



# TELCO CUSTOMER CHURN

EDA Project

Tools: Python | Power BI | Streamlit





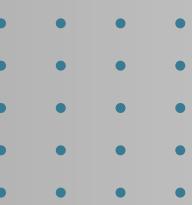
# BUSINESS PROBLEM

- High customer churn impacts revenue and growth
- Need early identification of churn-risk customers
- Data integration is key to proactive retention

## Integration Process:

- Unified all data using customerID as the primary key
- Cleaned missing and invalid values
- Removed duplicates
- Standardized categorical and numerical fields

This ensured a single, consistent, and trusted customer dataset.





# CUSTOMER 360-VIEW

One row per customer

A complete customer profile including:

- Demographics
- Billing behavior
- Service usage
- Contract details
- Churn status

Churn Indicator Features

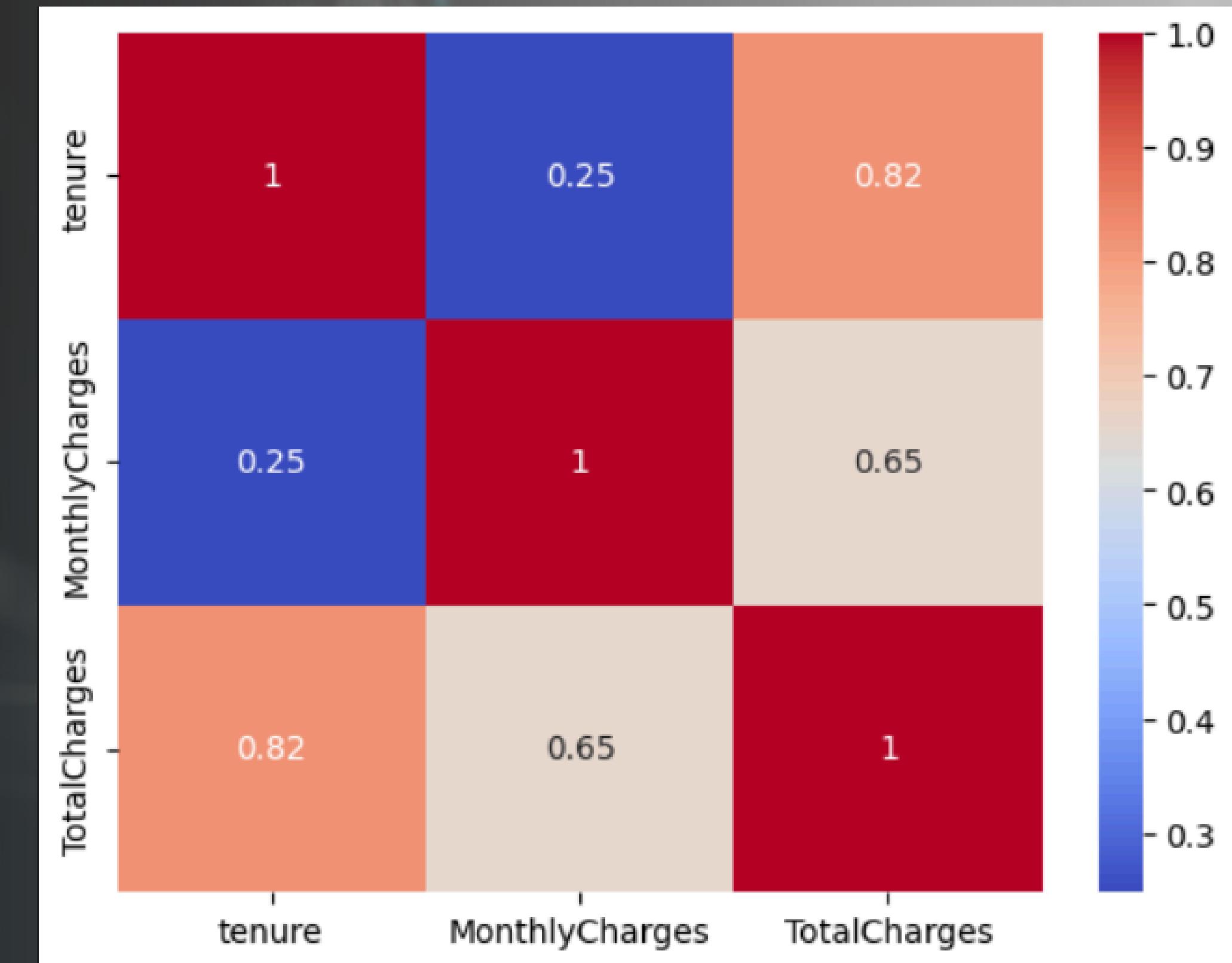
- Tenure
- Billing (Monthly & Total Charges)
- Contract type
- Service usage
- Demographics

These features help identify customers with a high probability of churn.



# Key Churn Insights

- Low tenure → higher churn
- Month-to-month contracts → highest churn
- High monthly charges → higher risk
- No support/security services → more churn



Correlation between Tenure & Total Charges = 0.82 (strong positive)

Correlation between Monthly Charges & Total Charges = 0.65 (moderate positive)

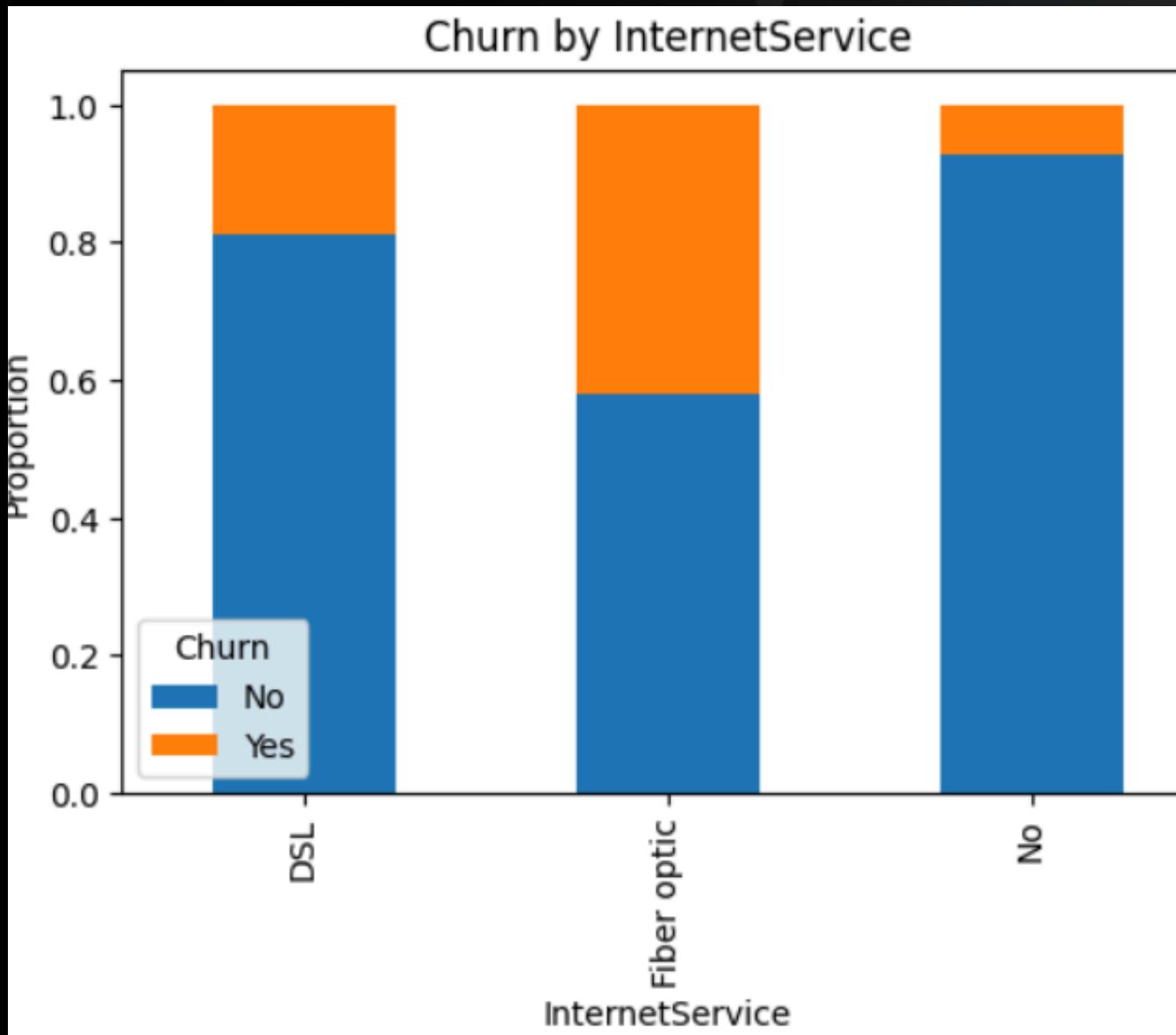
Correlation between Tenure & Monthly Charges = 0.25 (weak)

Indicates that Total Charges increase mainly with customer tenure

# Some Feature insights

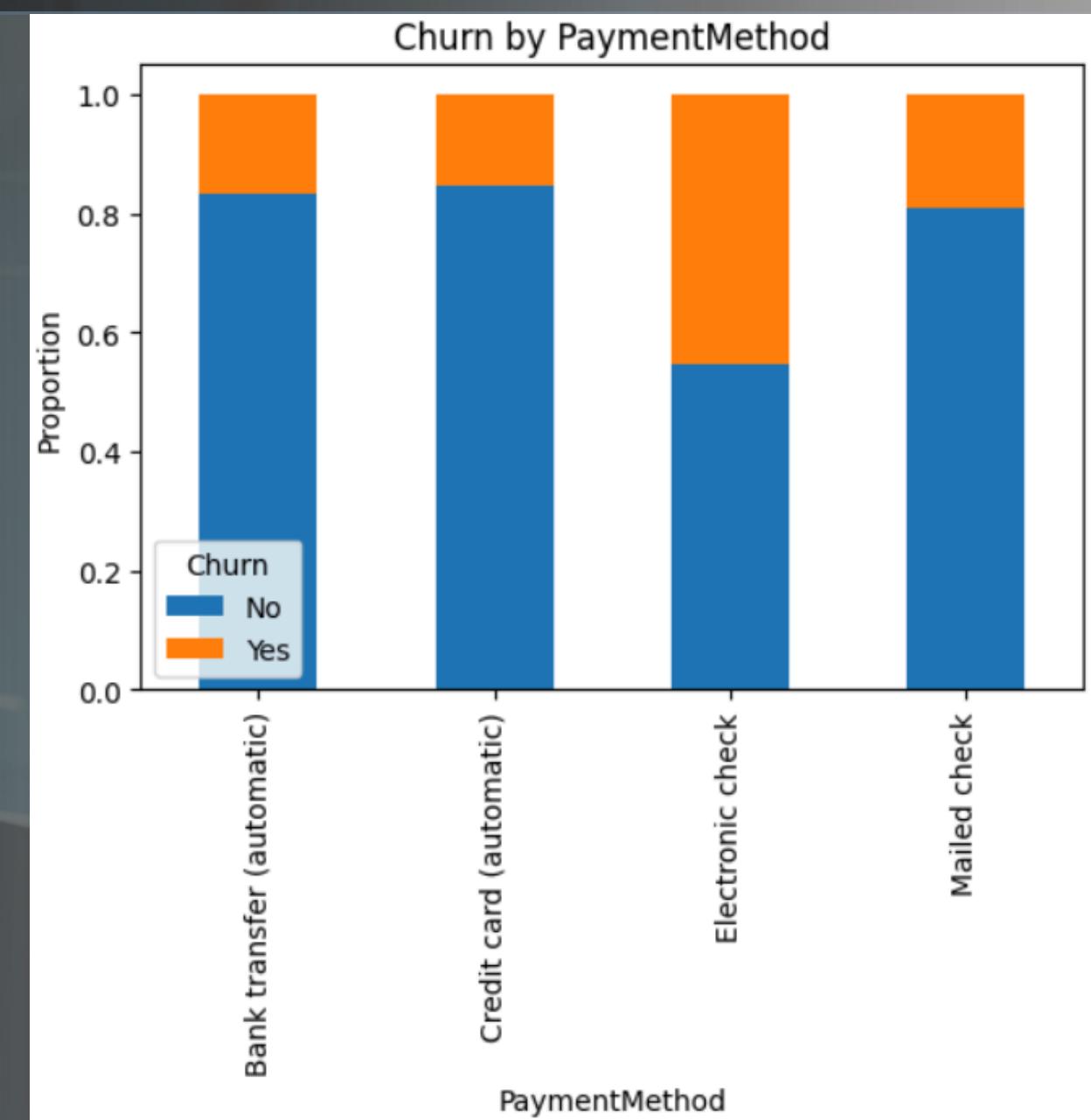
**Internet Service Insights:**  
**Fiber optic users are more likely to churn (41.89%) compared to DSL or no internet.**  
**Customers without internet rarely churn (only 7.41%).**

Internet Service	Churn = No	Churn = Yes
DSL	81.04%	18.96%
Fiber optic	58.11%	41.89%
No	92.60%	7.41%



**Payment Method Insights:**  
**Electronic check users have the highest churn rate (45.29%).**  
**Automatic payments (Bank transfer or Credit card) show lower churn, meaning higher retention.**

Payment Method	Churn = No	Churn = Yes
Bank transfer (automatic)	83.29%	16.71%
Credit card (automatic)	84.76%	15.24%
Electronic check	54.71%	45.29%
Mailed check	80.89%	19.11%



# IQ Decision Tree Model

**Best Parameters:**

**Max Depth:** 6

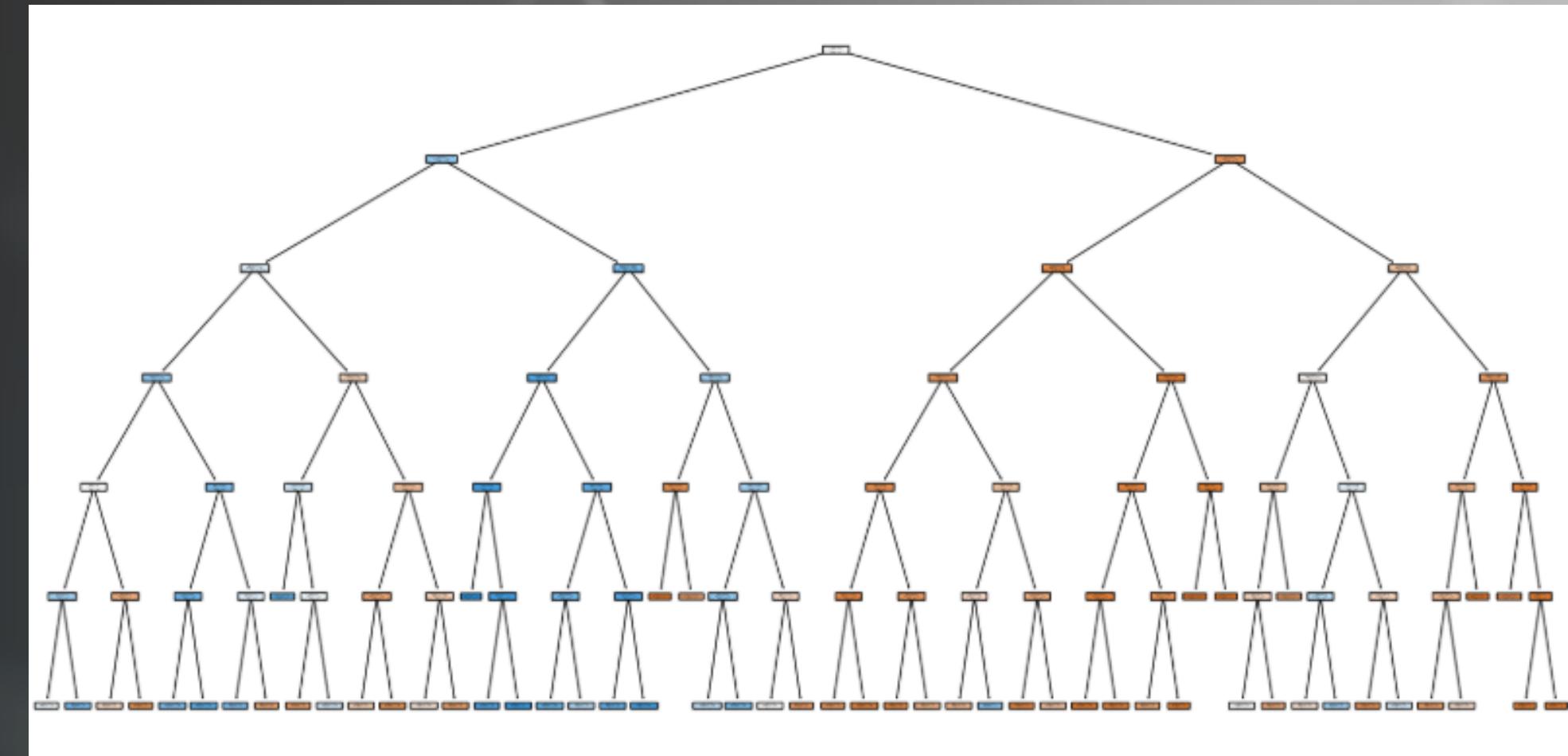
**Min Samples Leaf:** 20

**Min Samples Split:** 2

**Model Performance (Test Set):**

**Accuracy:** 73%

**F1-score (Churn = Yes):** 0.62



## Key Observations:

The model achieved high recall for churned customers (81%), meaning it successfully identifies most customers who are likely to churn.

Precision for churn is moderate (50%), which is acceptable for churn prediction where capturing at-risk customers is more critical.

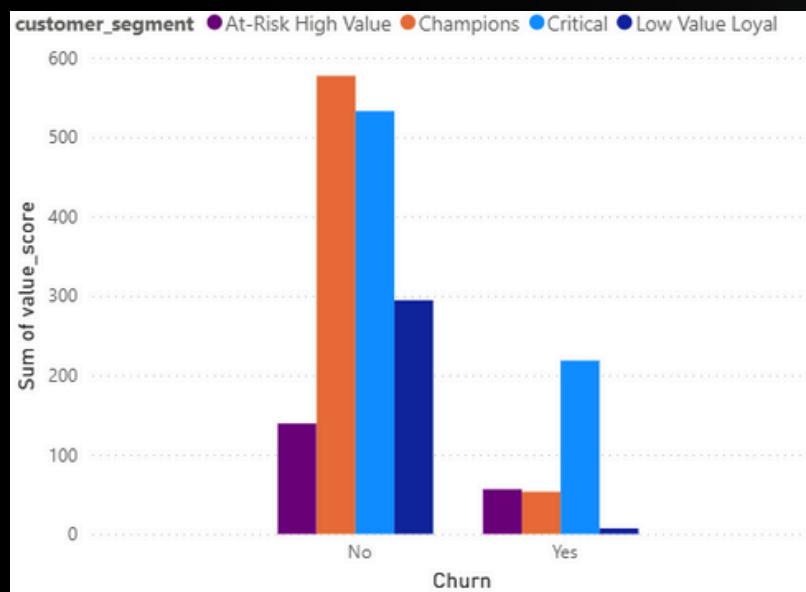
The balanced tree structure reduces overfitting while maintaining good predictive power.

## Business Insight:

This model is effective for early churn detection, allowing the company to proactively target high-risk customers with retention strategies.



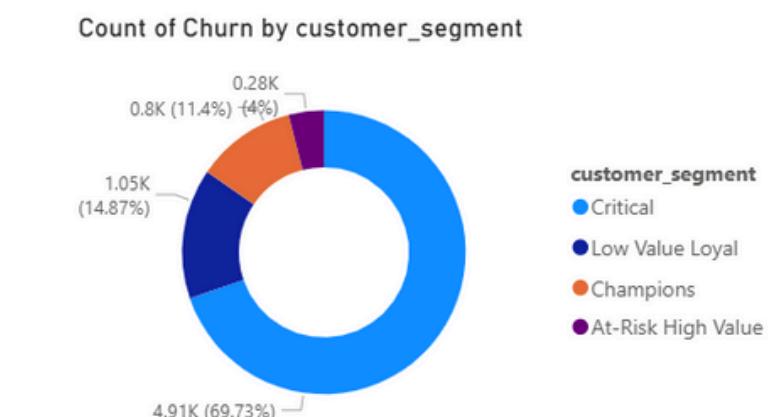
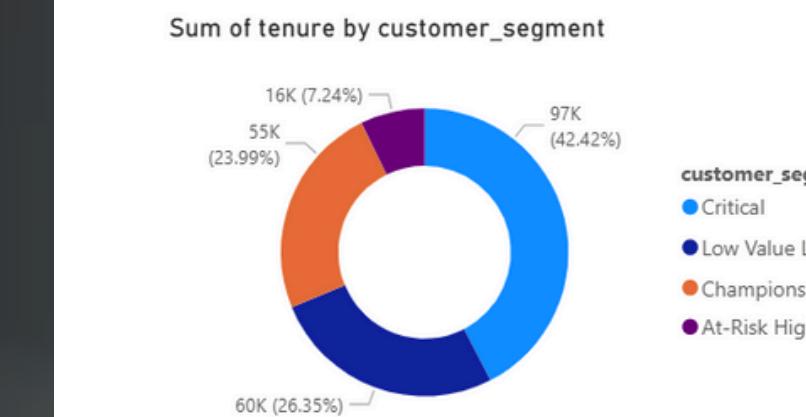
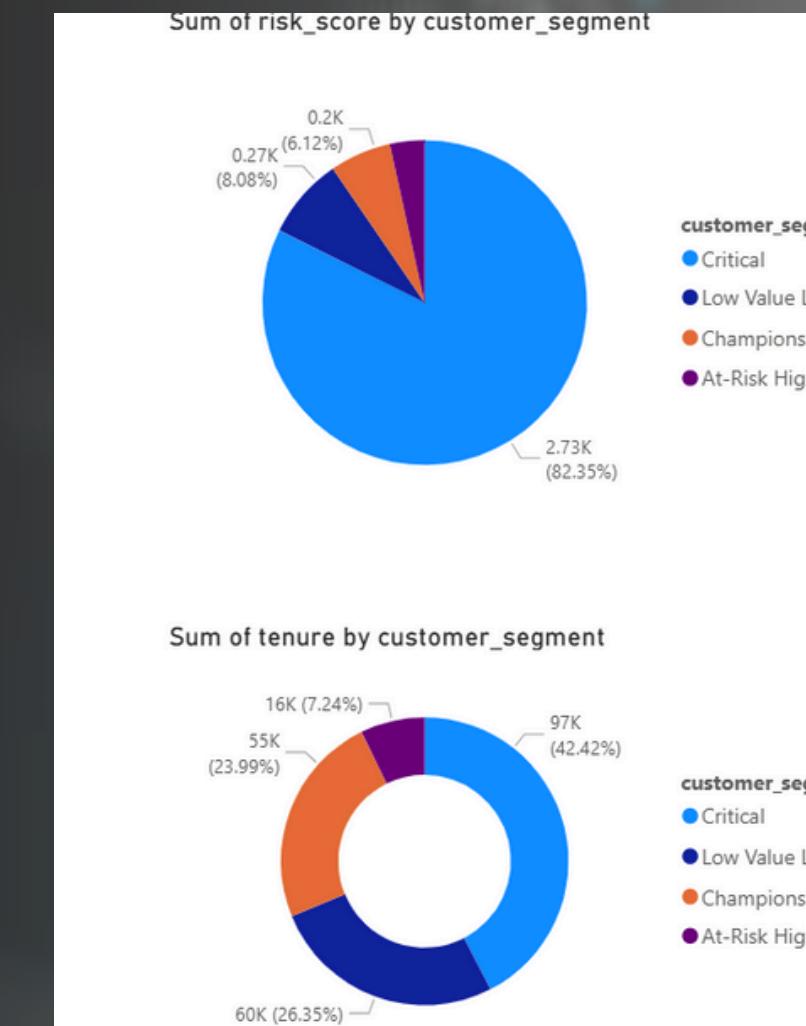
# POWER BI READINESS



customer\_segment, gender, InternetService, Cont...

- ✓ At-Risk High Value
- ✓ Champions
- ✓ Critical
- ✓ Low Value Loyal

customer_segment	Sum of TotalCharges	Sum of risk_score	Sum of CLV	Churn	Sum of tenure	InternetService	PaymentMethod
At-Risk High Value	322,125.35	22.00	64,612.84	No	3211	Fiber optic	Bank transfer (automatic)
At-Risk High Value	275,675.00	18.40	55,136.23	No	2737	Fiber optic	Credit card (automatic)
At-Risk High Value	535,958.05	36.87	106,921.68	No	5296	Fiber optic	Electronic check
At-Risk High Value	55,197.25	3.70	11,136.54	No	543	Fiber optic	Mailed check
At-Risk High Value	97,002.50	6.77	19,460.42	Yes	968	Fiber optic	Bank transfer (automatic)
At-Risk High Value	109,605.85	7.23	21,718.90	Yes	1063	Fiber optic	Credit card (automatic)
At-Risk High Value	276,015.20	19.30	55,106.02	Yes	2680	Fiber optic	Electronic check
Champions	511,698.70	20.83	102,276.52	No	6087	DSL	Bank transfer (automatic)
Champions	555,894.05	22.17	111,255.22	No	6577	DSL	Credit card (automatic)
Champions	128,743.85	5.33	25,639.28	No	1513	DSL	Electronic check
<b>Total</b>	<b>16,081,285.00</b>	<b>3,315.43</b>	<b>3,211,018.29</b>		<b>227990</b>		



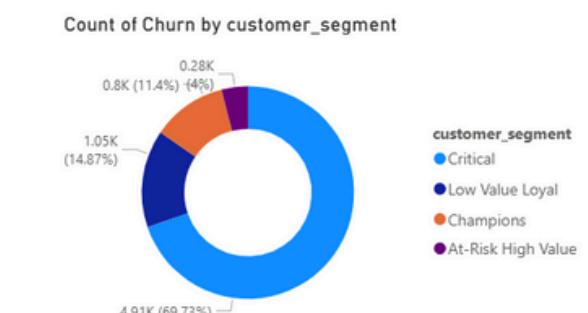
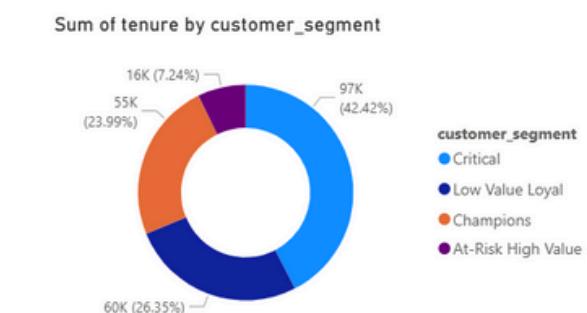
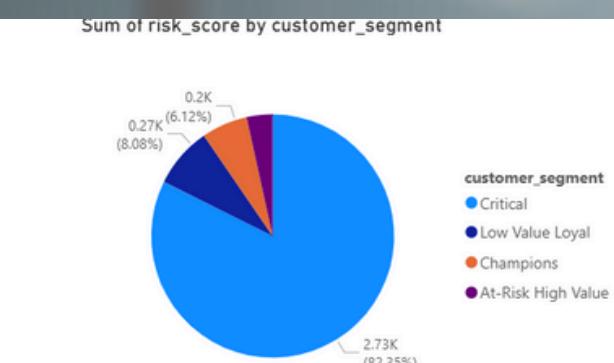
# • Q CUSTOMER SEGMENTATION:

Segments were created based on:

- Value Score (Tenure, Charges, Contract Type)
- Risk Score (Churn Risk Factors)

Four Customer Segments:

1. Champions – High Value, Low Risk
2. At-Risk High Value – High Value, High Risk
3. Low Value Loyal – Low Value, Low Risk
4. Critical – Low Value, High Risk





## Business Impact (Quantified)

- Enables early identification of high-risk customer segments
- Supports the company's target of 25% churn reduction
- Helps prioritize retention offers for customers with:
  - Short tenure
  - High monthly charges
  - No long-term contracts



# Churn Prediction Models – Telco Dataset

## Objective:

Predict customer churn to improve retention.

## Dataset Features:

tenure, MonthlyCharges, TotalCharges, contract type, demographics.

## Data Preprocessing:

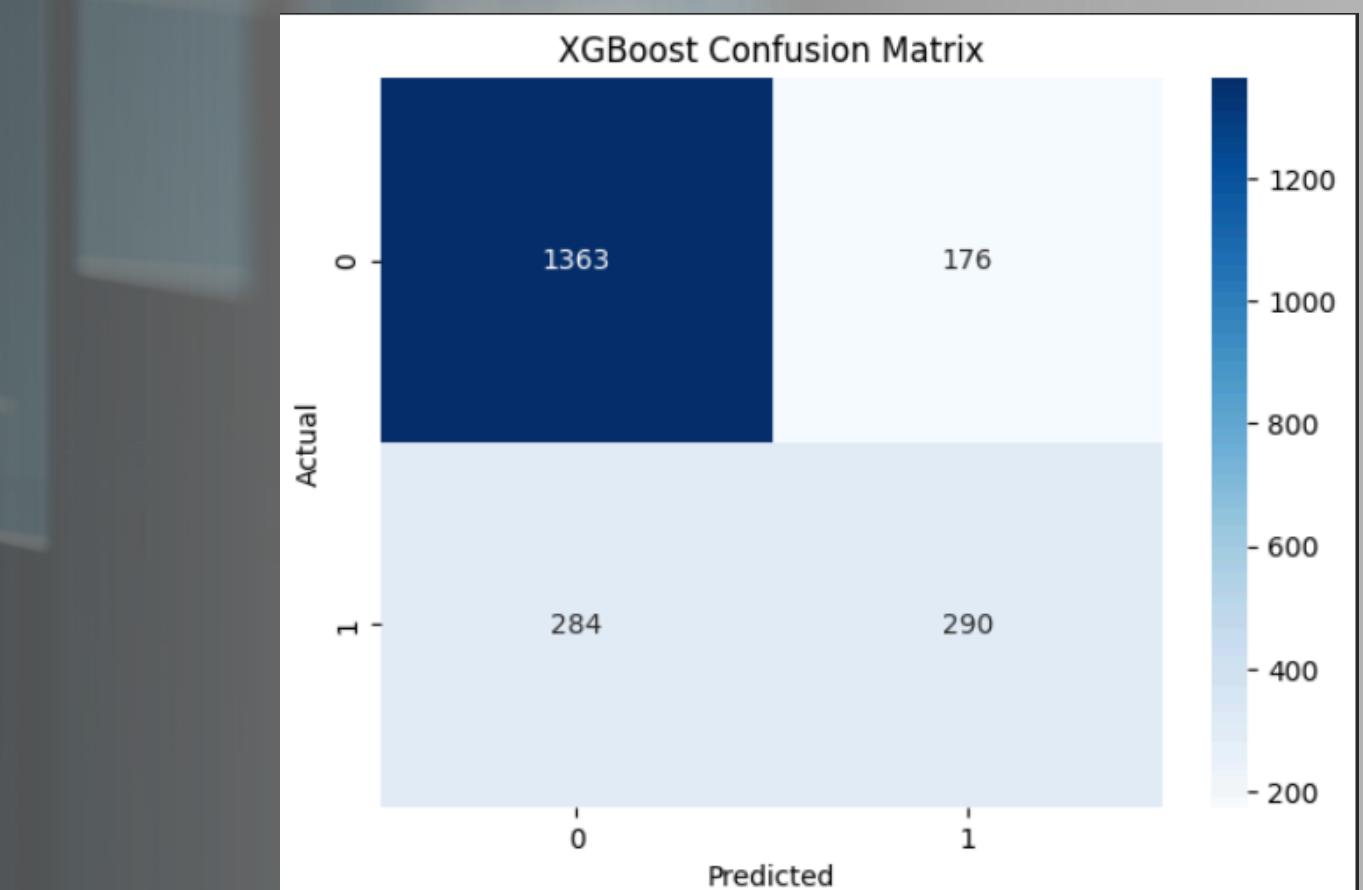
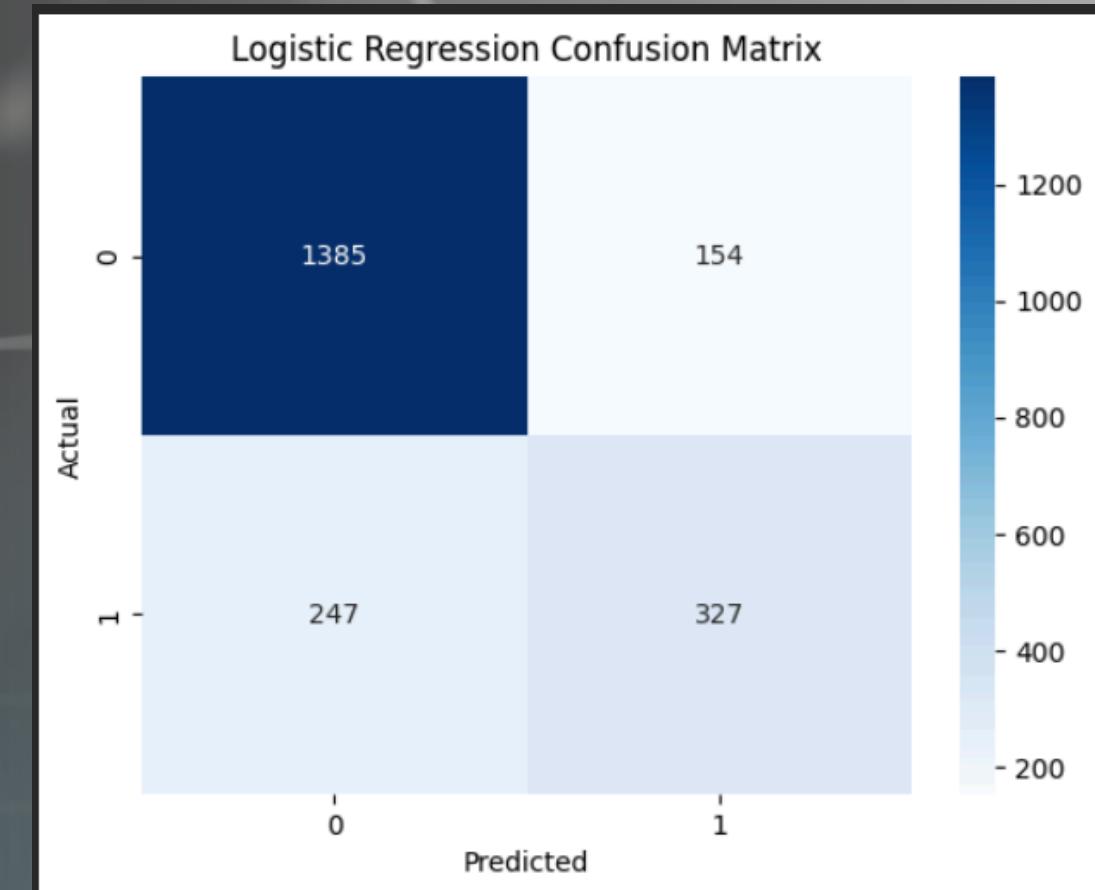
Split dataset into training (70%) and testing (30%).

## Standardized numeric features:

tenure, MonthlyCharges, TotalCharges.

## Models Used:

1. Logistic Regression
2. Decision Tree
3. RandomForest (optimized with GridSearchCV)
4. XGBoost



# ⌚ Model Performance & Customer Lifetime Value (CLV)

## Model Evaluation Metrics:

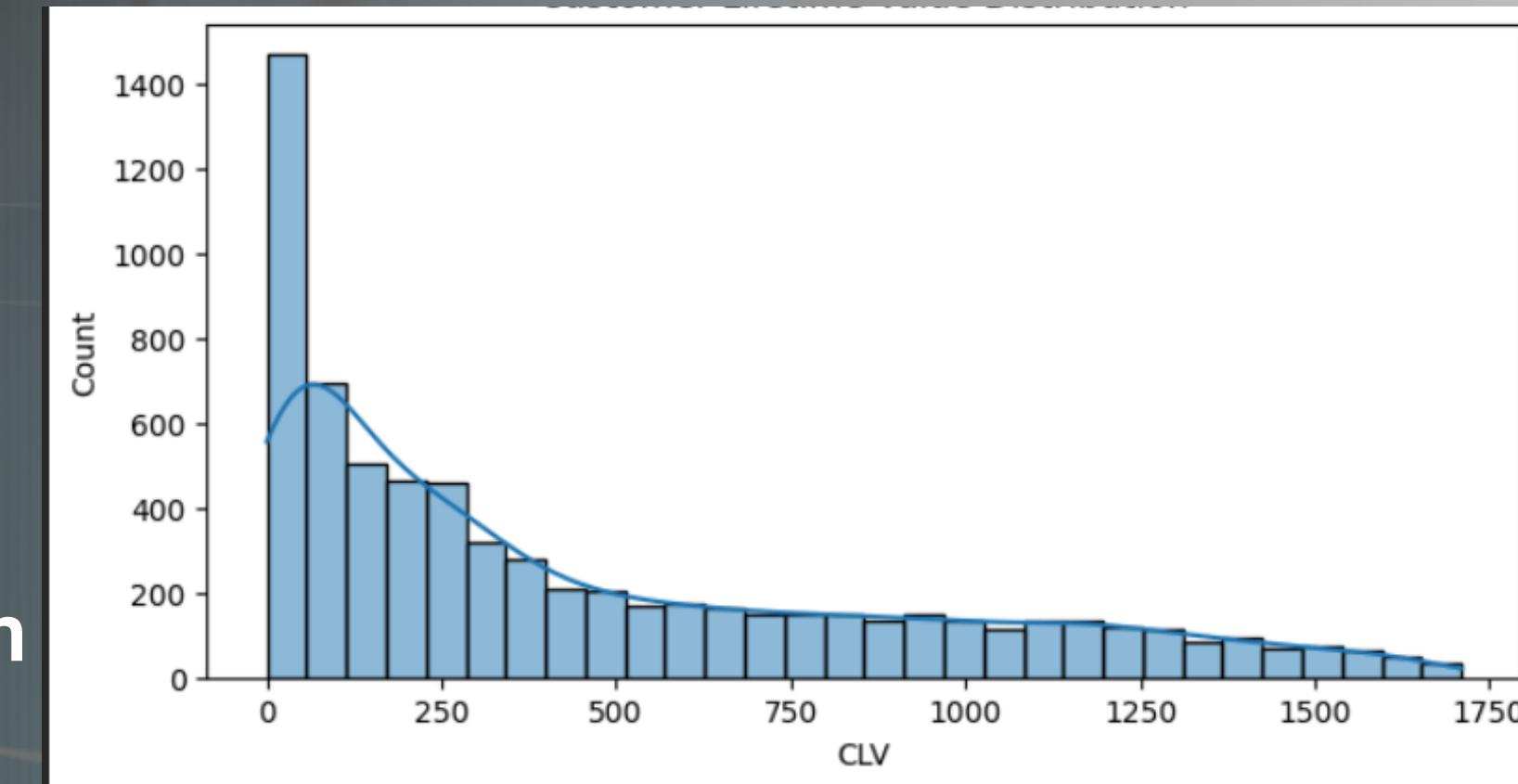
- Accuracy, ROC-AUC, Classification Report, Confusion Matrix
- Random Forest and XGBoost showed the best performance.

## Customer Lifetime Value (CLV):

1. Formula:  $CLV = \text{MonthlyCharges} \times \text{Tenure} \times \text{Profit Margin (20\%)}$
2. Segments: Low, Medium, High
3. Identifies top customers for targeted retention campaigns.

## Visualizations:

- Confusion Matrix of Random Forest
- CLV distribution histogram



# 🔍 Retention ROI & Customer 360 Dashboard

## Retention ROI Calculation:

- $\text{Retention\_ROI} = (\text{CLV} - \text{Retention Cost}) / \text{Retention Cost} \times (1 - \text{Churn Probability})$
- Segments: Negative, Low, High

## Key Insights:

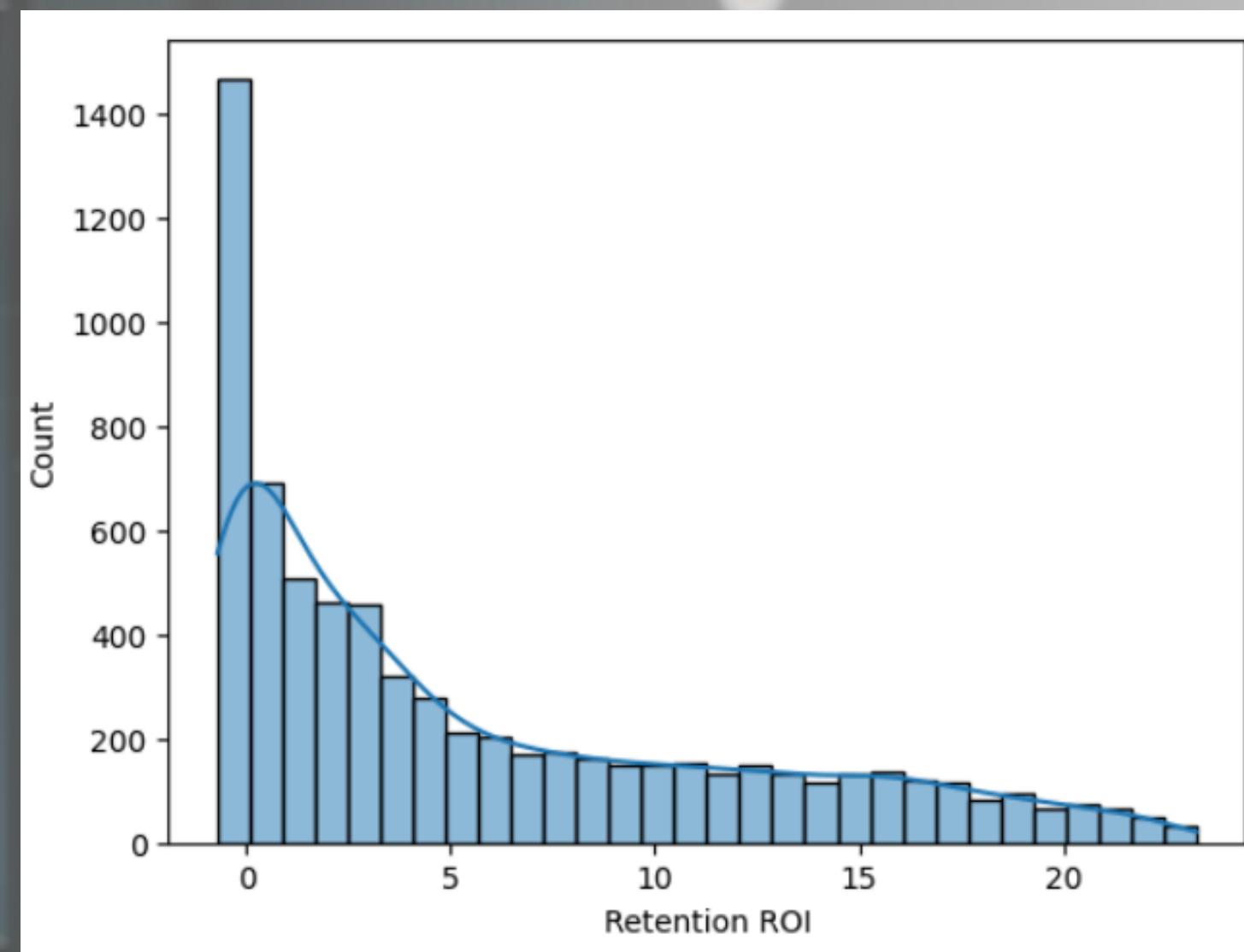
- Identify high-value customers with high retention ROI.
- Focus retention campaigns to maximize ROI.

## Dashboard (Streamlit) Features:

- Filters:
- Gender, Contract Type, CLV Segment
- Metrics: Total Customers, Average CLV, Average Retention ROI
- Visualizations: Churn distribution, CLV distribution, Retention ROI distribution
- Top 10 customers by CLV
- Customer Health Score combining CLV and Retention ROI

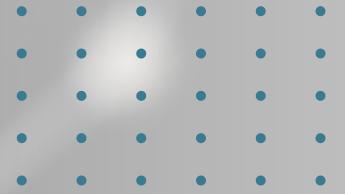
## Diagram/visual idea:

High CLV + High ROI → Prioritize retention





# Telco Churn Prediction – Streamlit Web App



## How it works:

Load pre-trained model (churn\_model.pkl)

**User inputs:** Numerical (Tenure, MonthlyCharges, TotalCharges)

**User inputs:** Categorical (Gender, Contract, Internet, Payment,  
Support)

Create input DataFrame & encode features

Predict churn probability & classify risk

## Business Value:

Identify at-risk customers early

Support retention decisions

Easy, interactive interface



# Telco Churn Prediction – Streamlit Web App

## Telco Churn Prediction

Enter customer information to predict churn.

Tenure (months)

12

Monthly Charges

70.00

Total Charges

800.00

Gender

Female

Contract Type

Month-to-month

Internet Service

DSL

Device Protection

Yes

Streaming TV

Yes

Streaming Movies

Yes

Paperless Billing

Yes

Payment Method

Electronic check

**Predict Churn**

## Prediction Result

🔮 Churn Probability: 0.29

✓ Customer likely to stay



## Churn distribution:

Histogram shows how customers are spread across churn probability bins. Use it to spot concentration of high-risk customers

## Risk & action segmentation:

Churn Risk Band filter (High/Medium/Low) and Retention Action breakdown help prioritize the right intervention.

## HealthScore snapshot:

Gauge summarizes customer health; combine with churn risk to find “high value / high risk” customers to save first.



## Customer Retention



## Strategy comparison:

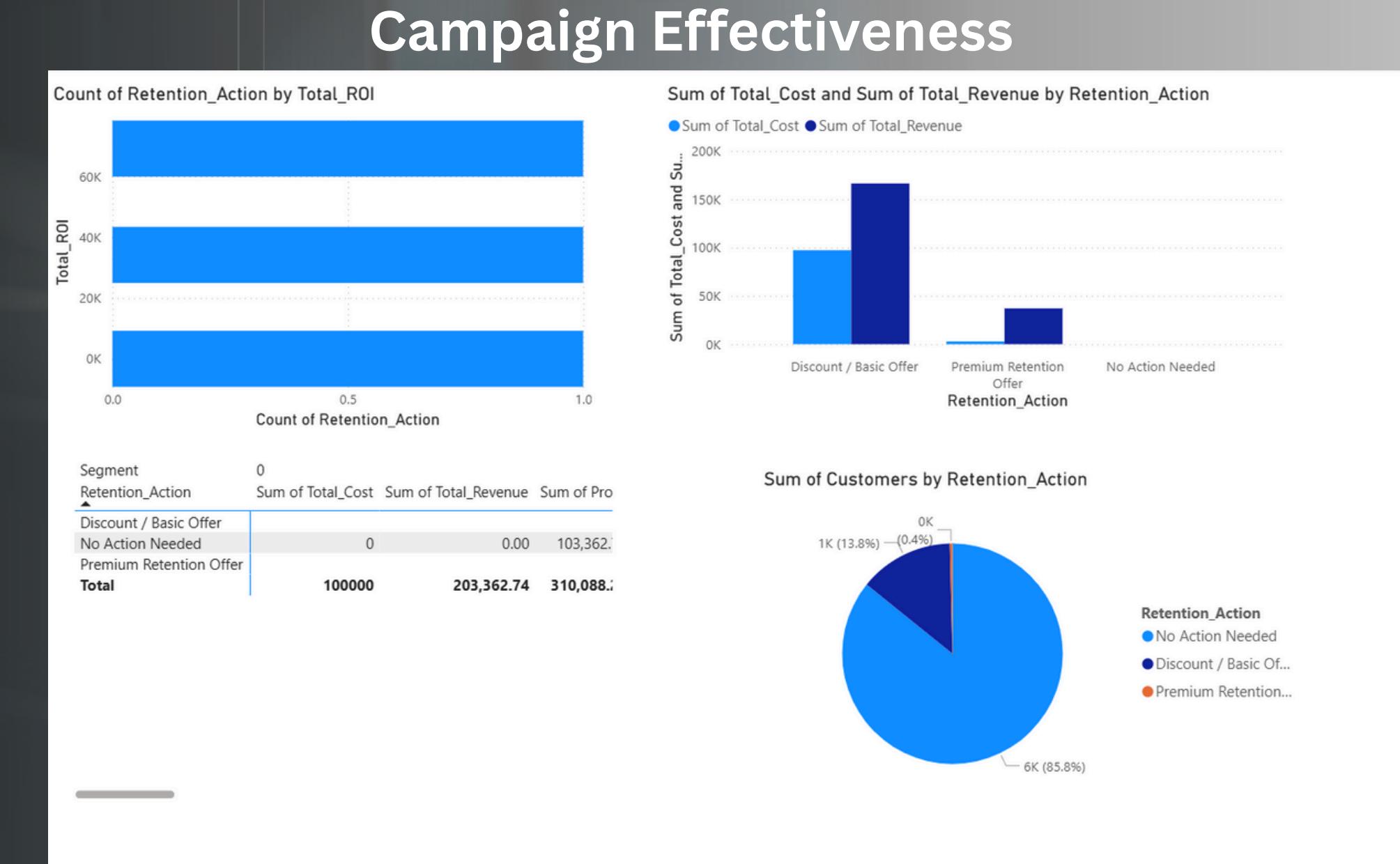
Bar charts compare outcomes by Retention Action. Use these to evaluate which offer type performs best.

## Segment drilldown:

Matrix breaks down Cost, Revenue and Profit by Segment × Action to understand where each strategy works.

## Filter for focus:

Retention\_Action slicer lets you isolate one strategy and see its distribution and totals across visuals.



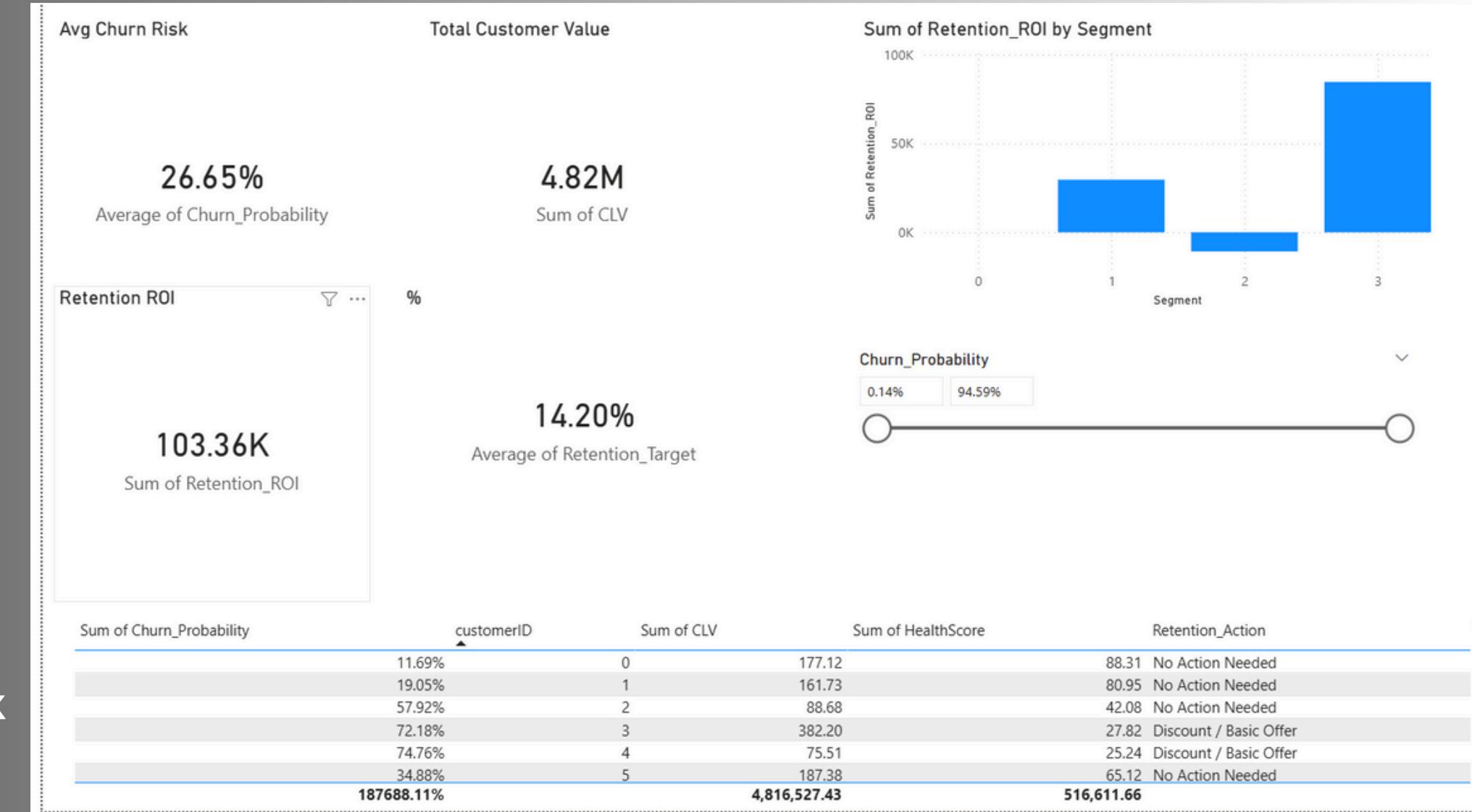
# Executive KPI Dashboard

## Top KPIs:

Cards summarize Avg churn risk, Total customer value (CLV), and overall retention ROI.

## Prioritize by risk:

Churn\_Probability range slider helps focus on high-risk customers (e.g., 0.60–1.00) for actioning



## From KPI → action list:

Detail table provides customer-level view (churn, CLV, health) and the suggested Retention\_Action

## Executive KPI Dashboard



# THANK YOU

## For Your Attention

Mini team1:

Mennatallah Mohsen  
Menna Akram

Mini team2:

Aisha Samir  
Rola Hany

Mini team3:

Nada Etman  
Abdelrahman Hatem

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**Rola Hany**  
**Aisha Samir**  
**Nada Etman**  
**Abdelrahman Hatem**