Churn Rate Investigation

Customer Segmentation:

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.

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
- LightGTM
- Variety of Logistic Regression
- Random Forest

Final Model: Logistic Regression
- AUC: 0.726
- Accuracy: 89.3%

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.

Objective Values:

\[
\min_x \sum_c (\alpha_c x_{ct} + y_c z_c + q_c (1 - \sum x_{ct}^c) + \sum x_{ct})
\]

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.

Key Variables/Inputs:

- \(x_{ct}\): sending an email to cluster \(c\) in week \(t\)
- \(z_{ct}\): known centroid demographic value \(j\) for cluster \(c\)
- \(\beta_c\): coefficient for cluster \(c\) for email category \(k\)
- \(\gamma_c\): coefficient for cluster \(c\) for demographic \(k\)
- \(\alpha_c\): coefficient for emails in week \(t\)

Business Impact

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: 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 modeled the importance of various factors on churn.

Q: Which Emails should be sent to each client undergoing Promo Roll?
A: An optimization formulation based on modeling 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.