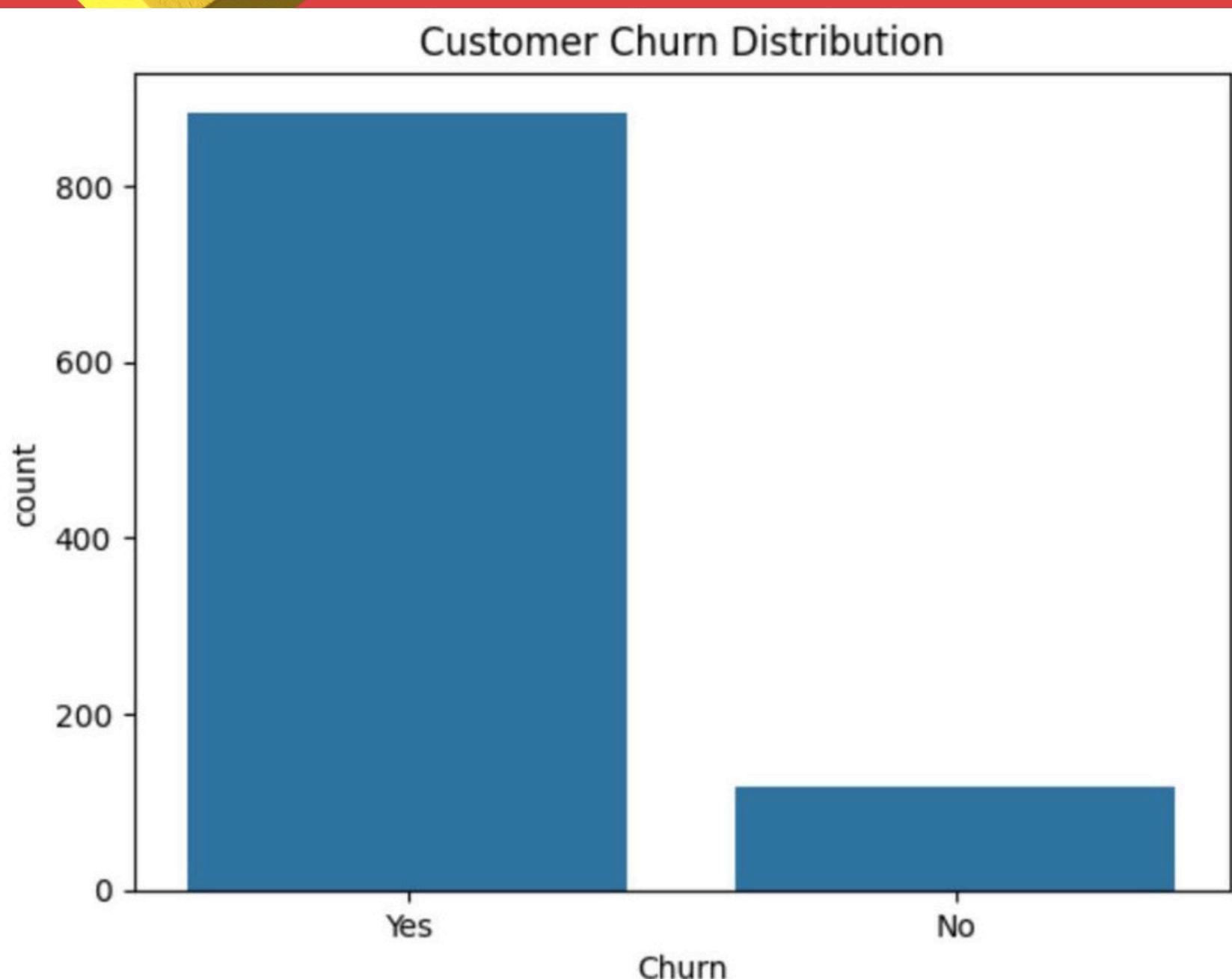


# “Telecom Churn Prediction with Explainable AI (SHAP & ML Models)”





👉 You can see the 'Yes' bar is much taller than the 'No' bar.

This means:

- A large portion of customers have churned.
- Only a small portion stayed.
- It looks like around 85–90% churned, only about 10–15% stayed.
- (Note: Usually in real datasets it's the opposite — this might be flipped in your example!)

#### ⚠ Why This Matters

Class Imbalance:

This plot reveals a major class imbalance — you have many more churned customers than non-churned ones (or vice versa if your labels are flipped).

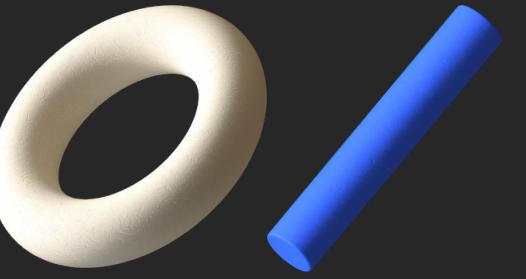
In churn prediction, this is a classic problem — if you train a model on this data without fixing imbalance, it will just predict the majority class every time.

#### Need for SMOTE or Balancing:

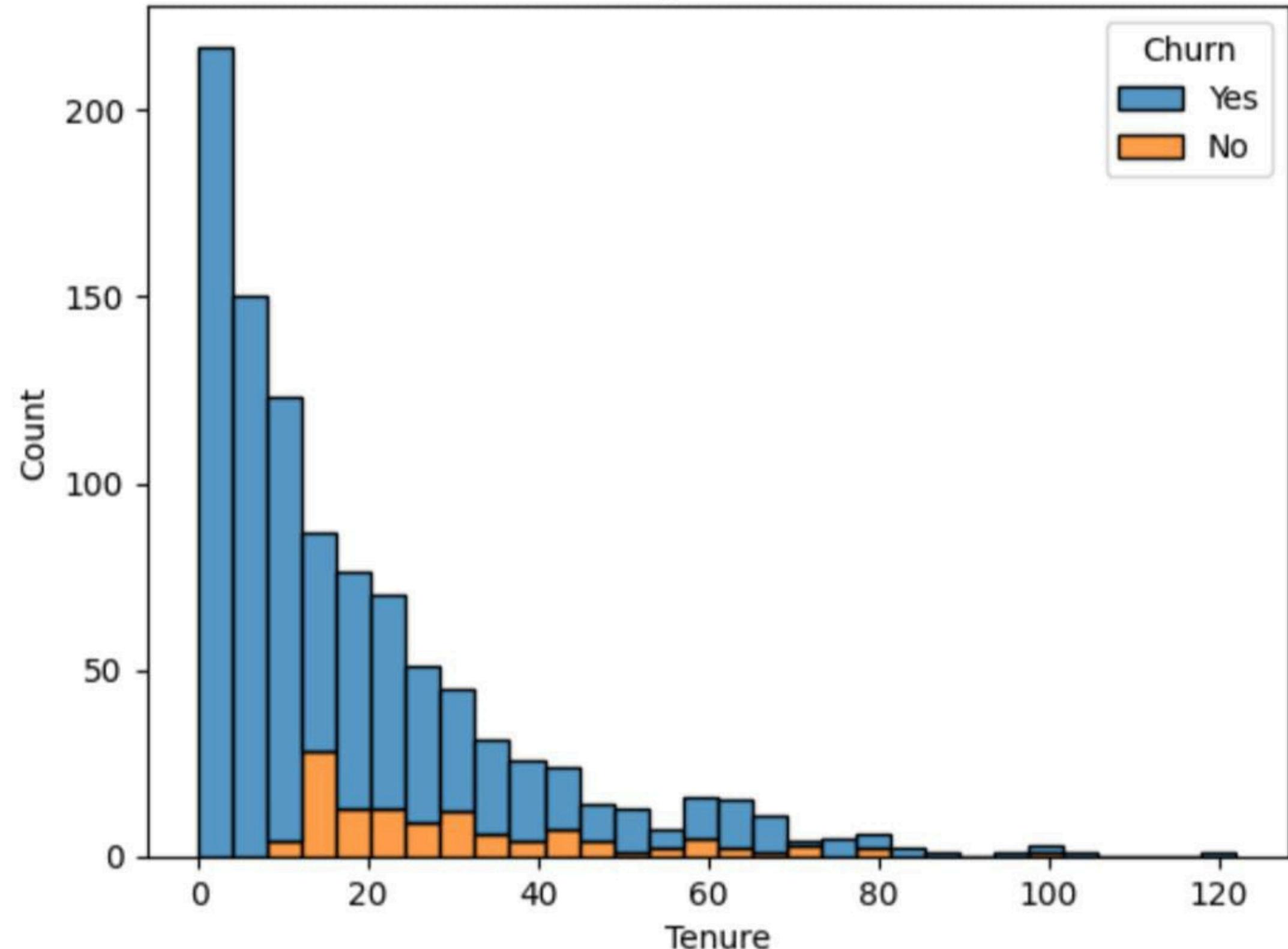
That's why you applied SMOTE in your pipeline — to generate synthetic samples of the minority class and balance things out, so your model learns both churned and non-churned patterns fairly.

#### Business Impact:

The fact that churn is so high shows how critical this problem is — the business is losing a significant portion of customers, which impacts revenue directly.

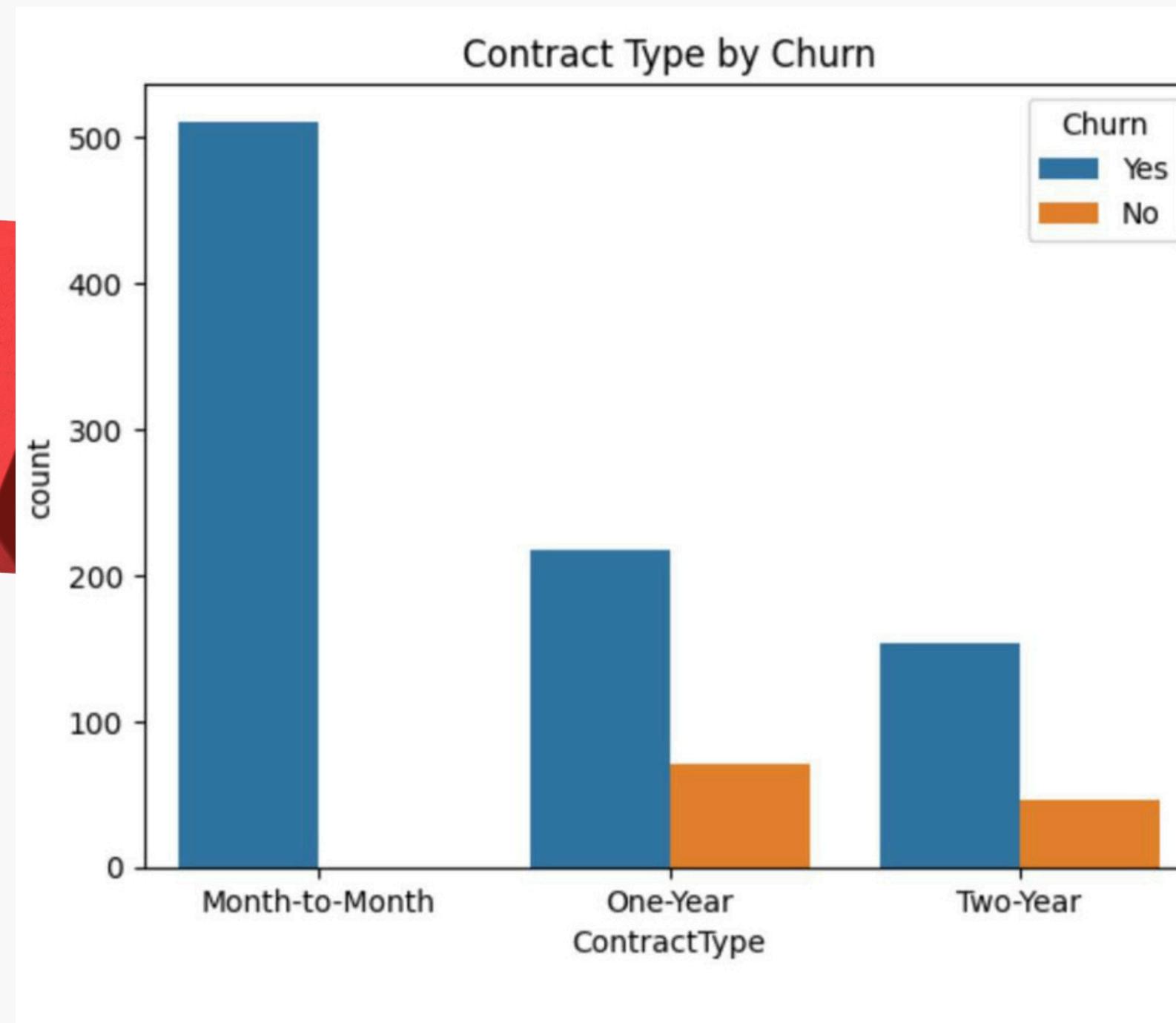


## Tenure by Churn Status

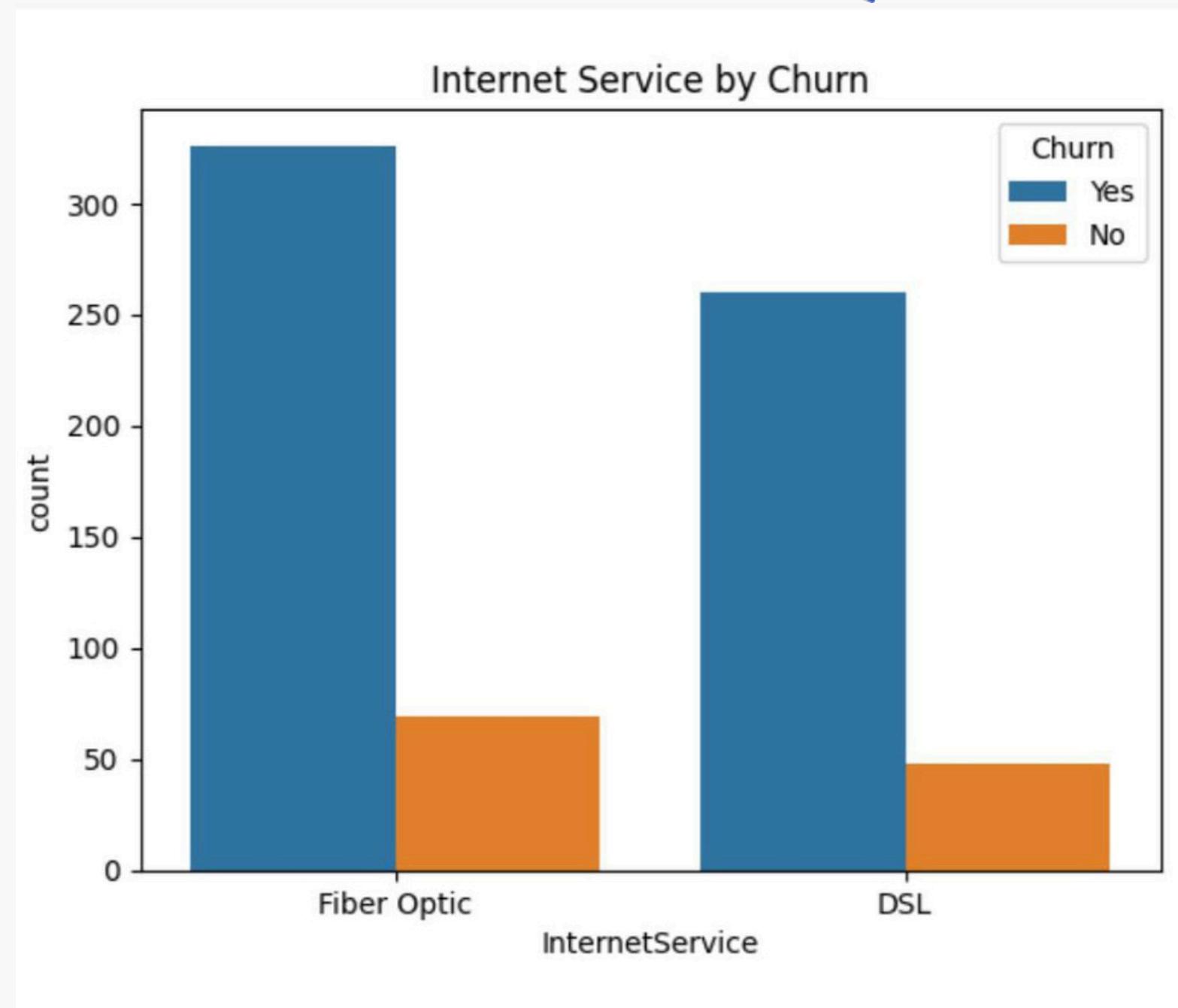


### ✓ Key Insight from This Plot:

- Most churn happens at low tenure:
- You can see that the blue bars are very high on the left (low tenure).
- This means most customers who leave do so within the first few months.
- After about 20-30 months, the number of churned customers drops sharply.
- Long-tenure customers are more loyal:
- The orange bars (no churn) stretch further to the right.
- Customers who stay longer are much less likely to churn.



- 👉 The Month-to-Month contract group has by far the highest churn — the tall blue bar means most churned customers are on flexible, short-term contracts.
- 👉 By contrast, One-Year and Two-Year contracts have:
  - Fewer total churned customers.
  - Higher proportion of customers who stayed (the visible orange bars).
- ✓ This shows that longer contracts help keep customers loyal — they are less likely to churn when they are locked in for a year or two.

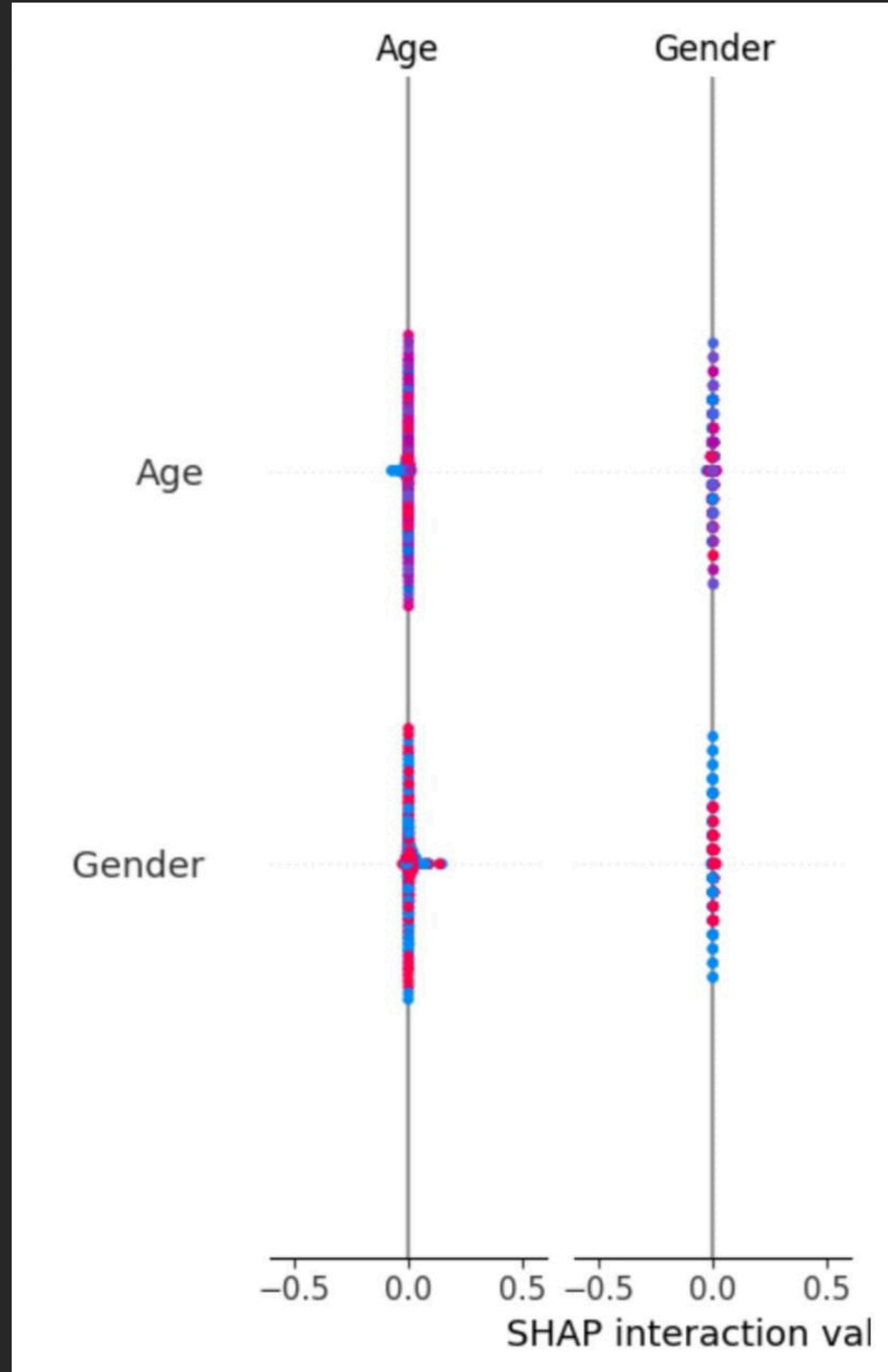


#### ✓ Key Insight from This Plot

👉 The Fiber Optic customers have a higher churn count than DSL customers.

- The blue bar for Fiber Optic is taller than the blue bar for DSL.
- The orange bars (stayed customers) are much smaller for both, but especially for Fiber Optic.

👉 This means that Fiber Optic customers churn more frequently than DSL customers.



**SHAP dependence interaction plot,**  
This is a SHAP dependence interaction plot,  
which shows how two features interact with  
each other and affect the model's output  
(churn probability).

- **Tool:** This comes from SHAP (SHapley Additive exPlanations) — a powerful explainable AI tool that shows how much each feature pushes a prediction higher or lower.
- **Purpose:** Instead of showing each feature's solo impact, this plot shows how two features interact together.



## Practical Recommendations

Based on the analysis, model results, and SHAP interpretability, here are 3 key recommendations for the telecom company to reduce customer churn:

### Convert Short-Term Contracts to Long-Term

Insight: Customers on month-to-month contracts have a significantly higher churn rate compared to those on annual or two-year contracts.

#### Recommendation:

- Offer incentives, such as discounts, loyalty rewards, or bundled services, to encourage month-to-month customers to switch to longer-term plans.
- Target high-risk segments with special promotions during the first few months of their tenure.

### Focus on Early Tenure Retention

Insight: Customers with low tenure (new customers) are more likely to leave, often within the first few months.

#### Recommendation:

- Design onboarding and retention campaigns for new customers.
- Offer welcome discounts, personalized offers, or engagement programs within the first 3-6 months.
- Assign dedicated customer service touchpoints for new sign-ups to improve satisfaction.

### Upsell & Promote Tech Support Services

Insight: The SHAP analysis shows that customers without technical support are more prone to churn.

#### Recommendation:

- Create attractive bundled packages that include tech support as a value-added service.
- Offer trial periods for tech support to increase adoption.
- Educate customers on the benefits of tech support through targeted marketing.