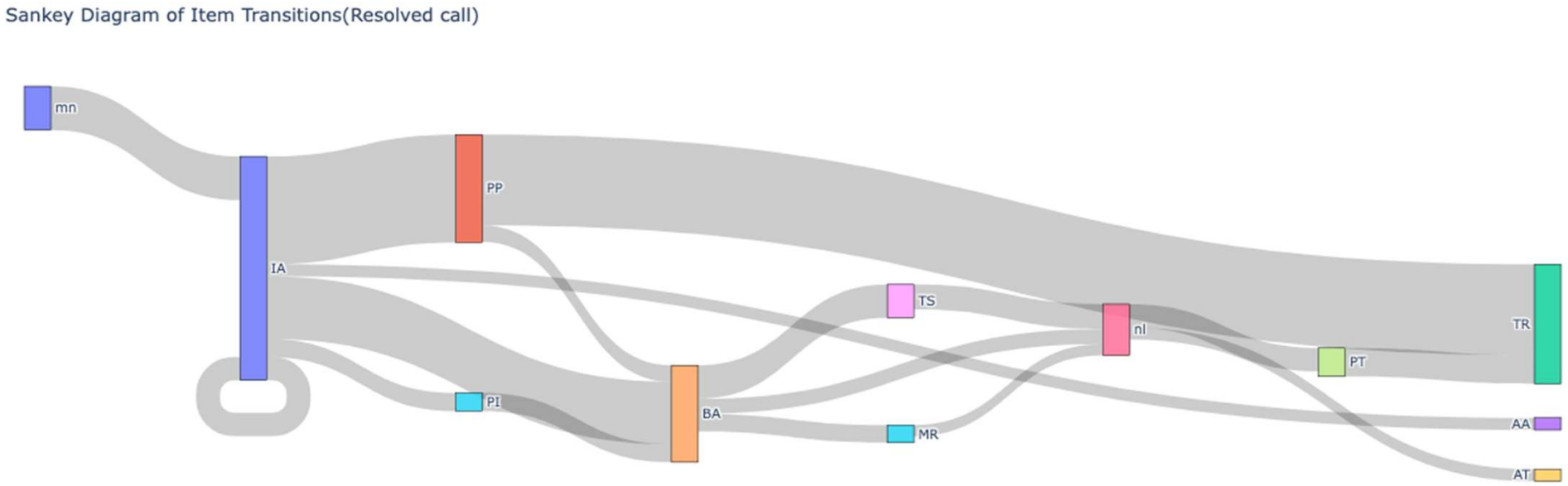
Pattern Discovery - Association Mining Rule
- Sankey Diagram (1/2)



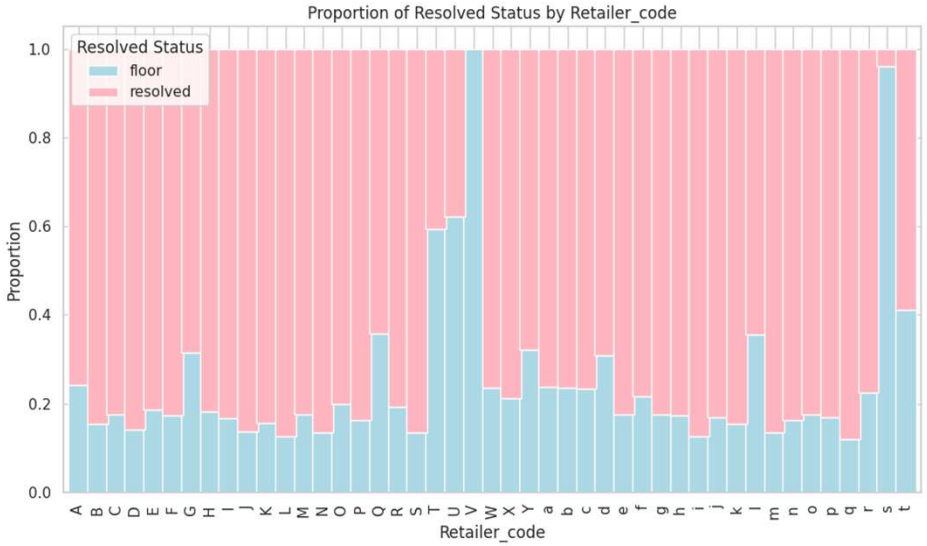
Key Component:

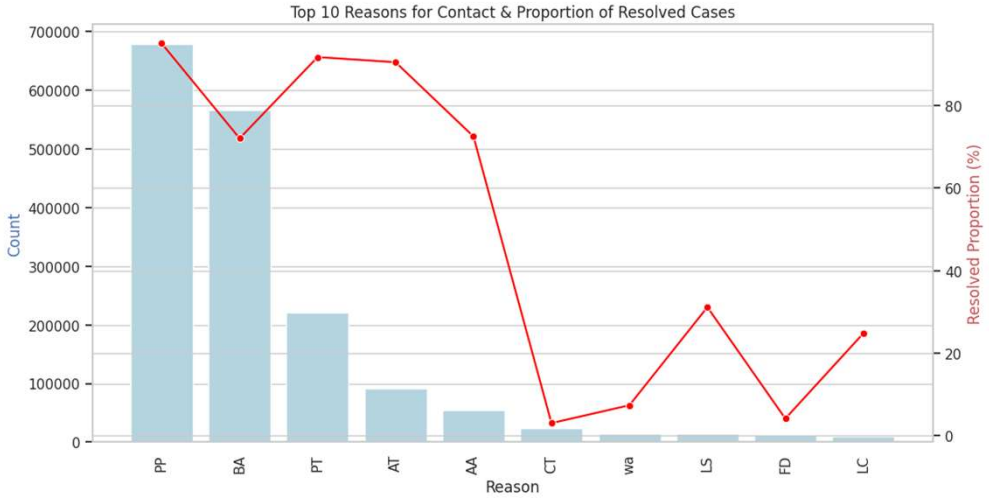
1. NLU Menu (nl)
2. Proactive Income (PI)
3. Pre-Transfer Menu (mt)
4. Global Router (RS)

Pattern Discovery - Association Mining Rule
- Sankey Diagram (2/2)



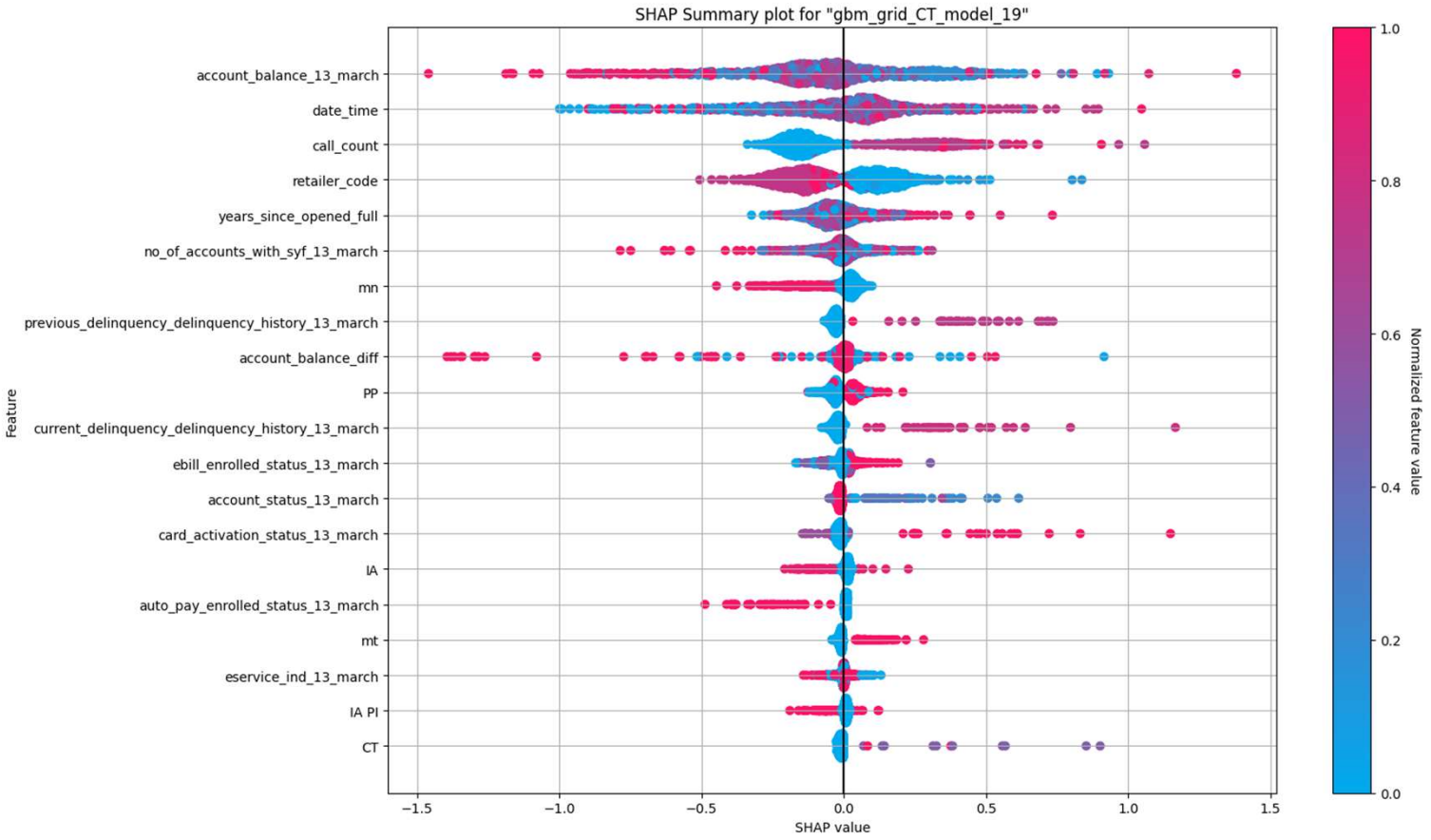
Pattern Discovery – retailer_code & reason





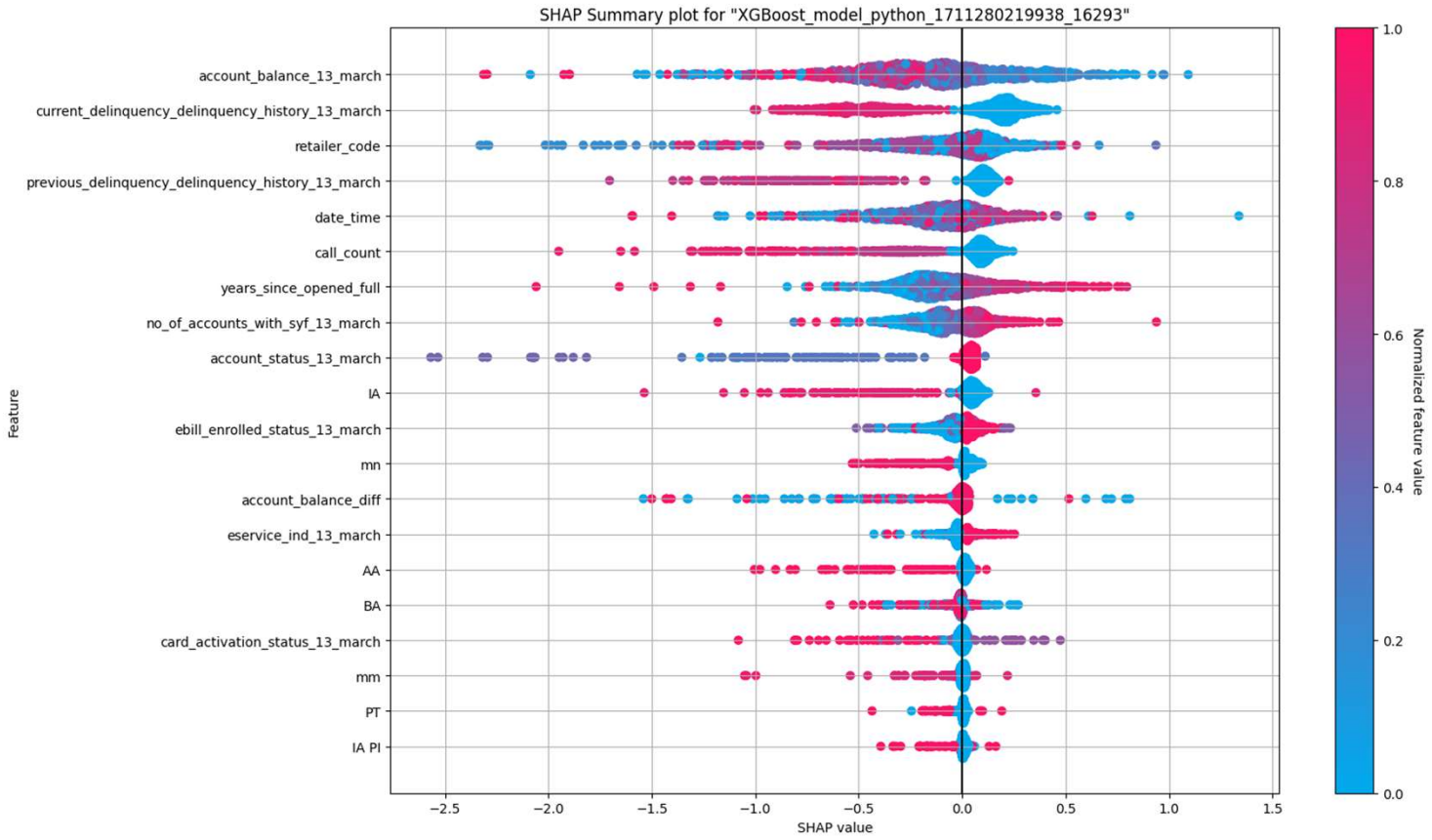
ML – on `resolved` (1/2)

Test Statistics	Value
f1	0.635
accuracy	0.890
precision	0.795



ML – on `resolved` (2/2)

Test Statistics	Value
f1	0.582
accuracy	0.898
precision	0.797



ROI Analysis – an example

Customer Service:	Average Time:	Cost per call:
$25 per hour	3 mins and 26 sec	$1.5

- Given that 1% improvement saves 200,000 agent/floor calls per month, that is, $300,000.

- Then we can conclude, if you use $300,000 gift cards to increase the number of users joining the “e-service” for example, and increase the success rate by 1%, then the investment is worthwhile.