

Telco customer churn EDA report

Introduction

This analysis explores customer churn in a telecommunications dataset to identify who churns, why they churn, and which factors correlate with retention. The goal is to translate exploratory findings into clear signals that can guide product, marketing, and customer success strategies.

Dataset overview

- **Scope:** 7,043 customer records with 21 features.
- **Target:** Churn (binary: Yes/No).
- **Feature types:** Predominantly categorical service attributes (e.g., InternetService, Contract, PaymentMethod), plus numerical variables (tenure, MonthlyCharges, TotalCharges).
- **Core numerics:**
 - **tenure:** 0–72 months (median 29)
 - **MonthlyCharges:** 18.25–118.75 (median 70.35)
 - **TotalCharges:** 0–8684.80 (median 1394.55)
- **SeniorCitizen:** 0/1; approximately 16.2% seniors

EDA process

Data inspection: Verified schema, types, and sample rows to understand feature meanings and value ranges.

Type corrections:

- **TotalCharges:** Converted from object to float after replacing blanks with 0.
- **SeniorCitizen:** Treated as integer (0/1) for clarity in analysis.

Quality checks:

- **Missing data:** None detected after cleaning.
- **Duplicates:** None found across rows or customerID.

Descriptive statistics: Summaries for numerics to assess central tendency and spread (e.g., tenure and charges).

Univariate and bivariate visuals: Count plots, a pie chart, a stacked bar chart, and a histogram with hue to examine churn distribution and relationships with:

- Demographics (gender, senior status)
- Customer lifecycle (tenure)
- Commercial terms (contract)
- Services (InternetService, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies, PhoneService, MultipleLines)
- Billing (PaymentMethod)

Insights and findings

Overall churn level

- **Churn rate:** 26.54% (1,869 churners; 5,174 retained).
- **Implication:** Imbalanced target but not extreme; meaningful patterns exist across segments.

Demographics

- **Gender:** Nearly identical churn counts (Female 939 vs. Male 930) suggest gender is not a meaningful predictor.
- **Senior citizens:** Substantially higher churn among seniors.
- Non-seniors: 1,393 churn vs. 4,508 retained (23.6% churn rate).
- Seniors: 476 churn vs. 666 retained (41.7% churn rate).
- **Implication:** Age proxy (SeniorCitizen) is a strong risk indicator.

Customer lifecycle (tenure)

- **Early tenure risk:** Churn is heavily concentrated at very low tenure (especially 0–3 months).
- **Long-tenure loyalty:** Churn drops sharply as tenure increases, with 60–72 months showing strong retention.

- **Implication:** The onboarding and first 90 days are critical for intervention.

Contracts

- **Month-to-month drives churn:** 1,655 churners on month-to-month vs. much lower on fixed terms.
- **Fixed-term contracts retain:** One year (166 churners, 1,307 retained) and two year (48 churners, 1,647 retained) have markedly lower churn.
- **Implication:** Contract structure is one of the strongest levers for retention.

Services and support

- **Security/support reduce churn:** Customers with OnlineSecurity and TechSupport enabled are less likely to churn; absence correlates with higher churn.
- **Internet type matters:** Fiber optic shows higher churn versus DSL; may reflect price sensitivity, performance perceptions, or demographic mix.
- **Implication:** Bundling protection/support services can be an effective retention strategy.

Billing and payment behavior

- **Electronic check is risky:** Highest churn among payment methods (Electronic check: 1,071 churn vs. 1,294 retained).
- **Automatic payments retain:** Much lower churn with Bank transfer (automatic: 258 churn vs. 1,286 retained) and Credit card (automatic: 232 churn vs. 1,290 retained). Mailed check churn is moderate (308 churn vs. 1,304 retained).
- **Implication:** Encourage automatic payments to lower friction and reduce churn.

Business implications (actionable)

- **Promote fixed-term contracts:** Target month-to-month customers with incentives to upgrade to 1–2 year plans.
- **Protect the “first 90 days”:** Welcome flows, onboarding calls, and early-value nudges for new sign-ups.
- **Bundle retention-friendly services:** Discounts for OnlineSecurity/TechSupport packages.
- **Nudge to autopay:** Campaigns to move Electronic check users to automatic payment methods.

- **Target senior risk:** Proactive support and tailored offers for senior customers.

Visualizations

- **Churn distribution (count + pie)**
 - **What it shows:** Class balance—5,174 “No” vs. 1,869 “Yes,” equating to 26.54% churn.
 - **Why it matters:** Establishes baseline and justifies focus on high-signal features.
- **Churn by gender (count plot)**
 - **What it shows:** Very similar churn levels by gender (Female 939; Male 930).
 - **Why it matters:** Gender adds little predictive signal; deprioritize in modeling.
- **Churn by senior status (count + stacked percentage bar)**
 - **What it shows:** Seniors churn more ($\approx 41.7\%$) than non-seniors ($\approx 23.6\%$).
 - **Why it matters:** Strong risk segment for targeted retention.
- **Churn by tenure (histogram with hue)**
 - **What it shows:** Early tenure customers churn disproportionately; long-tenured customers are loyal.
 - **Why it matters:** Time-in-service is a key proxy for relationship strength; prioritize early lifecycle interventions.
- **Churn by contract type (count plot)**
 - **What it shows:** Most churners are month-to-month ($\approx 1,655$); far fewer in one-year (166) and two-year (48).
 - **Why it matters:** Contract term is a controllable, high-impact lever.
- **Churn vs. service features (grid of count plots)**
 - **What it shows:** Lower churn when OnlineSecurity and TechSupport are enabled; higher when absent. DSL tends to retain better than Fiber optic.
 - **Why it matters:** Cross-sell/upsell of protection/support services can improve retention.
- **Churn by payment method (count plot)**

- **What it shows:** Electronic check users churn the most (1,071). Automatic payments (Bank transfer/Credit card) have the lowest churn (258 and 232).
- **Why it matters:** Payment friction and automation correlate strongly with retention; behaviorally actionable.

Conclusion

- **Core drivers of churn:** Month-to-month contracts, early tenure, Electronic check payments, absence of OnlineSecurity/TechSupport, and senior status.
- **Core drivers of retention:** Fixed-term contracts, long tenure, automatic payments, and enabling protection/support services.

This EDA provides a clear map from descriptive patterns to actionable strategies, positioning the team to reduce churn and deepen customer lifetime value.