DATA OVERVIEW

🎯 Customer Churn Prediction Analytics

📊 Dataset Overview

Total Customers	Churn Rate	Avg Monthly Charges	Avg Tenure (months)
7,043	26.5%	$64.76	32.4

Customer Churn Distribution

📋 Dataset Sample

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	OnlineBackup	DeviceProtection	TechSupport	Stream
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL	No	Yes	No	No	No
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL	Yes	No	Yes	No	No
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL	Yes	Yes	No	No	No
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL	Yes	No	Yes	Yes	No
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic	No	No	No	No	No
5	9305-CDSKC	Female	0	No	No	8	Yes	Yes	Fiber optic	No	No	Yes	No	Yes
6	1452-KIOVK	Male	0	No	Yes	22	Yes	Yes	Fiber optic	No	Yes	No	No	Yes
7	6713-OKOMC	Female	0	No	No	10	No	No phone service	DSL	Yes	No	No	No	No
8	7892-POOKP	Female	0	Yes	No	28	Yes	Yes	Fiber optic	No	No	Yes	Yes	Yes
9	6388-TABGU	Male	0	No	Yes	62	Yes	No	DSL	Yes	Yes	No	No	No

ℹ️ Dataset Information

Dataset Shape: (7043, 21)

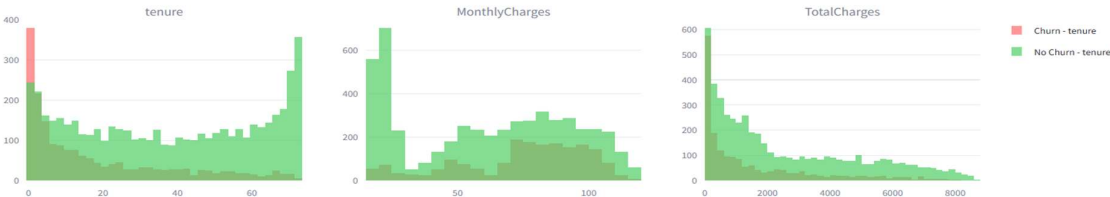Missing Values: 0

Numerical Columns: 3

Categorical Columns: 18

Exploratory Data Analysis
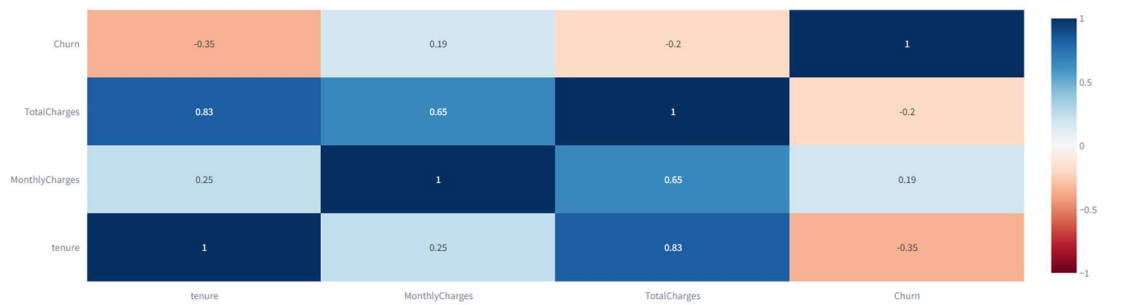
🔍 Exploratory Data Analysis

📈 Feature Distributions by Churn Status

Distribution of Numerical Features by Churn Status

🔥 Correlation Analysis
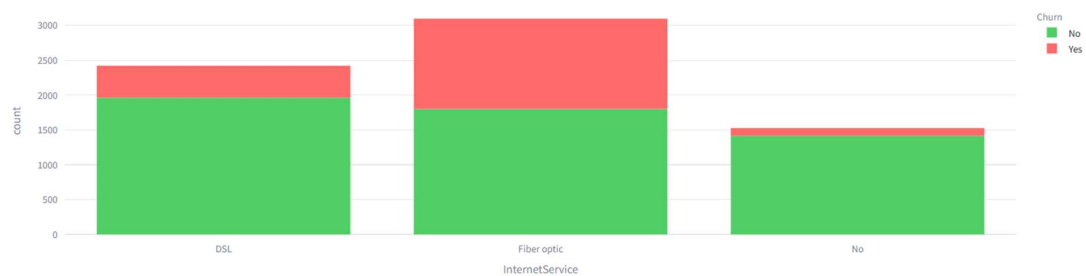
Correlation Matrix of Numerical Features

	tenure	MonthlyCharges	TotalCharges	Churn
Churn	-0.35	0.19	-0.2	1
TotalCharges	0.83	0.65	1	-0.2
MonthlyCharges	0.25	1	0.65	0.19
tenure	1	0.25	0.83	-0.35

📊 Categorical Features Analysis

Churn Distribution by Contract

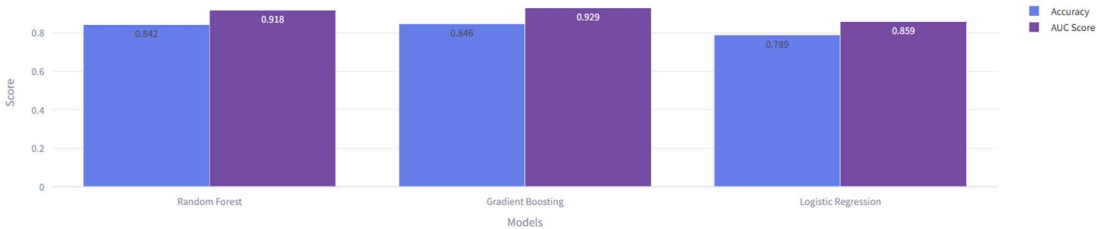**Churn Distribution by PaymentMethod**

Churn Distribution by InternetService

🤖 Model Performance Analysis

📊 Model Comparison

Model Performance Comparison

📈 ROC Curve Analysis

ROC Curve - Gradient Boosting

Random Forest	🏆 Gradient Boosting	Logistic Regression
Accuracy: 0.8422	**Accuracy:** 0.8461	**Accuracy:** 0.7894
AUC Score: 0.9177	**AUC Score:** 0.9295	**AUC Score:** 0.8590

🎯 Feature Importance

Top 15 Most Important Features
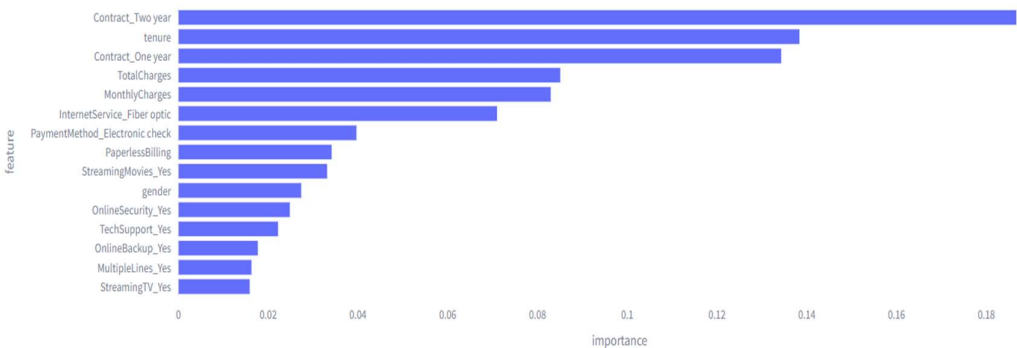
CHURN PREDICTION

👤 Customer Demographics

Gender
| Male ▾ |

Senior Citizen
| No ▾ |

Has Partner
| No ▾ |

Has Dependents
| No ▾ |

Tenure (months)
12
0 — 72

📞 Services

Phone Service
| No ▾ |

Multiple Lines
| No ▾ |

Internet Service
| DSL ▾ |

Online Security
| No ▾ |

Online Backup
| No ▾ |

Device Protection
| No ▾ |

Tech Support
| No ▾ |

Streaming TV
| No ▾ |

Streaming Movies
| No ▾ |

💰 Billing Information

Contract
| Month-to-month ▾ |

Paperless Billing
| No ▾ |

Payment Method
| Electronic check ▾ |

Monthly Charges ($)
65.00
18.00 — 120.00

Total Charges ($)
| 780.00 − + |

🔮 Predict Churn Risk

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☑ LOW CHURN RISK
Probability: 0.7%

Customer Status: Stable

- 🌟 Consider upselling additional services
- 💎 Invite to loyalty program
- 📈 Monitor for service expansion opportunities
- 🗣 Request referrals and testimonials

Churn Probability
0.7%

Retention Probability
99.3%

BUSINESS INSIGHTS

💡 Business Insights & Recommendations

🔗 🎯 Key Findings from Churn Analysis

📊 Customer Behavior Patterns

High-Risk Segments:

- 🏦 Month-to-month contract customers
- 💳 Electronic check payment users
- 🌐 Fiber optic internet subscribers
- 👥 Customers without partners/dependents
- ⏱ Short tenure customers (< 12 months)

Retention Factors:

- 📑 Long-term contracts (1-2 years)
- 🏛 Automatic payment methods
- 👨‍👩‍👧 Customers with family dependencies
- 🔵 Multiple service subscriptions

💰 Revenue Impact Analysis

Cost of Churn:

- 💸 Average customer lifetime value: $1,500+
- 📉 Monthly revenue loss per churned customer
- 🎯 Acquisition cost vs retention cost ratio: 5:1

Retention ROI:

- 📈 5% retention improvement = 25-95% profit increase
- 🎁 Targeted offers can reduce churn by 15-20%
- 📞 Proactive outreach increases retention by 30%

🚀 Strategic Recommendations

🎯 Immediate Actions

1. **Early Warning System**

   - Deploy real-time churn prediction
   - Set up automated alerts for high-risk customers
   - Create intervention workflows

2. **Retention Campaigns**

   - Target month-to-month customers
   - Offer contract upgrade incentives
   - Implement loyalty programs

📈 Medium-term Strategy

1. **Service Optimization**

   - Improve fiber optic service quality
   - Enhance customer support
   - Streamline billing processes

2. **Customer Experience**

   - Personalized service recommendations
   - Proactive customer communication
   - Feedback collection and action

🔮 Long-term Vision

1. **Predictive Analytics**

   - Advanced ML model deployment
   - Real-time customer scoring
   - Automated retention actions

2. **Business Intelligence**

   - Customer segmentation strategies
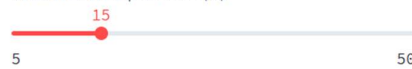   - Lifetime value optimization
   - Market expansion planning

💰 Retention ROI Calculator

Customers at Risk

| 1000 | − | + |

Avg Monthly Revenue per Customer ($)

| 65 | − | + |

Retention Rate Improvement (%)

15

5   50

Campaign Cost per Customer ($)

| 25 | − | + |

Customers Retained

150

Annual Revenue Saved

$117,000

Campaign ROI

368%