

Customer Churn Analysis Project

1. Project Overview

This project analyzes customer churn for a telecommunications company with the goal of identifying key churn drivers, quantifying revenue at risk, and providing actionable insights to improve customer retention. The project was designed as an end-to-end data analytics case study, covering data cleaning, feature engineering, SQL analysis, and dashboarding in Tableau.

Objective:

- Measure overall churn rate
- Identify churn patterns by tenure, contract type, customer value, and service usage
- Quantify revenue at risk due to churn
- Visualize insights using Tableau

2. Dataset Description

- Rows: 7043
- Columns: 35
- Missing Data:
 - 5174 values in *Churn Reason* column
- Key Features:
 - Demographics (gender, senior citizen, location)
 - Account information (tenure, contract type, payment method)
 - Services subscribed (internet, streaming, security, support)
 - Financial metrics (monthly charges, total charges, CLTV)
 - Churn indicators (churn flag, churn score, churn reason)

3. Business Questions

This project was designed to answer the following key business questions, all of which are directly addressed through the SQL analysis and Tableau dashboard:

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- What is the overall customer churn rate, and what proportion of customers are actively churning versus retained?
- Which customer segments are most likely to churn based on tenure groups (e.g., 0–12 months, 13–24 months, long-term customers)?
- How does contract type (month-to-month, one-year, two-year) impact churn behavior?
- Are high-value customers more or less likely to churn compared to regular customers?
- How does the number of subscribed services relate to churn likelihood?
- What is the estimated monthly revenue at risk due to customer churn?
- What are the most common stated reasons for churning, and which issues appear most frequently among churned customers?

4. Data Cleaning (Python)

a) Data Cleaning

- Handling missing values, particularly in churn_reason and financial fields

```
df['Churn Reason'] = df['Churn Reason'].fillna("Active") # Fill NaN values with "Active"
```

- Ensuring correct data types for numeric and categorical columns

```
df['Total Charges'] = pd.to_numeric(df['Total Charges'], errors = 'coerce') # Convert to numeric, setting errors to NaN  
df['Total Charges'] = df['Total Charges'].fillna(0) # Fill NaN values with 0
```

- Standardizing column names (lowercase, underscores) for SQL compatibility

```
df.columns = df.columns.str.strip().str.lower().str.replace(' ', '_')
```

b) Feature Engineering

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- **Tenure Groups:** Customers segmented into tenure buckets (0–12, 13–24, 25–48, 49+ months)

```
def tenure_groups(months):  
    if months <= 12:  
        return '0-12 Months'  
    elif months <= 24:  
        return '13-24 Months'  
    elif months <= 48:  
        return '25-48 Months'  
    else:  
        return '49+ Months'  
      
df['Tenure Groups'] = df['Tenure Months'].apply(tenure_groups)
```

- **Number of Services:** Count of subscribed services per customer

```
service_columns = ['Phone Service', 'Multiple Lines', 'Internet Service', 'Online Security', 'Online Backup',  
                  'Device Protection', 'Tech Support', 'Streaming TV', 'Streaming Movies']  
  
df['Number of Services'] = df[service_columns].apply(lambda row: sum(row == 'Yes'), axis = 1)
```

- **High-Value Customer Flag:** Recalculated in SQL using above-average monthly charges or CLTV

```
df['High Value Customer'] = np.where(df['Monthly Charges'] >= 70, 'Yes', 'No')
```

5. Data Storage & SQL Analysis

a) Data Ingestion

- Cleaned data was exported from Python as a CSV file and imported into MySQL using the command-line interface and LOAD DATA LOCAL INFILE for efficient bulk loading.

b) SQL KPIs & Views

- Key SQL metrics were calculated and stored as views for Tableau integration:

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- Overall churn rate

churn_overview

churn_flag	customers	percent_of_total
0	5174	73.46
1	1869	26.54

- Churn by tenure group

churn_by_tenure

tenure_groups	customers	churn_rate_percent
0-12 Months	2186	47.44
13-24 Months	1024	28.71
49+ Months	2239	9.51
25-48 Months	1594	20.39

- Churn by contract type

churn_by_contract

contract	customers	churned	churn_rate_percent
Month-to-month	3875	1655	42.71
One year	1473	166	11.27
Two year	1695	48	2.83

- Churn by high-value customer status

churn_by_value

high_value_customer	customers	churned	churn_rate_percent
1	5514	1593	28.89
0	1529	276	18.05

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- Revenue at risk due to churn

revenue_at_risk

monthly_revenue_at_risk	total_cltv_at_risk
139130.8500137330	7755256

- Churn by number of services

churn_by_services

number_of_services	customers	churned	churn_rate_percent
0	80	35	43.75
1	1701	359	21.11
2	1188	390	32.83
3	965	352	36.48
4	922	289	31.34
5	908	232	25.55
6	676	152	22.49
7	395	49	12.41
8	208	11	5.29

- Top churn reasons

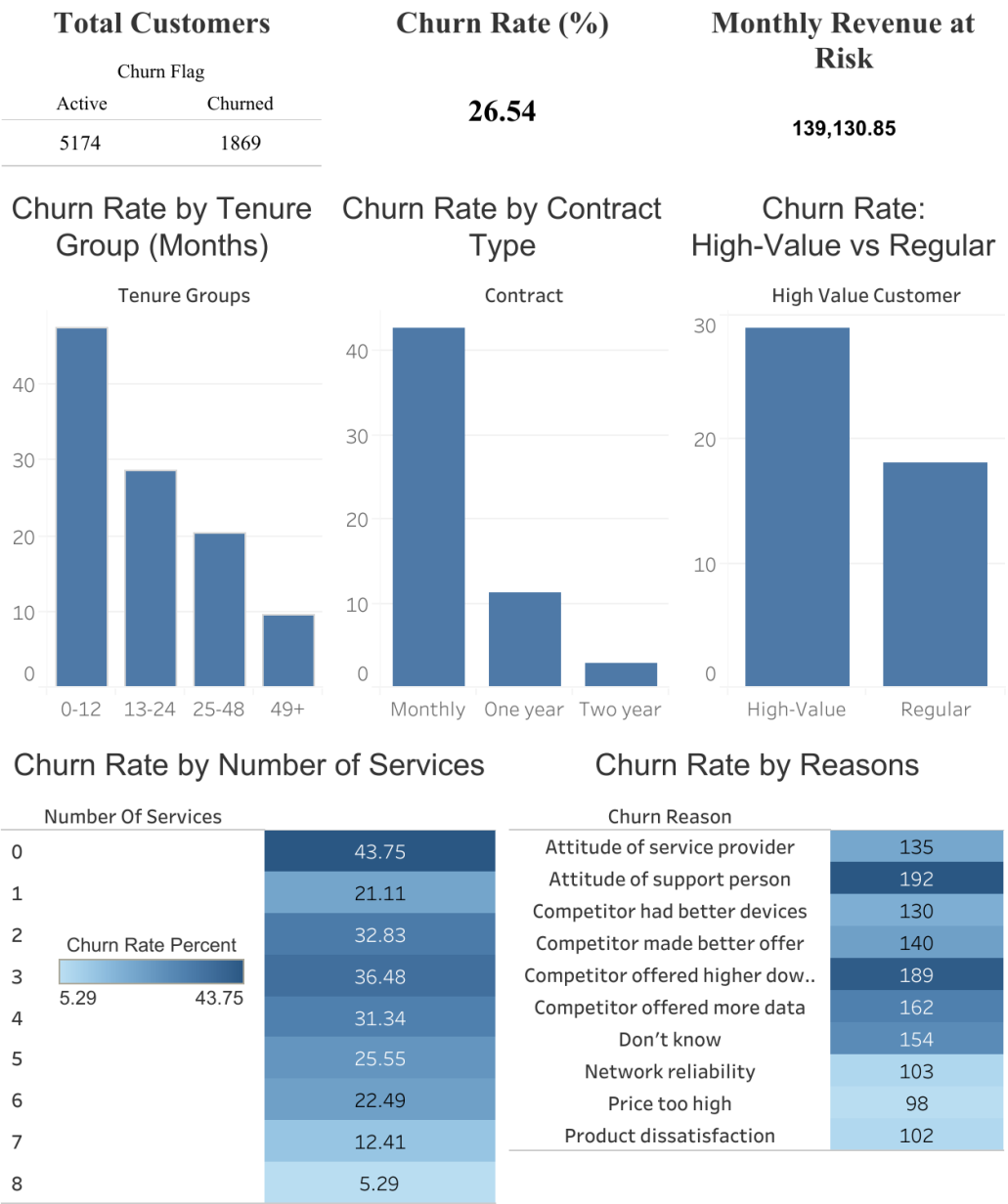
top_churn_reasons

churn_reason	churned_customers
Attitude of support person	192
Competitor offered higher download speeds	189
Competitor offered more data	162
Don't know	154
Competitor made better offer	140
Attitude of service provider	135
Competitor had better devices	130
Network reliability	103
Product dissatisfaction	102
Price too high	98

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6. Tableau Dashboard

The dashboard was created using all the info we extracted while using SQL and Python, to visually show key business insights clearly.



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7. Key Insights

- The overall churn rate is approximately **26.5%**, indicating significant retention challenges
- Customers with **short tenure (0–12 months)** are most likely to churn
- **Month-to-month contracts** show substantially higher churn compared to longer-term contracts
- **High-value customers** exhibit higher churn rates, increasing revenue risk
- Customers with **fewer subscribed services** are more likely to churn
- Top churn reasons include pricing concerns, competitive offers, and service quality issues

8. Business Recommendations

Based on the analysis, the following actions are recommended:

- Implement targeted onboarding and engagement programs for new customers
- Incentivize longer-term contracts to reduce churn
- Prioritize retention strategies for high-value customers
- Bundle services to increase customer stickiness
- Address pricing competitiveness and service quality concerns highlighted in churn reasons