

# Summary and The Conclusion

## Objective

The primary objective of this project was to **analyze customer churn behavior** within a telecom dataset and identify **key factors influencing customer retention and attrition**.

By leveraging **Python, Pandas, Matplotlib, and Seaborn**, the goal was to:

- Understand patterns behind customer churn through data-driven insights.
  - Visualize the relationship between demographic, service, and payment factors with churn.
  - Provide actionable recommendations to help the business **reduce churn and improve customer loyalty**.
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## Data Preparation and Cleaning

The dataset included customer demographics, account details, and service-related features.

Key preprocessing steps included:

- Replacing blank or invalid entries in TotalCharges with zero and converting it to numeric format.
- Mapping the SeniorCitizen column from binary (0/1) to categorical values (Yes/No).
- Checking for and handling missing data to ensure dataset integrity.

After cleaning, the data was ready for exploratory analysis and visualization.

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## Exploratory Data Analysis (EDA)

### 1. Overall Churn Rate

A combination of count and pie charts revealed that **26.54%** of total customers have churned, while **73.46%** remain active.

This means **roughly 1 in 4 customers** leave the service, signifying a notable churn challenge.

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## 2. Gender Distribution and Churn

Gender distribution was nearly balanced, with **no significant difference in churn rates** between males and females.

This suggests that gender does not play a decisive role in customer churn behavior.

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## 3. Senior Citizens and Churn

Approximately **16%** of customers were senior citizens, who exhibited a **churn rate of about 42%**, compared to **24%** for non-seniors.

This shows that older customers are more likely to leave, possibly due to price sensitivity or difficulty with digital services.

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## 4. Internet Service Type

- **Fiber Optic users:** ~**41%** churn rate
- **DSL users:** ~**19%** churn rate
- **No internet service:** negligible churn

Fiber Optic customers churn significantly more, indicating possible dissatisfaction with cost or service quality.

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## 5. Online Services (Security, Backup, Tech Support)

Customers **without additional services** such as *OnlineSecurity*, *OnlineBackup*, *DeviceProtection*, or *TechSupport* showed **churn rates between 35–45%**, compared to **10–20%** for those using these services.

Hence, **value-added services play a major role in retaining customers.**

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## 6. Contract Type

Contract duration has a **strong negative correlation with churn**:

- **Month-to-month:** ~43% churn
- **One-year:** ~11% churn
- **Two-year:** ~3% churn

Longer-term contracts clearly improve retention, suggesting businesses should encourage extended plans.

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## 7. Payment Method

Payment behavior insights:

- **Electronic check users:** highest churn (~45%)
- **Credit card, bank transfer, and mailed check users:** lower churn (~15–20%)

This points toward potential issues in the **electronic check billing experience** leading to higher dissatisfaction.

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## Visualizations

The project includes a wide range of insightful charts such as:

- **Count plots** (with churn hue differentiation) to compare categorical features.
- **Pie charts** showing churn proportions in percentages.

- **Subplots** for multi-feature analysis (e.g., service and contract combinations).

These visuals helped simplify complex relationships, making the analysis easy to interpret.

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## Insights & Recommendations

1. **Promote long-term contracts** — churn drops by nearly **70%** for annual or biennial plans.
  2. **Bundle add-on services** like Tech Support and Online Security to improve engagement.
  3. **Investigate Fiber Optic dissatisfaction** — possibly related to pricing or network quality.
  4. **Design senior-friendly plans** to reduce churn among older customers.
  5. **Enhance electronic billing experience** to lower churn in the electronic check segment.
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## Conclusion

This project provides a **data-driven view of customer churn dynamics**, identifying critical factors such as **contract duration, service engagement, and payment behavior** that significantly impact retention.

By combining detailed preprocessing, exploratory data analysis, and visualization, this analysis offers clear insights and strategic recommendations to **reduce churn, enhance customer satisfaction, and boost long-term profitability**.