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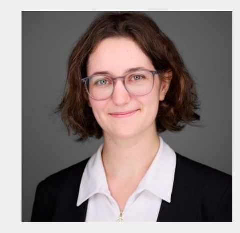
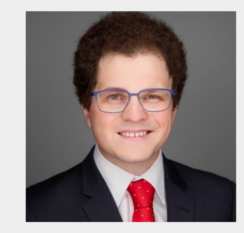
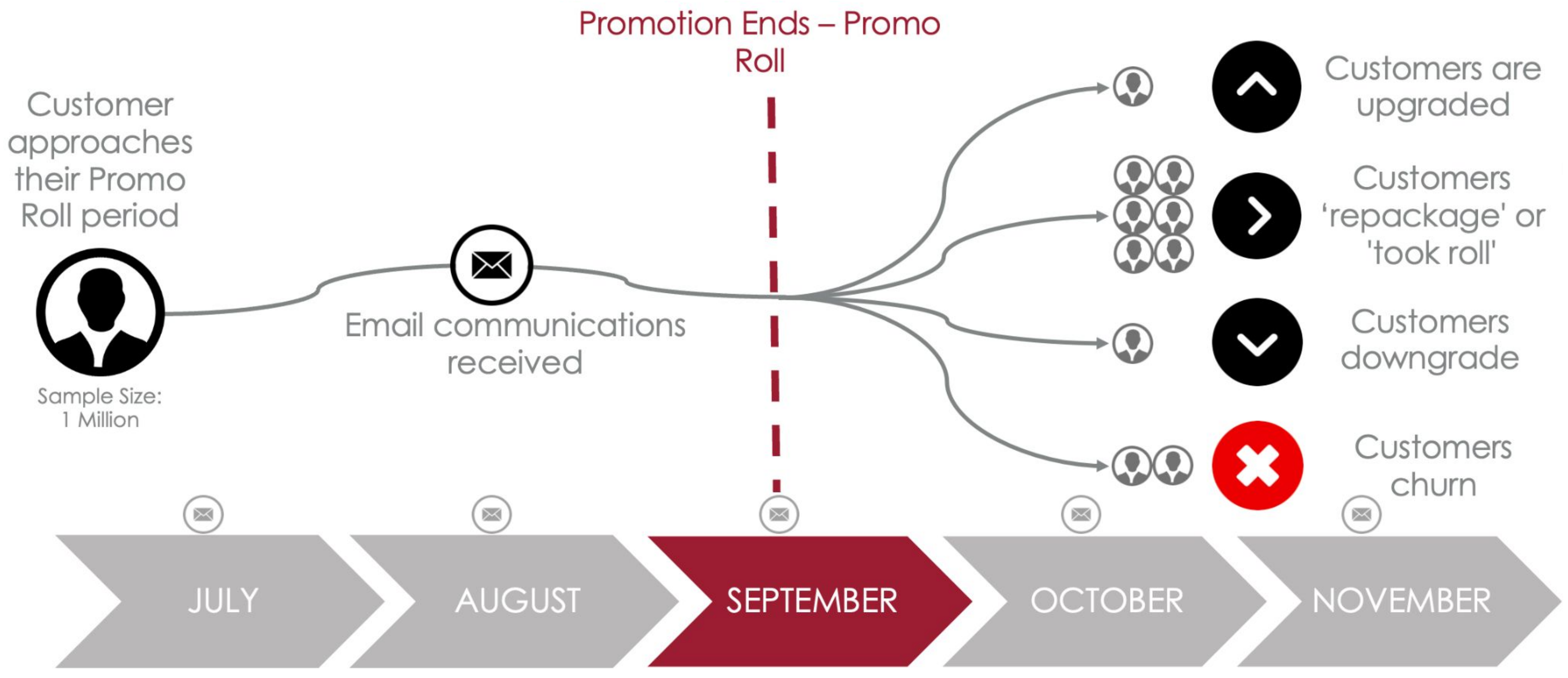
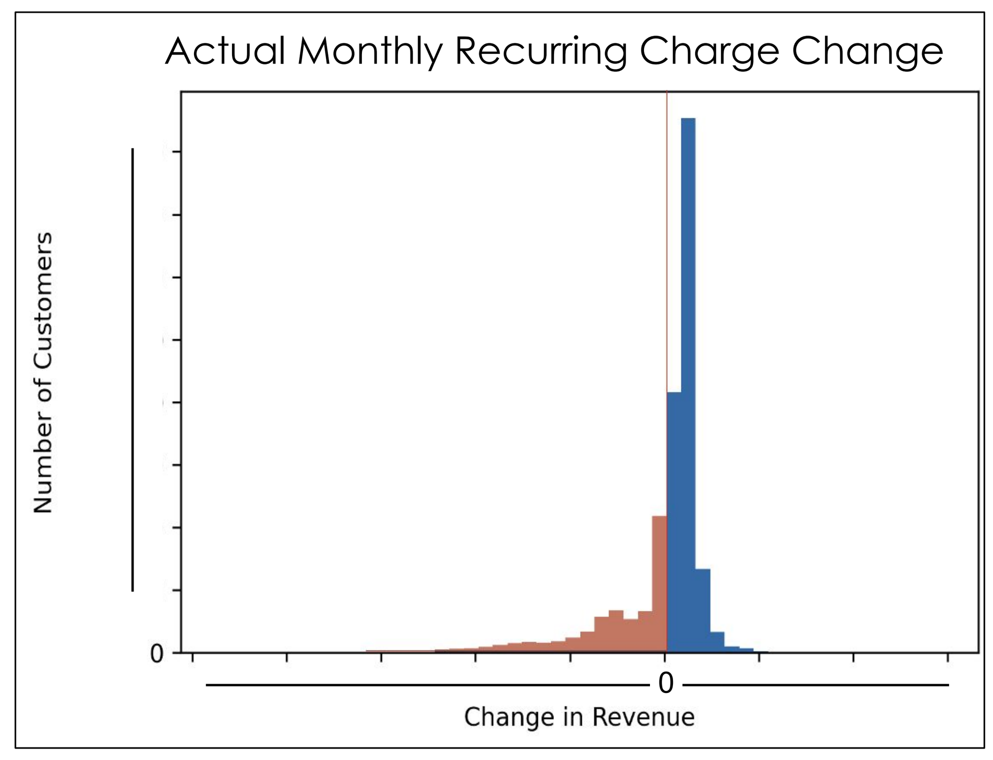



Making Spam Meat Again

Leveraging Targeted Email Marketing to Reduce Churn

Problem Breakdown





^ *Fig 1: Distribution of Roll Revenue Change*

Average expected MRC increase/customer:

21%

Assuming no churn

churn

Actual Average MRC increase per customer post-churn:

2%

Churn Rate Investigation

Customer Segmentation:

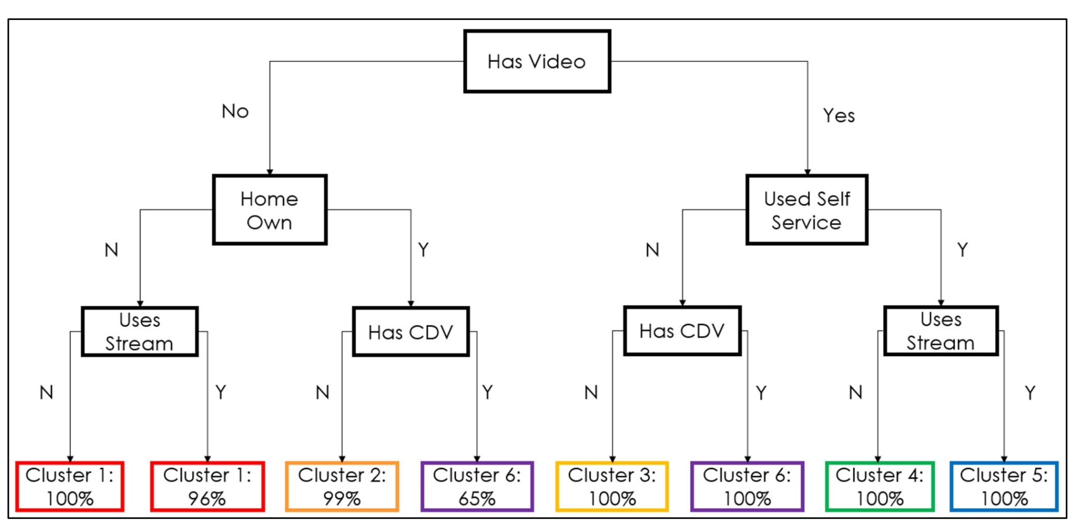
Cluster	Churn Δ
1	+13.7%
2	-0.9%
3	-2.2%
4	-2.4%
5	-4.1%
6	-6.3%

^ *Fig 2: Cluster Churn Rate*

Segmentation via Clustering was performed to isolate important sub-groups within the client base

- K-means with Silhouette Score was used to develop the clusters and select the correct amount
- Churn was omitted to avoid data leakage
- A decision tree was overlaid for interpretability

> *Fig 3: Decision Tree for each Cluster and the assigned purity and size of each leaf*



Promo Roll Churn Prediction:

Predictive Modelling was conducted to assess the impact of various factors on churn, and aid in the development of a prescriptive framework

Data Includes:

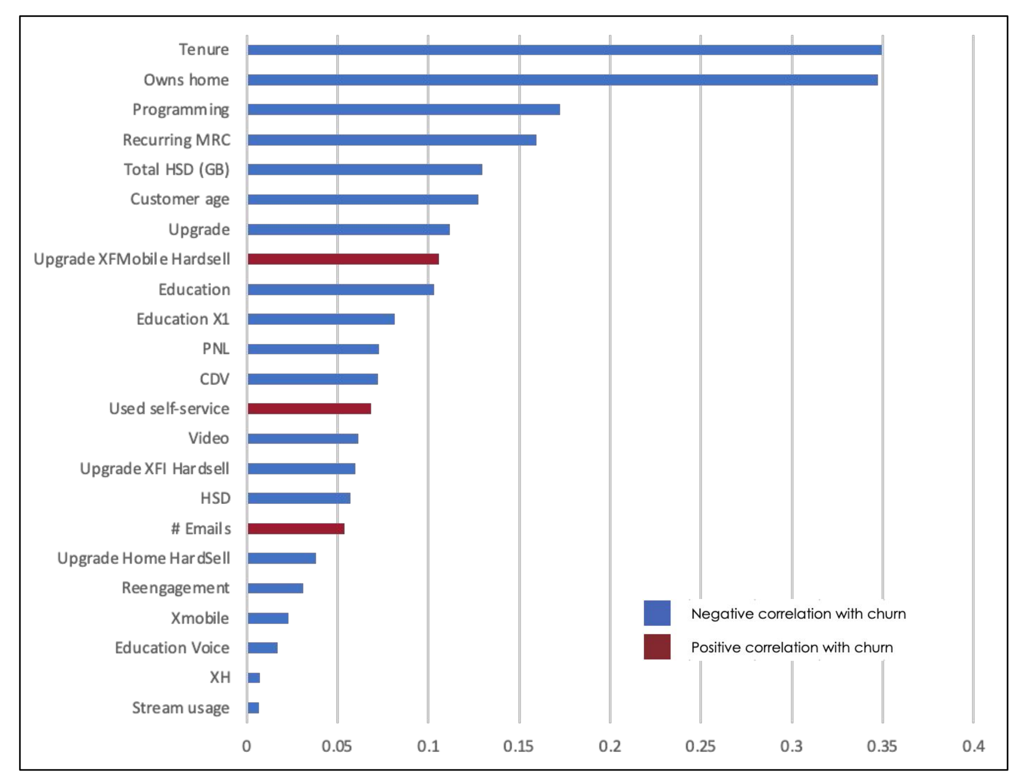
- Emails by key Email Program
- Number of total Emails Sent
- Selected Demographic Features

Models Examined:

- Gradient Boosting
  - XGBoost
  - LightGBM
- Variety of Logistic Regression
- Random Forest

Final Model: Logistic Regression

- AUC: 0.726
- Accuracy: 89.3%



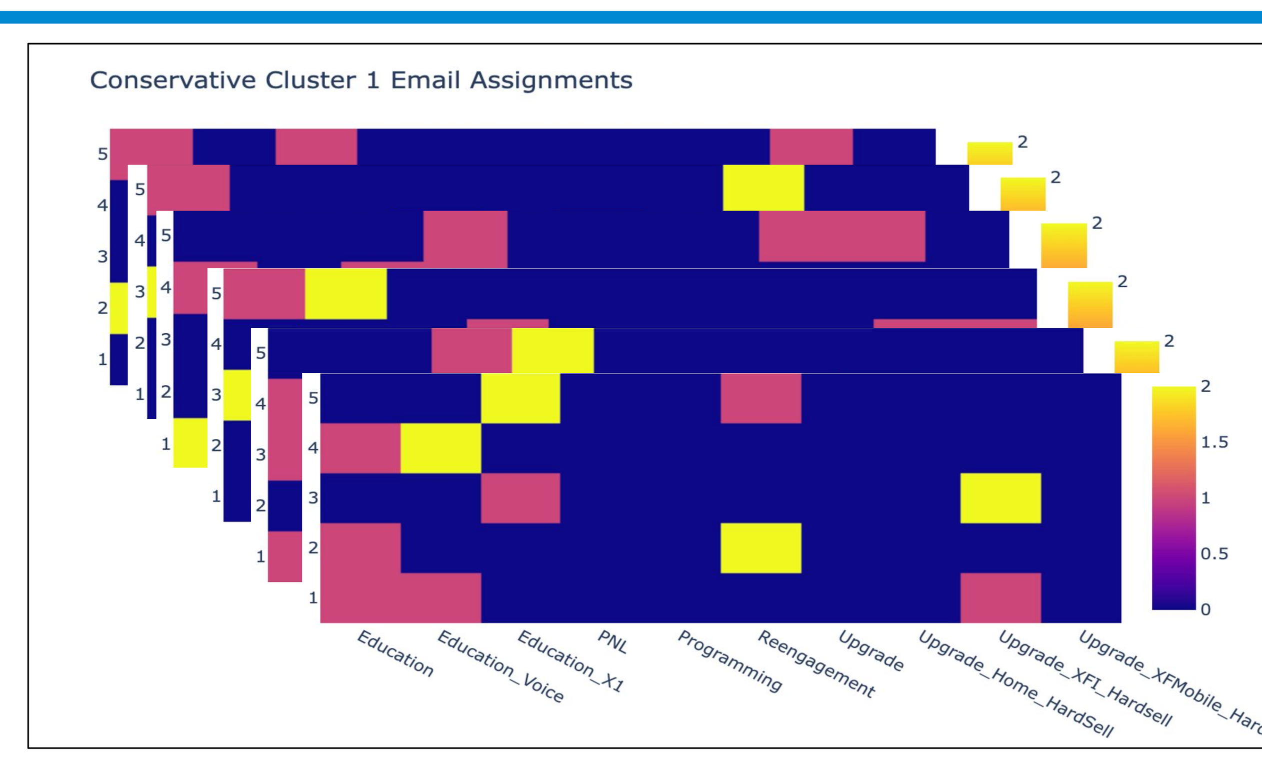
^ *Fig 4: Feature Importance of Model Factors*

Prescriptive Application

Combining the modelling performed on Churn Prediction and Segmentation we created a decisioning engine through optimization of cluster centroids to assign email mix strategies:

Segment Assignment → *Cluster Centroid*
Product and Usage Data → *Optimization Formulation*
Predictive Model → *Optimization Formulation*

Optimization Formulation → Email Mix Strategies with assignments for each rolling individual



^ *Fig 5: Example Email Mix Strategy Set*

Objective Values:

$$\text{Min}_{\mathbf{x}}\ \sum_c(\boldsymbol{\beta}_c\mathbf{x}_c + \boldsymbol{\gamma}_c\mathbf{z}_c + \rho_c\cdot(s_c+\textstyle\sum_j x_{cj})) + \sum_t \boldsymbol{\alpha}_t\mathbf{x}_t$$

[Log Odds] *[Timing]*

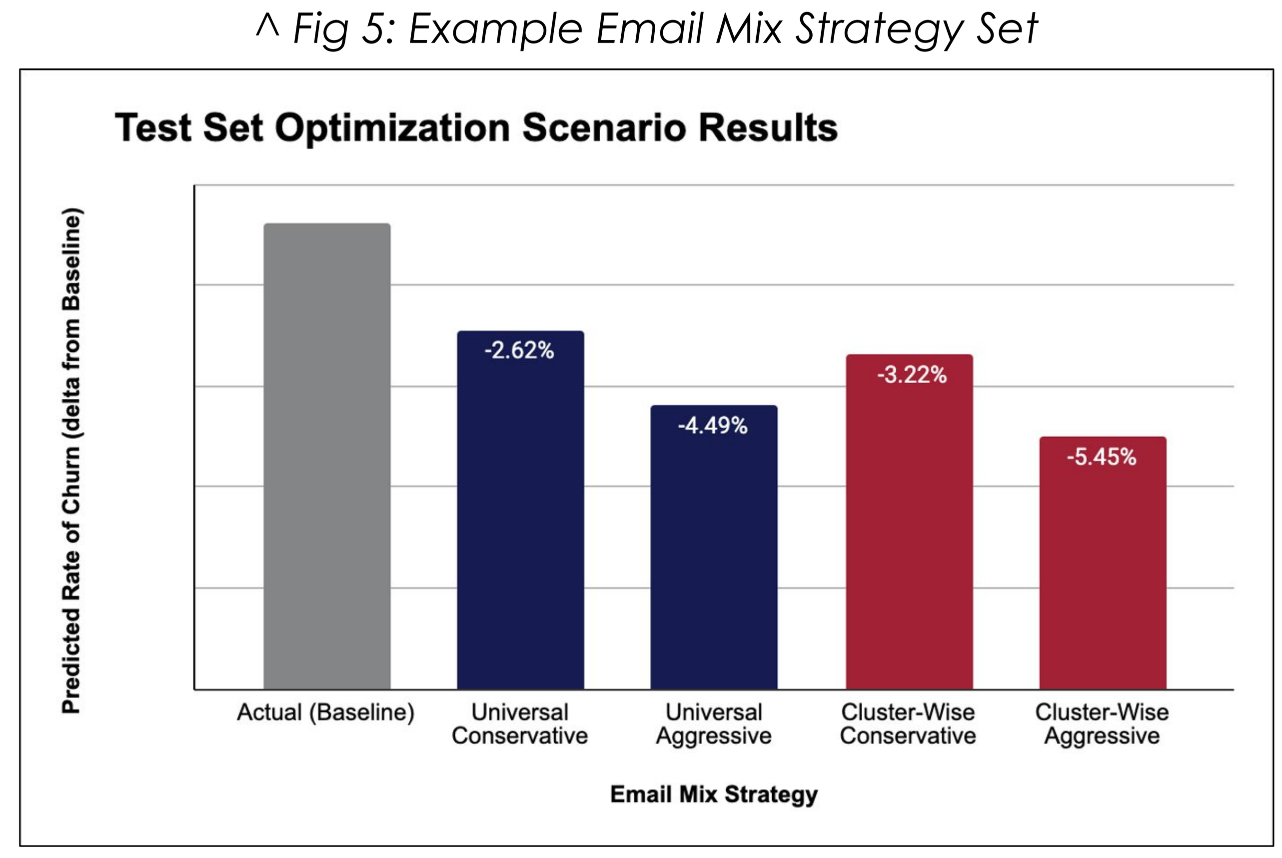
Key Variables/Inputs:

x_{cjt} - sending an email *j* to cluster *c* in week *t*
z_{ij} - known centroid demographic value *j* for cluster *c*
β_{cj} - coefficient for cluster *c* for email category *j*
γ_{ck} - coefficient for cluster *c* for demographic *k*
α_t - coefficient for emails in week *t*

Constraints:

- Restrict the total number of emails that can be sent in any one week
- Restrict the total number of emails sent in any one category
- Restrict the total number of emails from one category sent in any two-week period

Exact constraint values malleable for different strategies.



^ *Fig 6: Test Outcomes from Different Mix Strategy Sets*

Business Impact

Q: What differentiates clients and their actions during Promo Roll?

A: Through our segmentation of the Promo Roll client base we isolated important subsets of clients and modelled the importance of various factors on churn

Q: What role does Email Campaigns play in Promo Roll?

A: Based on the results of our modelling Emails from a subset of controllable campaigns were found to correlate with reduced churn, and a further **randomized test** was proposed to continue analyzing the impact of emails on churn

Q: Which Emails should be sent to each client undergoing Promo Roll?

A: An optimization formulation based on modelling of churn rates enabled us to generate email mix strategies both universally and by cluster. This resulted in a conservative reduction in churn rate of over **3 percentage points** in offline testing

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