

TELECOM CHURN PREDICTION

AGENDA

Understanding Customer Churn Drivers

Analyze key factors influencing customer churn, including usage patterns (e.g., ARPU, call minutes, recharge frequency), customer satisfaction indicators, and competitive threats.

Identify the phases of customer behavior (e.g., "good", "action", and "churn") and analyze any shifts in usage or engagement leading up to churn.

Predictive Modeling for Churn Prevention

- Use machine learning models to predict the likelihood of customer churn, focusing on maximizing recall/sensitivity to capture potential churn cases.
- Develop actionable insights from model results to implement targeted retention strategies (e.g., incentives, improved customer support) for at-risk customers.

ABOUT THE PROJECT

The telecom company provides telecom services to many clients. But due to many reasons. customers switch from one service provider to other. Telecom churn has emerged as the single largest cause of revenue erosion for telecom operators.

- Now telecom company manager wants to know actionable insights to retain customers and increase customers' lifetime values.
- Here in this project we have to analyse a huge dataset from which we are going to extract actionable insights & make a Dashboard that can be useful for a Sales manager to work on and see how our business is doing. Also, he can make data-driven decisions & which will help him to retain customers and increase customers' lifetime values.
- We have extracted many different insights which we will see further in this report

STEPS FOR PRE-PROCESSING

EDA

TRAINING THE MODEL

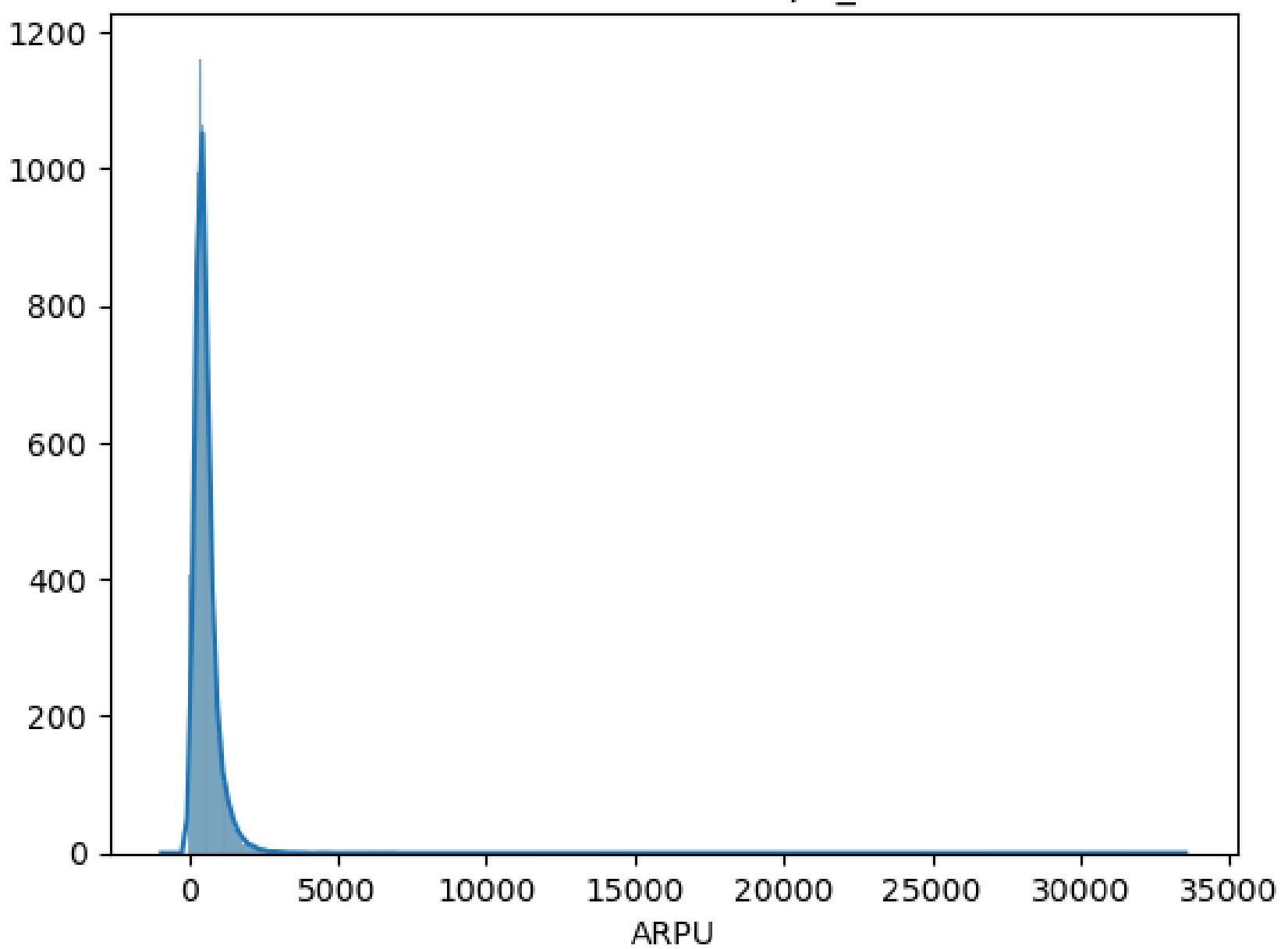
FEATURE SELECTION



EDA

GRAPH

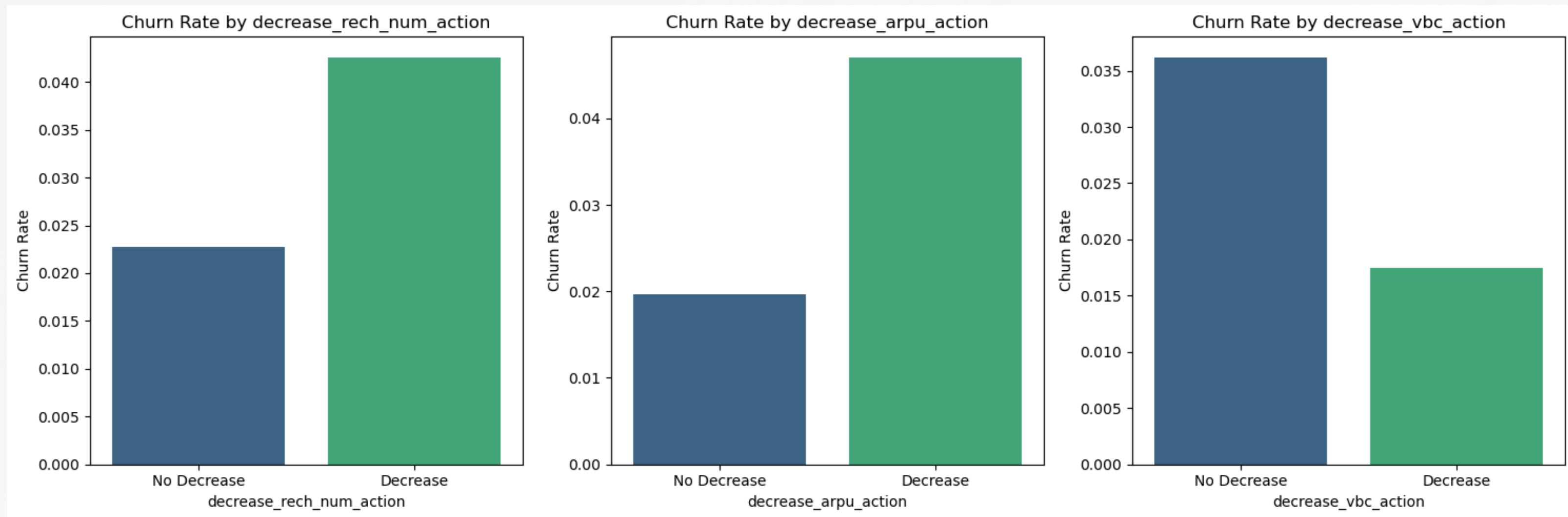
DISTRIBUTION OF arpu_8



- High-Value and High-Usage Customers Are Less Likely to Churn:
- Both ARPU and total outgoing MOU data show that higher values correlate with lower churn rates. This suggests that high-value, high-engagement customers are more loyal. It would be beneficial to focus retention efforts on these high-value users, as their departure would have a significant impact on revenue. Early Drop in Usage as a Churn Signal:
- Lower median MOU and ARPU in churned customers suggest that a drop in usage and revenue could be an early indicator of churn. Monitoring changes in MOU and ARPU over time may help identify customers who are at risk of churning before they actually leave, allowing the company to take proactive steps. Potential for Segmentation and Targeted Interventions:
- Based on ARPU and MOU distributions, customers could be segmented into high, medium, and low-value groups. Targeted offers could then be tailored for each group to improve retention. For example, high-value customers might benefit from loyalty rewards, while low-value customers could be offered promotional plans to boost engagement. Retention Strategy Focused on ARPU and MOU:
- Since ARPU and MOU are strong indicators of customer value and engagement, these metrics could be used to prioritize retention efforts. High-value users and those with consistent usage patterns should be a key focus.

EDA

Target retention efforts toward customers with declining recharge numbers and ARPU, possibly by offering incentives or personalized packages to reignite their engagement.
Investigate the needs of high VBC users who churn, as they may benefit from specialized data-focused plans or loyalty rewards to encourage retention.



FEATURE ANALYSIS

FEATURE ANALYSIS

Feature Analysis and Model Complexity

1. Optimal Parameters and Model Performance:

- Best Test Accuracy: The model achieved a test accuracy of 0.975 with the hyperparameters $C = 1000$ and $\gamma = 0.01$.
- Observation: While these parameters yield the highest accuracy, they may lead to an overfit model, as the high γ value (0.01) increases model complexity, causing it to fit the training data too closely.

2. Effect of Gamma on Model Complexity:

- Higher Gamma (0.01): High gamma values add more non-linearity, making the model complex and prone to overfitting. Although it maximizes test accuracy, this setting may not generalize well to unseen data.
- Lower Gamma (0.0001): Reducing gamma leads to a simpler, more balanced model. With gamma set to 0.0001, the train and test accuracy remain nearly identical, reducing the risk of overfitting and improving generalization.

3. Trade-Off Between Gamma and C:

- High Gamma + Moderate C: A combination of high gamma and moderate C values yields a highly accurate but complex model.
- Low Gamma + Higher C: A simpler model can be achieved with lower gamma (e.g., 0.0001) and a higher C (e.g., 100), which provides stable accuracy and improved generalization.

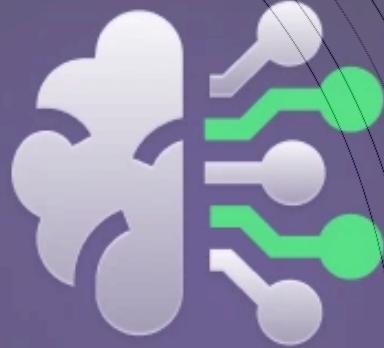
4. Preferred Model Choice:

- Although the best parameters ($C = 1000$, $\gamma = 0.01$) maximize test accuracy, they may not align with the goal of model simplicity and generalization.
- We recommend a simpler model with $\gamma = 0.0001$ and $C = 100$, as it achieves similar accuracy (~90%) while avoiding overfitting.

FEATURE ANALYSIS WITHOUT PCA

- FEATURE SIGNIFICANCE
- FEATURE SELECTION STRATEGY

**Feature Selection
Techniques**
in Machine Learning



AGENDA

Feature Significance:

The model coefficients indicate that some features positively contribute to churn prediction, while others have a negative impact.

Upon examining p-values, it's clear that several features are statistically insignificant, as they have high p-values, meaning their contribution to the model may not be reliable.

Feature Selection Strategy:

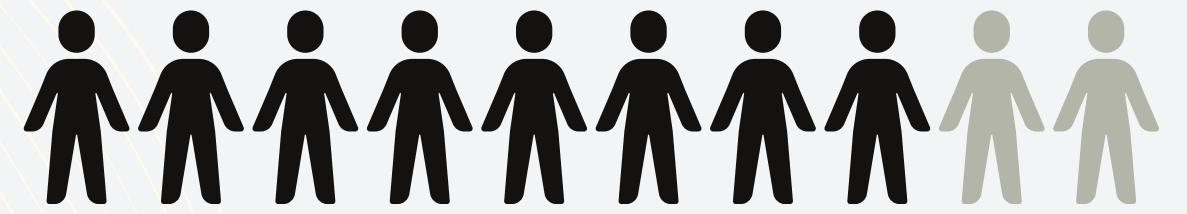
Coarse Tuning (Auto + Manual): To improve model simplicity and performance, we adopt a two-step feature selection approach:

Automatic Feature Selection with RFE: We initially reduce the number of features by using Recursive Feature Elimination (RFE). This method ranks features based on their importance and iteratively removes the least important features.

Manual Feature Elimination: After RFE, we further refine the feature set by manually examining p-values and VIFs (Variance Inflation Factors), eliminating any features that remain statistically insignificant or show high multicollinearity.



BUSINESS RECOMMENDATION AND STRATEGY



STRATEGIES

STRATEGY N°1



1. Enhance Loyalty Programs for High-Value Customers
Target: Customers with high ARPU in earlier months who show a decline in recent months (e.g., ARPU dropping from month 6 to month 8).
Action: Offer loyalty rewards, discounts, or exclusive service upgrades to these customers.
Personalized engagement can help re-engage high-value customers, reducing their risk of churn.

STRATEGY N°2



2. Introduce Cost-Effective Roaming and International Plans
Target: Customers with high roaming and international outgoing usage. Action: Implement affordable international and roaming bundles. Providing cost-effective or loyalty-based discounts on these services can retain customers who use these features and reduce their incentive to switch to other providers with better deals.

STRATEGY N°3



3. Encourage Active Usage Among Passive Users
Target: Customers who have high incoming calls but limited outgoing or other engagement (e.g., high total_ic_mou_8 and ic_others_8). Action: Launch targeted promotions or incentives, such as free outgoing minutes or bundled packages. These could prompt passive users to increase their engagement, thereby increasing the perceived value of the service and lowering churn probability.

STRATEGIES

STRATEGY N°4



4. Promote Data Packages and Improve Network Quality

Target: Customers with low data usage, particularly those using minimal 2G or 3G data (e.g., `low_monthly_2g_8` and `monthly_3g_8`). **Action:** Educate these customers on data plans, offer bonus data packages, or introduce low-cost starter packs to encourage greater data usage.

Improving network performance or addressing quality issues could also help retain these customers, particularly if they are dissatisfied with their current service quality.

STRATEGY N°5



5. Deploy Early Intervention for Declining ARPU and VBC

Users Target: Customers with significant decreases in ARPU or VBC usage in the action phase (`decrease_arpu_action` and `decrease_vbc_action`). **Action:** Implement predictive alerts to identify users showing reduced engagement in ARPU or VBC services. Offer retention incentives such as personalized bundles, additional services, or discounts to these users before they fully disengage.

STRATEGY N°6



6. Launch Special Engagement Campaigns for Churn-Risk Segments

Target: Customers who show multiple risk factors, such as declining ARPU, low data usage, and high reliance on incoming calls. **Action:** Develop a dedicated engagement program offering value-add services (e.g., reduced rates on high-demand features, loyalty points, or free trials for premium features). These campaigns could re-engage at-risk customers and demonstrate the service's value, discouraging churn.

CONTRIBUTORS

Paulami Sur Roy

Tushar Kumar

