

AI Project

Week 4 – Telco Churn Analysis & Retention Strategy
with Cursor AI
(Data-Driven Insights with XGBoost Prediction)

Guideline

- Executive Summary
- Business Context
- Data & Tool Used
- Churn Overview & Key Metrics
- XGBoost Churn Model
- Segment-Based Insights
- Retention Strategy
- Summary & Recommendations
- Cursor AI Interface
- Appendix

Executive Summary

- **Churn rate at 26.5% with up to \$140k monthly revenue at risk; target reduction to 20–25%**
- Added **5+ segmentation features** to improve customer clustering and analysis
- Built an **XGBoost churn model** to identify strongest churn drivers
- Identified **4 high-risk segments:** Month-to-Month, Tenure < 12, High-ARPU, Fiber
- Designed **4 retention plays** expected to **reduce churn by 5%**

Business Context

- **High churn rates directly reduce revenue. (Usually 25%, currently 26.5%)**
- **Goals:** increase customer LTV and reduce early-stage churn.
- **Project objectives:**
 - Identify high-risk customer segments
 - Build a predictive churn model
 - Design targeted retention strategies

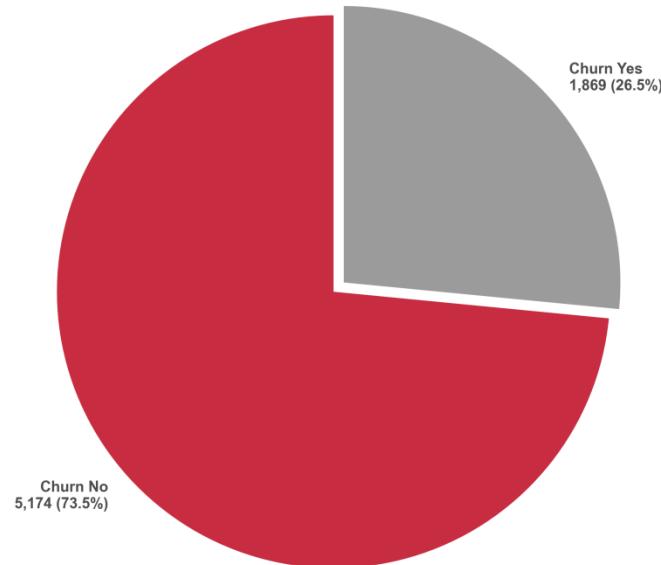
Data & Tool Used

- Data Download from **Kaggle**: [Telco Customer Churn Analysis](#)
- **Cursor AI & XGBoost**
- **Process Flow:** Prompt > Produce Scripts > Data Clean > Exploratory Data Analysis > Feature Engineering > XGBoost Model > Produce Strategies

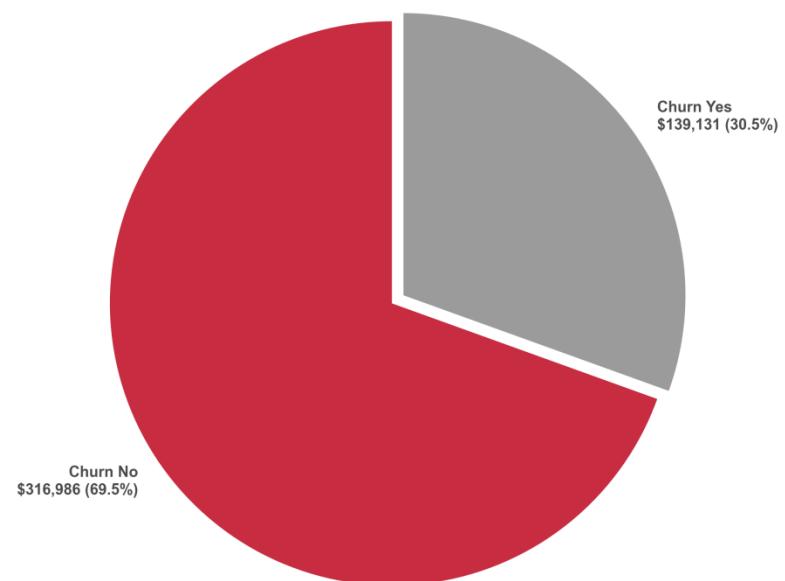


Churn Overview & Key Metrics

Customer Churn Distribution
(by Customer Count)



Customer Churn Distribution
(by Monthly Revenue)



Overall Churn Performance

Among 7,043 customers, **1,869** churned → **26.5%** churn rate

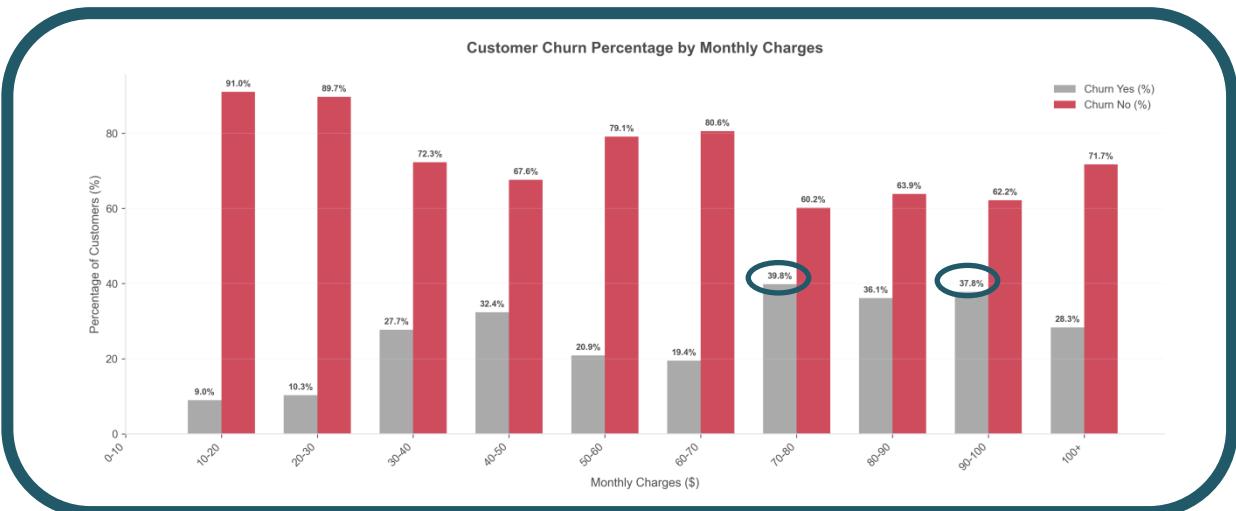
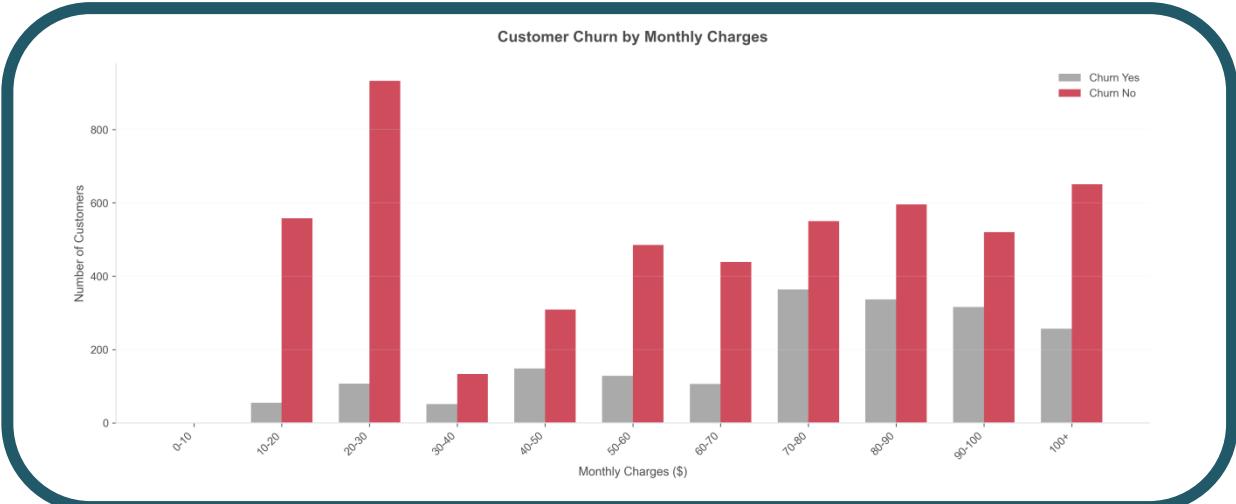
With an average ARPU of up to \$130, the **estimated revenue impact is up to \$139,131 (30.5%)**

Churn Overview & Key Metrics

Churn Rates by Key Segments

High ARPU \$70–80: 39.8%

High ARPU \$90–100: 37.8%



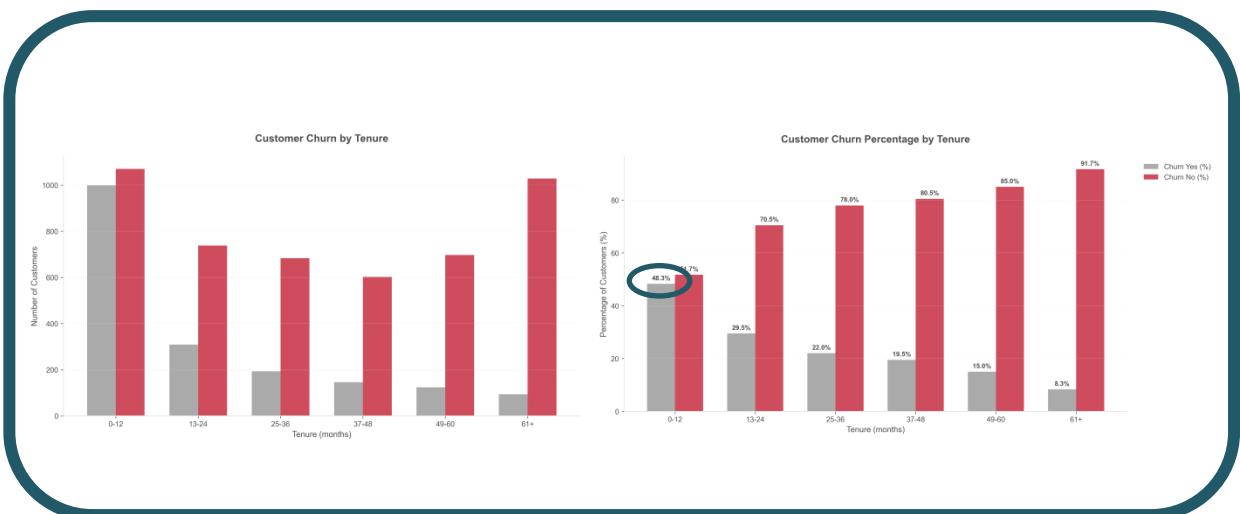
Churn Overview & Key Metrics

Churn Rates by Key Segments

Month-to-Month: 42.7%



Tenure 0–12 months: 48.3%

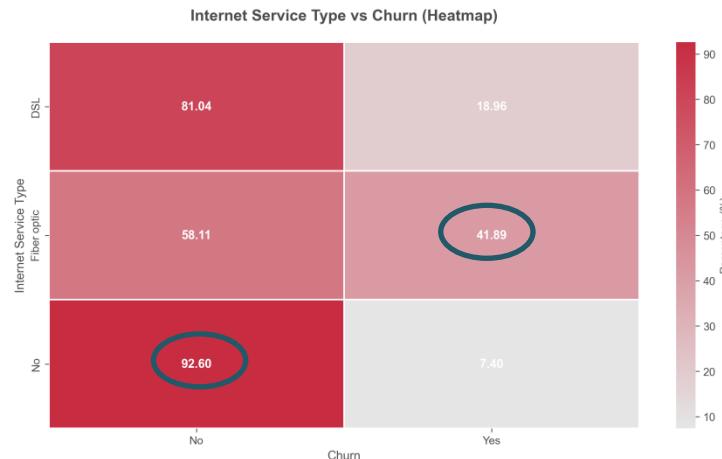


Churn Overview & Key Metrics

Churn Rates by Key Segments

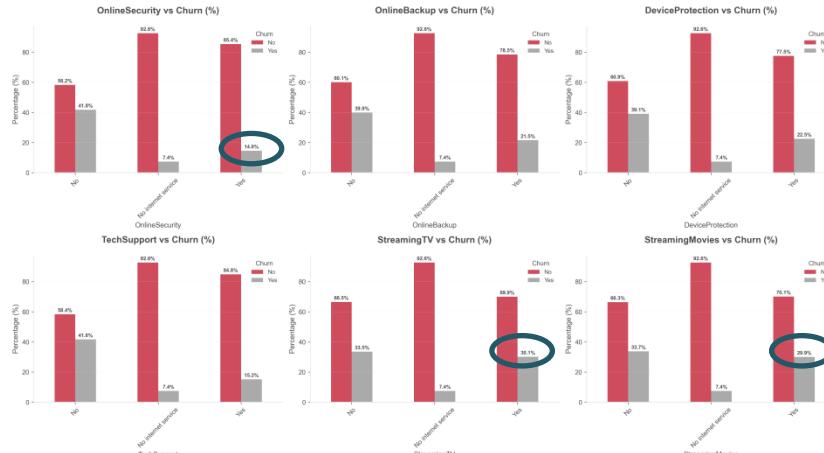
Fiber Optic users: High

No Internet service: Low



Streaming TV / Movie: up to 30%

Online Security users: Lowest



Churn Overview & Key Metrics

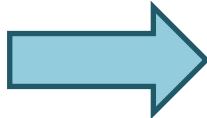
Key Takeaways

- Early-stage customers (0–12 months) and month-to-month contracts are the biggest pain points
- High-ARPU users show weaker loyalty
- Service usage patterns show clear churn risk signals (Fiber + Streaming)

XGBoost Churn Model

Feature Engineering

1. Contract type (Label Encoding)
2. Tenure (Add Group)
3. Monthly Charges (Add Group)
4. Total Charges (Add Group)
5. Service Count (Count add-on services like Security, TV, Movies...)
6. High ARPU flag (Monthly Charges > 70)
7. Early Tenure flag (Tenure < 12, Month-to-month)



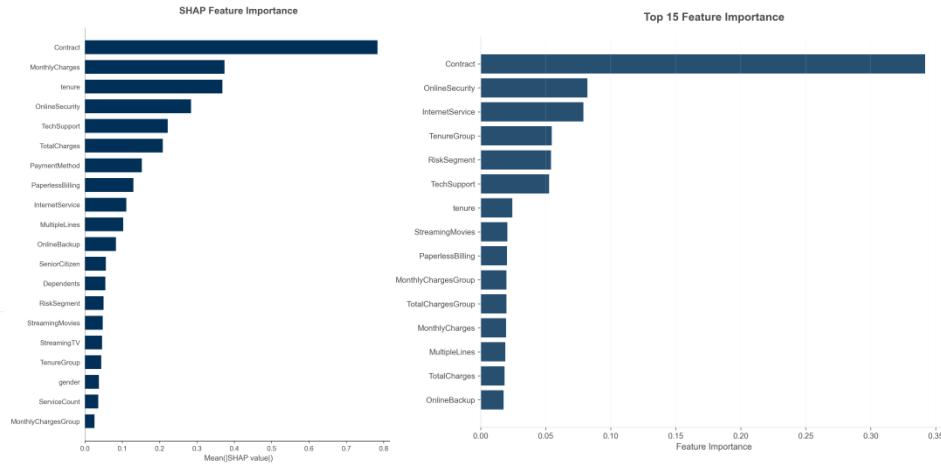
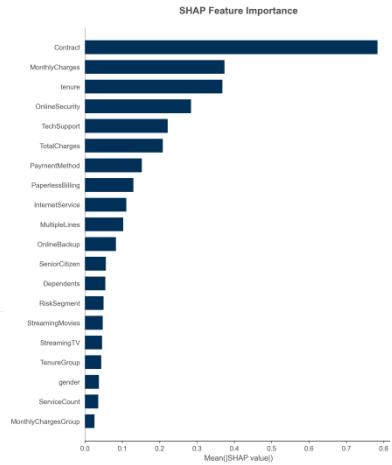
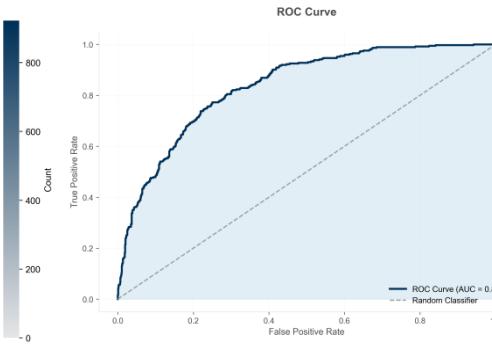
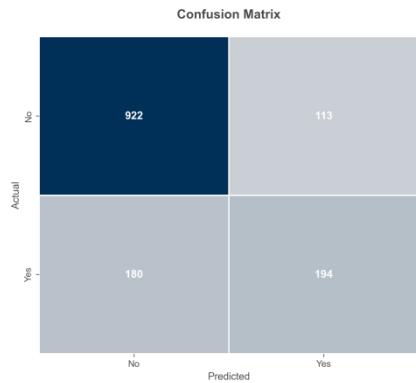
Model Results

AUC > 0.836*(Expected)

Recall High → High risk customers

Feature importance (SHAP) Top 5 :

- Contract type
- Tenure
- Monthly charges
- Online Security
- Tech Support



XGBoost Churn Model

customerID	Churn_Probability	Churn_Risk	Contract	tenure	MonthlyCharges	InternetService	Revenue	OnlineSecurity	OnlineBackup	DeviceProtection	TechSupport	StreamingTV	PayingMo	ServiceCount
2012-NWRPA	0.956846893	High	Month-to-month	11	99.55	Fiber optic	99.55	No	No	Yes	No	Yes	Yes	3
9497-QCMMS	0.956449151	High	Month-to-month	1	93.55	Fiber optic	93.55	No	No	No	No	Yes	Yes	2
9300-AGZNL	0.955652833	High	Month-to-month	1	94	Fiber optic	94	No	No	No	No	Yes	Yes	2
9248-OJYKK	0.955340385	High	Month-to-month	1	76.45	Fiber optic	76.45	No	No	No	No	No	No	0
6894-LFHLY	0.95513612	High	Month-to-month	1	75.75	Fiber optic	75.75	No	No	No	No	No	No	0

High-risk Person from Model

Person A : New customer , tenure <12 , Fiber, Month to Month

Person B : High charge (\$80+), no add-on (Low service engagement)

Person C : Streaming-heavy, sensitive to price

Segment-Based Insights

Segmentation Design

- Tenure : Early (0–12) / Mid (12–36) / Loyal (>36)
- Contract : Month-to-month / 1 Year / 2 Year
- Monthly Charge : Lowest (\$0-\$30) / Low (\$30-\$50) / Mid (\$50-\$70) / High (\$70-\$90) / Highest (\$90+)
- Internet Service : DSL / Fiber / No
- Risk Segment : Low (Other) / Mid (Month-to-month & Tenure ≥ 12) / High (Month-to-month & Tenure < 12)

Segment Churn Summary

High Risk :

- Month-to-month
- Tenure (<12)
- High Charge (\$70-90)
- Fiber
- No add-on service

Retention Strategy

Strategy A — New (Tenure < 12), Month-to-month customers

Customer Count – 806, Average Churn Probability – 77.62%, Monthly Revenue At Risk - \$60,792.25

- Offer 10 to 15 % Discount on 1-year contract

Action Items

- Offer onboarding support package
- Give 90-day welcome program
- Assign dedicated retention specialist
- Offer first-month tech check
- Offer price-lock promised price

Strategy B — High charge (\$70+) customers

Customer Count – 910, Average Churn Probability – 75.59%, Monthly Revenue At Risk - \$80,027.70

- Convert to annual contract with premium benefits

Action Items

- Offer 2-year contract with 20% discount
- Provide premium service add-ons (Security / Tech Support / Streaming / TV)
- Priority customer service access
- Exclusive loyalty rewards program
- Family bundle (lower churn 20–30%)
- Customized personal content package

Retention Strategy

Strategy C — Fiber Optic customers

Customer Count – 963, Average Churn Probability – 76.06%, Monthly Revenue At Risk - \$83,949.20

- Improve service quality and add value

Action Items

- Service quality audit and improvement
- Offer speed upgrade or price match
- Add complementary services (security, backup)
- Proactive technical support

Strategy D — Low service engagement customers

Customer Count – 572, Average Churn Probability – 75.32%, Monthly Revenue At Risk - \$39,503.95

- Increase service stickiness

Action Items

- Offer bundled services at discounted rate
- Free trial of premium services (Security, Backup)
- Educational content on service benefits
- Referral program incentives

Summary & Recommendations

- **Total High-Risk Customers: 1,124**
- **Total Monthly Revenue At Risk: \$90,544.00**
- **Annual Revenue At Risk: \$1,086,528.00**
- **Key churn drivers fall into three major categories:**
 1. Price sensitivity (high monthly fees, month-to-month contracts)
 2. Poor early-stage experience (tenure < 12 months)
 3. Service bundle mismatch (Fiber Optic + no security/tech support add-ons)
- **Key Recommendations:**
 1. Prioritize Month-to-Month customers with low tenure for immediate intervention
 2. Focus on high-value customers (>\$70/month) for contract conversion
 3. Address service quality issues for Fiber Optic customers
 4. Increase service engagement for customers with low service count
 5. Implement proactive retention campaigns based on churn probability thresholds
 6. Monitor model performance monthly and retrain quarterly

Cursor AI Interface

The screenshot displays the Cursor AI Interface, a development environment with the following components:

- Left Sidebar:** Contains sections for **Agents**, **Editor**, **File**, **Edit**, **Selection**, **View**, **Go**, and **... .**. It also shows a tree view of files and folders related to a "TELCO CHURN" project, including "telco_churn_analysis.py", "xgboost_churn_model.py", and various log and configuration files.
- Code Editor:** Shows two open files: "telco_churn_analysis.py" and "xgboost_churn_model.py". The "xgboost_churn_model.py" file contains Python code for data analysis and visualization, including imports for pandas, numpy, xgboost, and matplotlib, and uses sns.set_style("whitegrid") and plt.style.use('default'). The code also includes plt.rcParams['figure.figsize'] = (12, 6) and plt.rcParams['font.sans-serif'] = ['Liberation Sans', 'DejaVu Sans', 'Bitstream Vera Sans', 'sans-serif']. The terminal below the editor shows command-line output for saving SHAP plots and feature importance charts.
- Terminal:** Displays the command "PS C:\Users\林珈名\Desktop\專案資料源\Telco Churn> []" and the message "Ctrl+K to generate command".
- Analysis Pane:** Located on the right, this pane provides insights into the code. It highlights errors like "line 409 invalid dataframe dtype" and "line 372 invalid dataframe dtype valueerror(msg)". It also suggests fixes such as "Enhance streaming experience" and "Repair the list conversion to string (use separator)".
- Bottom Status Bar:** Shows "Cursor Tab", "Ln 12, Col 30", "Spaces: 4", "UTF-8", "CRLF", "Python 3.14.0 64-bit", and other system information.

Appendix

XGBoost Report & Segment Analysis (Direct output from Cursor AI)

XGBOOST CHURN PREDICTION MODEL & RETENTION STRATEGY REPORT

Analysis Date: 2025-11-26 11:27:41

1. MODEL EVALUATION METRICS

Metric	Value
Accuracy	0.792051
Precision	0.631922
Recall	0.518717
F1 Score	0.569750
AUC	0.835618

2. TOP 15 FEATURE IMPORTANCE

Feature	Importance
Contract	0.341817
OnlineSecurity	0.082099
InternetService	0.079043
TenureGroup	0.054614
RiskSegment	0.054103
TechSupport	0.052635
tenure	0.024279
StreamingMovies	0.020610
PaperlessBilling	0.020327
MonthlyChargesGroup	0.019896
TotalChargesGroup	0.019855
MonthlyCharges	0.019545
MultipleLines	0.018933
TotalCharges	0.018390
OnlineBackup	0.017706

3. SEGMENT-BASED CHURN ANALYSIS

Tenure:

TenureGroup	Actual_Churn_Rate	Avg_Churn_Probability	Avg_Monthly_Charges	Customer_Count
0-12	0.4768	0.4742	56.1720	2175
13-24	0.2871	0.2886	61.3573	1024
25-36	0.2163	0.2127	65.5755	832
37-48	0.1903	0.1872	66.3182	762
49-60	0.1442	0.1471	70.5508	832
61+	0.0661	0.0689	75.9527	1407

Contract:

Contract	Actual_Churn_Rate	Avg_Churn_Probability	Avg_Monthly_Charges	Customer_Count
Month-to-month	0.4271	0.4273	66.3985	3875
One year	0.1127	0.1079	65.0486	1473
Two year	0.0283	0.0303	60.7704	1695

MonthlyCharges:

MonthlyChargesGroup	Actual_Churn_Rate	Avg_Churn_Probability	Avg_Monthly_Charges	Customer_Count
0-30	0.0980	0.0966	21.5035	1653
30-50	0.3080	0.3017	42.7937	646
50-70	0.2076	0.2061	59.9692	1161
70-90	0.3780	0.3743	80.0601	1844
90+	0.3278	0.3346	101.0187	1739

InternetService:

InternetService	Actual_Churn_Rate	Avg_Churn_Probability	Avg_Monthly_Charges	Customer_Count
DSL	0.1896	0.1887	58.1022	2421
Fiber optic	0.4189	0.4200	91.5001	3096
No	0.0740	0.0714	21.0792	1526

RiskSegment:

RiskSegment	Actual_Churn_Rate	Avg_Churn_Probability	Avg_Monthly_Charges	Customer_Count
High	0.5194	0.5166	58.0223	1908
Low	0.0676	0.0664	62.7596	3168
Medium	0.3376	0.3407	74.5235	1967