

Customer Churn Analysis

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1 Uni-variate & Distributional Analysis

Table 1.1: Summary of the Dataset

Variable	Mean	Median	Sd	Min	Q1	Q2	Q3	Q4	Max
Age	49.09	50.00	18.17	18	34.00	50.00	65.00	80.00	80.00
Tenure	34.68	34.00	21.04	0	16.00	34.00	52.25	72.00	72.00
MonthlyCharges	68.51	69.02	29.07	18	43.74	69.02	92.65	119.77	119.77
TotalCharges	2339.68	1900.12	1808.26	0	938.64	1900.12	3380.87	8444.03	8444.03

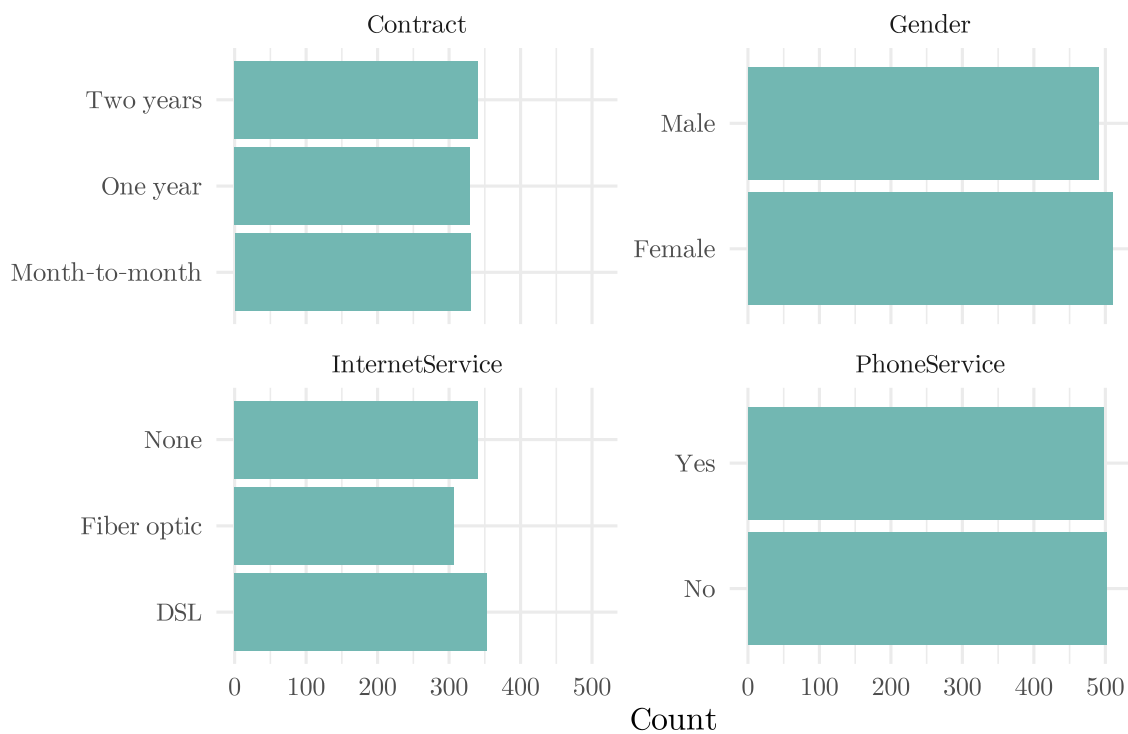
Table 1.2: Random 10 samples from the dataset

Gender	Age	Tenure	PhoneService	InternetService	Contract	MonthlyCharges	TotalCharges	Churn
Male	46	61	Yes	Fiber optic	One year	75.59	4610.99	No
Male	63	63	Yes	DSL	Month-to-month	22.01	1386.63	No
Female	36	1	Yes	None	One year	48.25	48.25	No
Male	34	24	No	None	One year	87.21	2093.04	No
Female	36	63	No	Fiber optic	Two years	54.83	3454.29	No
Male	50	10	Yes	None	One year	113.24	1132.40	No
Female	57	44	Yes	DSL	Month-to-month	43.35	1907.40	Yes
Male	26	11	Yes	None	One year	50.39	554.29	No
Male	45	52	No	None	Two years	110.23	5731.96	No
Male	22	61	Yes	None	One year	86.99	5306.39	No

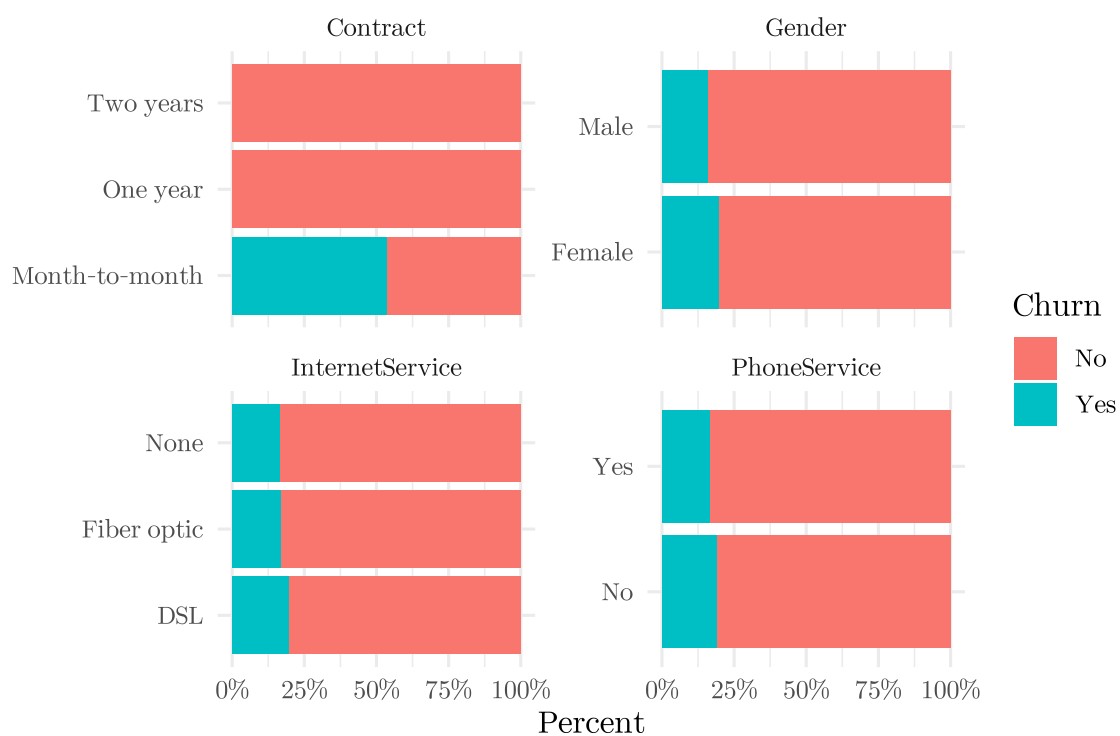
1.1 Numeric Distributions (Histograms)



1.2 Categorical Counts (Phone/Internet/Contract)

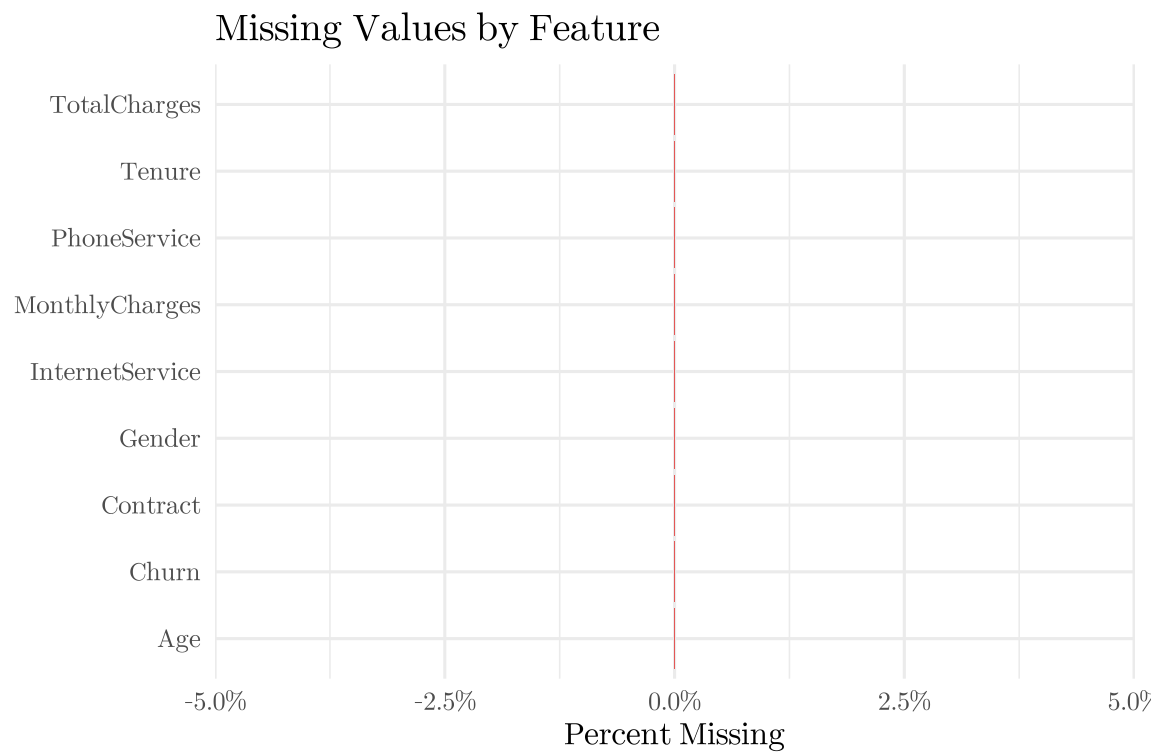


1.3 Categorical Proportions by Churn



1.4 Missingness Overview

As can be seen from the following table, there is no missing data.



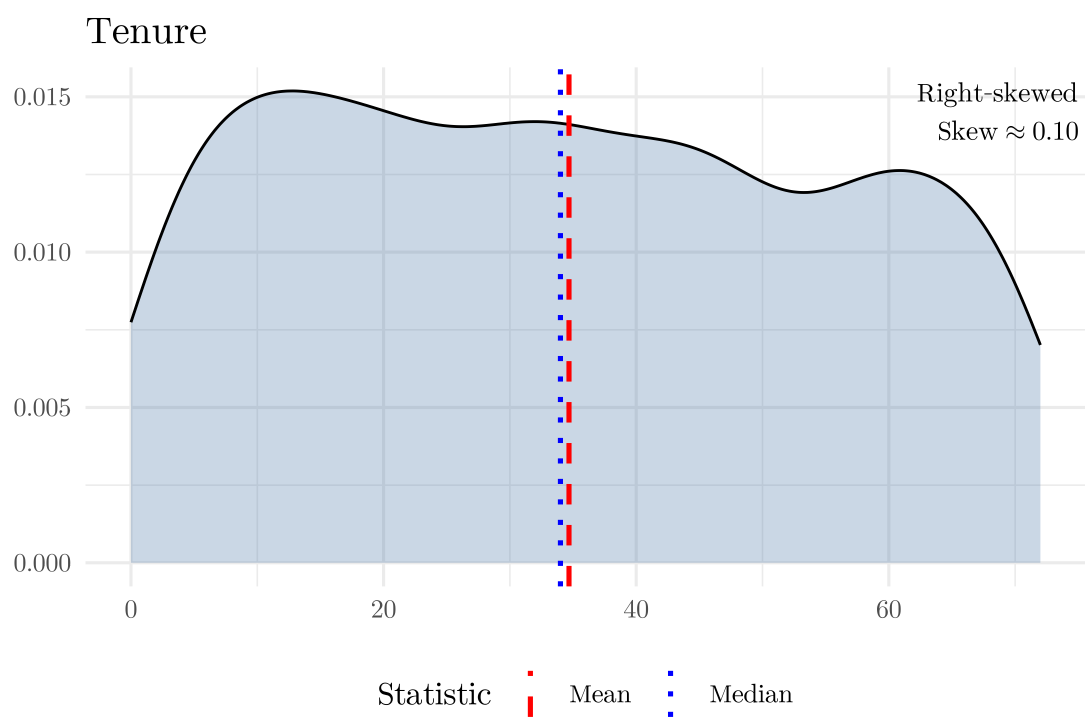
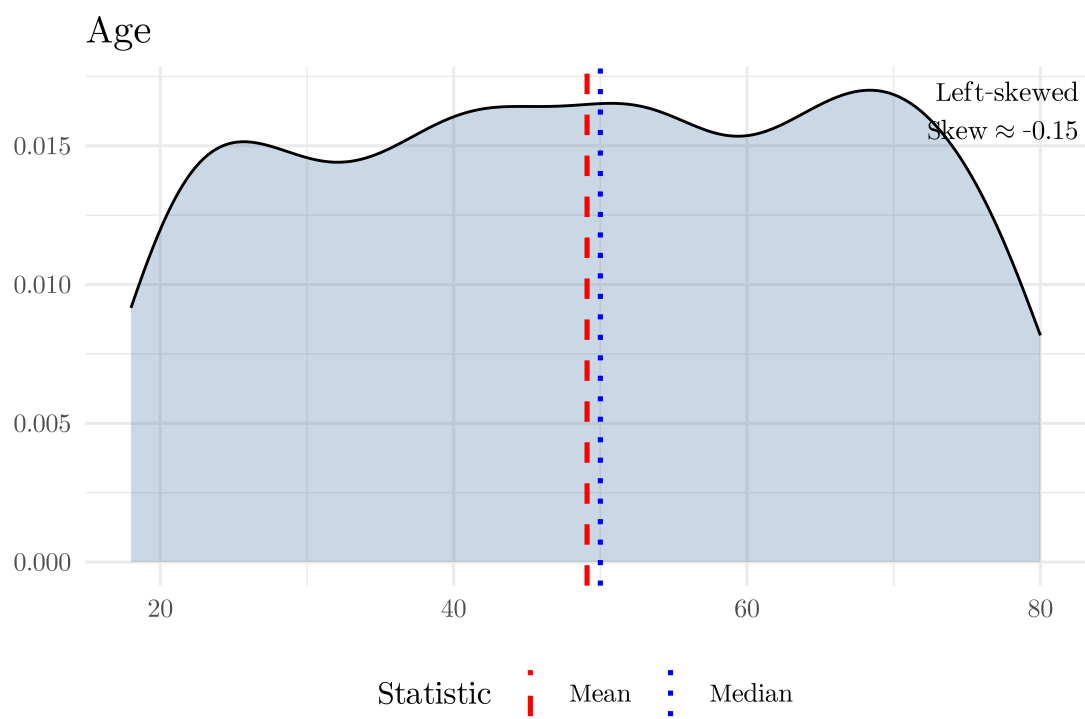
1.5 Skewness

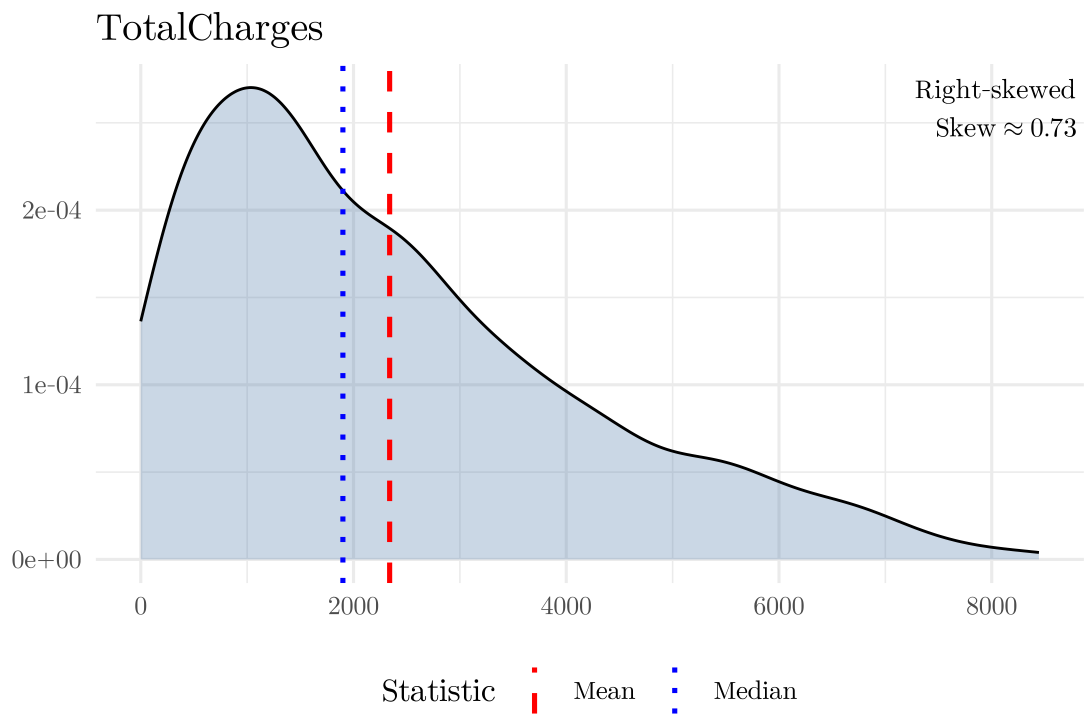
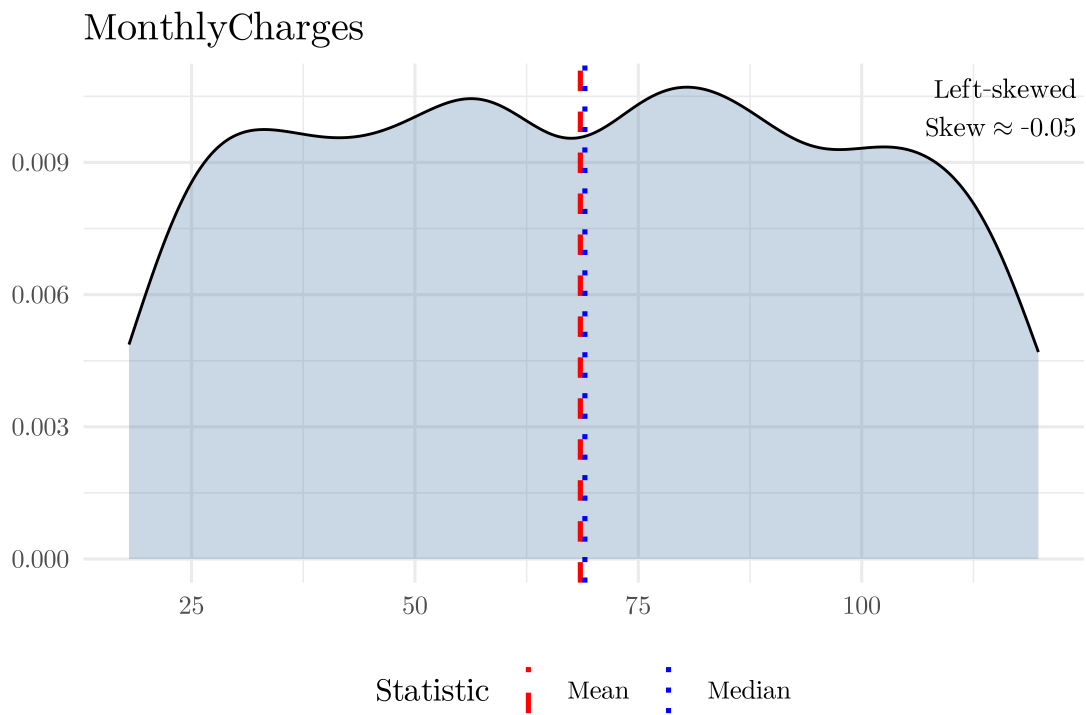
1.5.1 Quick skew check (numeric)

Table 1.3: Skewness

feature	n	mean	median	sd	p99	skew_hint
TotalCharges	1000	2339.68	1900.12	1808.26	7247.88	Right-skewed
Age	1000	49.09	50.00	18.17	80.00	Left-skewed
Tenure	1000	34.68	34.00	21.04	72.00	Right-skewed
MonthlyCharges	1000	68.51	69.02	29.07	118.93	Left-skewed

1.5.2 Skew check



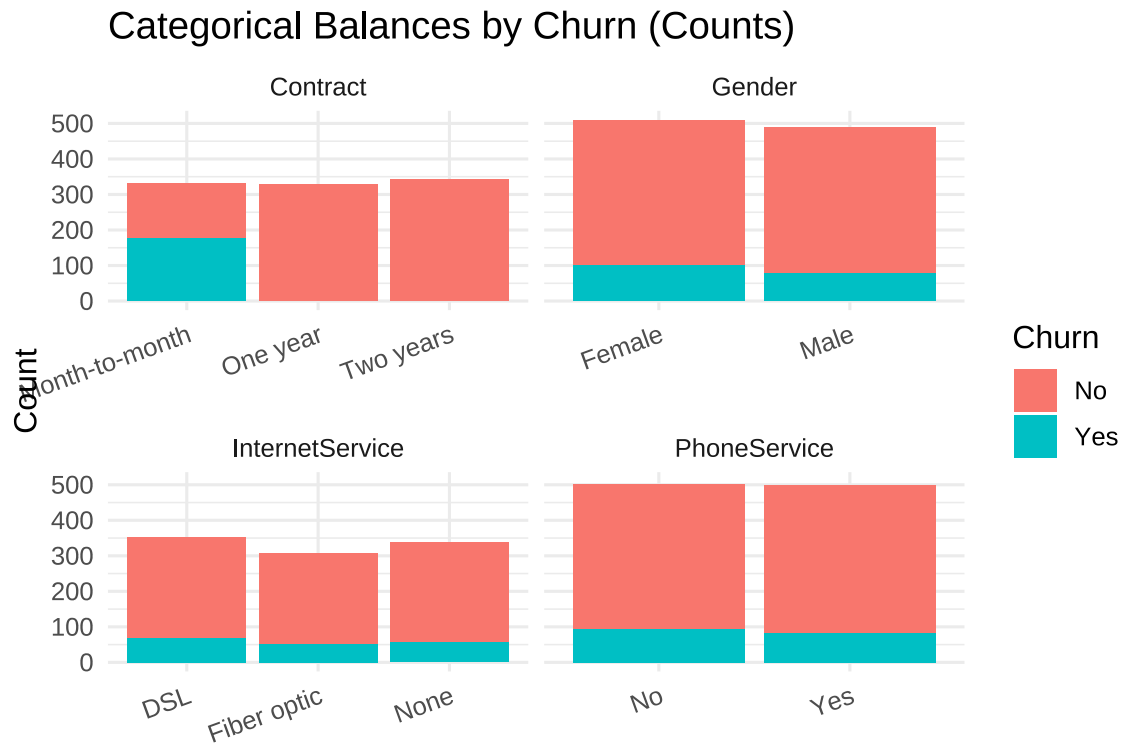


1.6 Churn vs Non-Churn Proportions

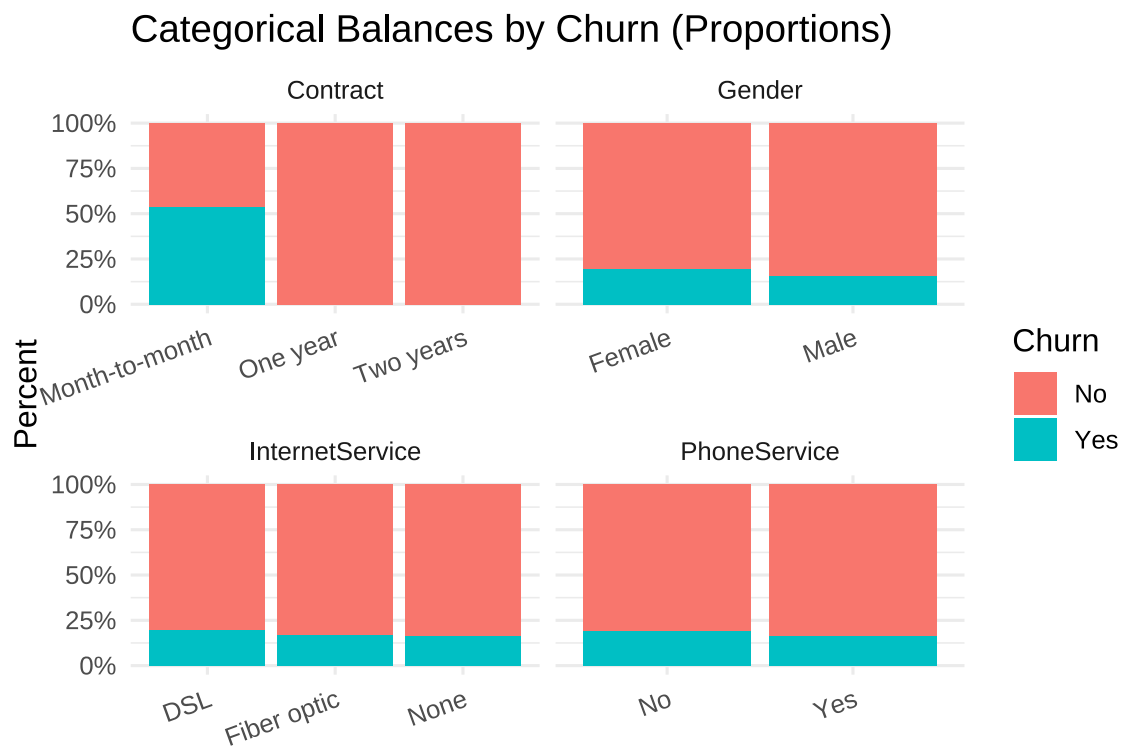
Table 1.4: Categorical features of interest

Churn	Feature	Level
No	Gender	Male
Yes	InternetService	DSL
No	InternetService	DSL
No	InternetService	Fiber optic
No	PhoneService	No

1.6.1 Stacked bar (counts by category)



1.6.2 Normalized bar (proportions within each category)



2 Bivariate (Churn vs. Features)

2.1 Churn rate by **Tenure** bins (0-6, 6-12, 12-24, 24-48, 48+)

Tenure is how long a customer has been with the company (in months). Following is the hypothesis, Customer who are new (short tenure) are more likely to churn; customers who have stayed longer are “stickier”

To test this,

1. Group customers into bins of tenure (0-6 months, 6-12, etc.).
2. Compute churn rate = (# churned customers) / (total customers) in each bin.
3. Plot churn rate across bins to visualize patterns.

If churn is very high in 0-6 months bin, that means the company has an onboarding / early experience problem.

Table 2.1: Data Frame with Tenure Bin tags

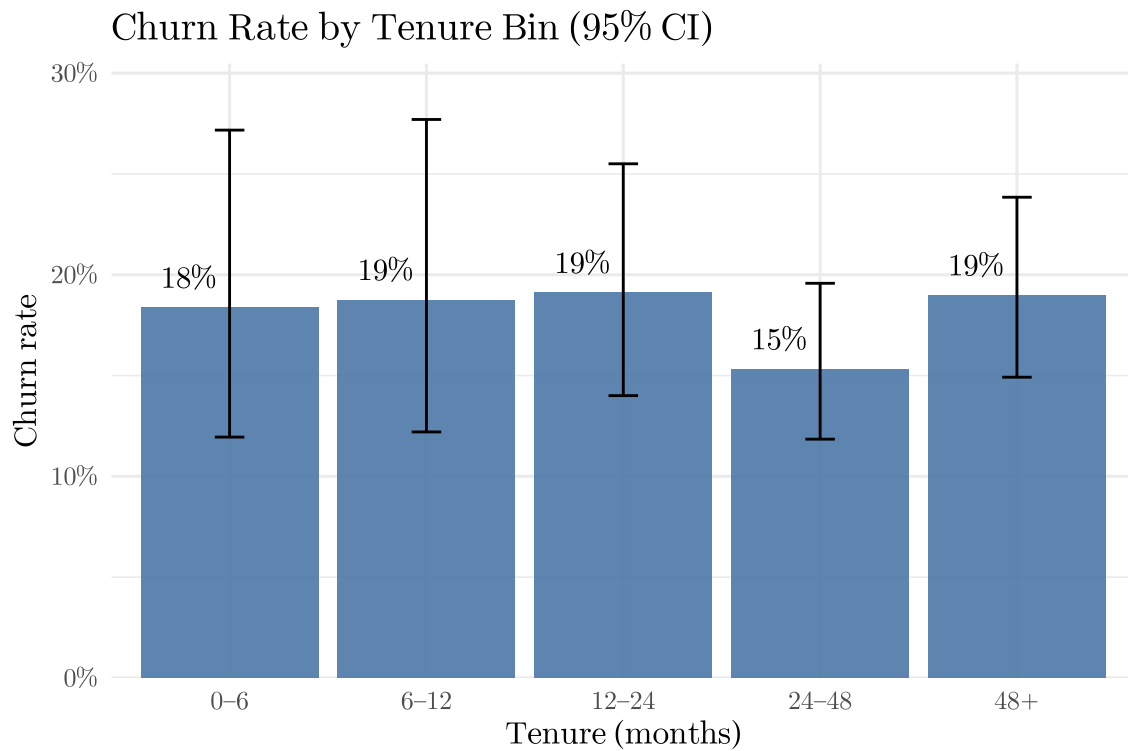
Gender	Age	Contract	Tenure Bin
Male	75	Two years	24-48
Male	61	One year	12-24
Male	48	Month-to-month	24-48
Male	71	Month-to-month	24-48
Female	22	Month-to-month	48+

- n = number of customers
- churn_yes = number of churned customers
- $p = \text{churn_yes} / n$ = churn proportion

Table 2.2: Tenure statistics

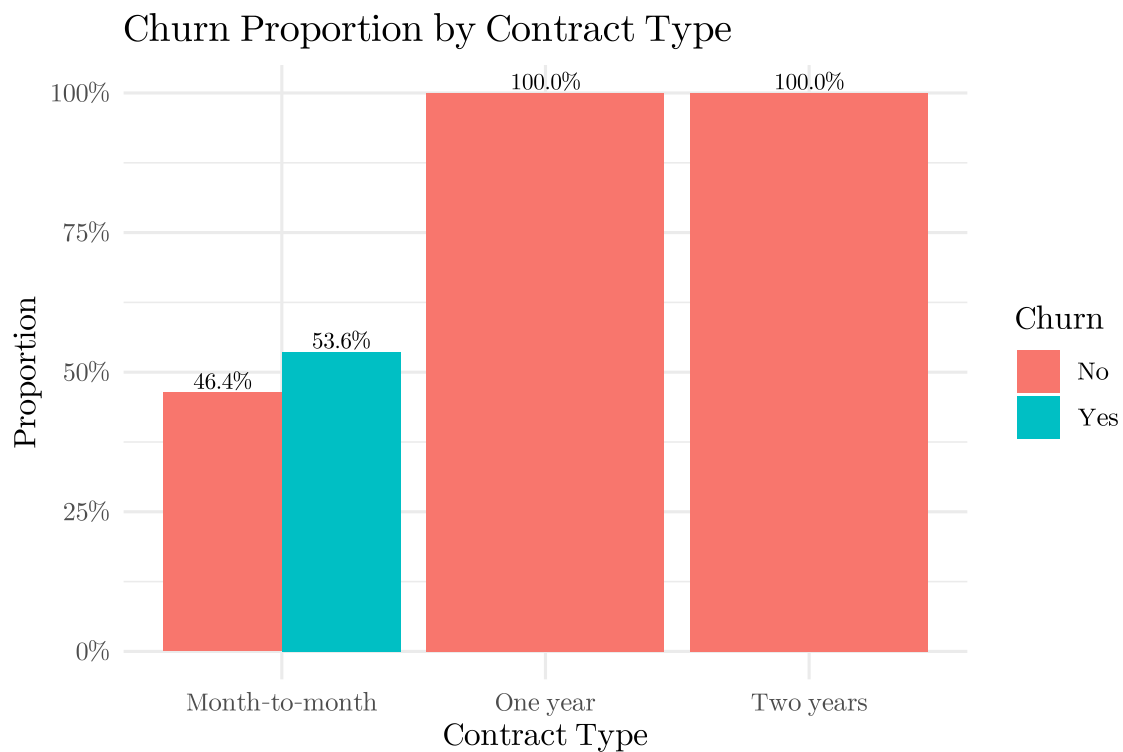
level	churn_yes	n	p	p_lo	p_hi
0-6	18	98	0.18	0.12	0.27
6-12	18	96	0.19	0.12	0.28
12-24	34	178	0.19	0.14	0.26
24-48	51	333	0.15	0.12	0.20
48+	56	295	0.19	0.15	0.24

Because churn rate is an estimate from data, we add 95% confidence interval using the Wilson method.



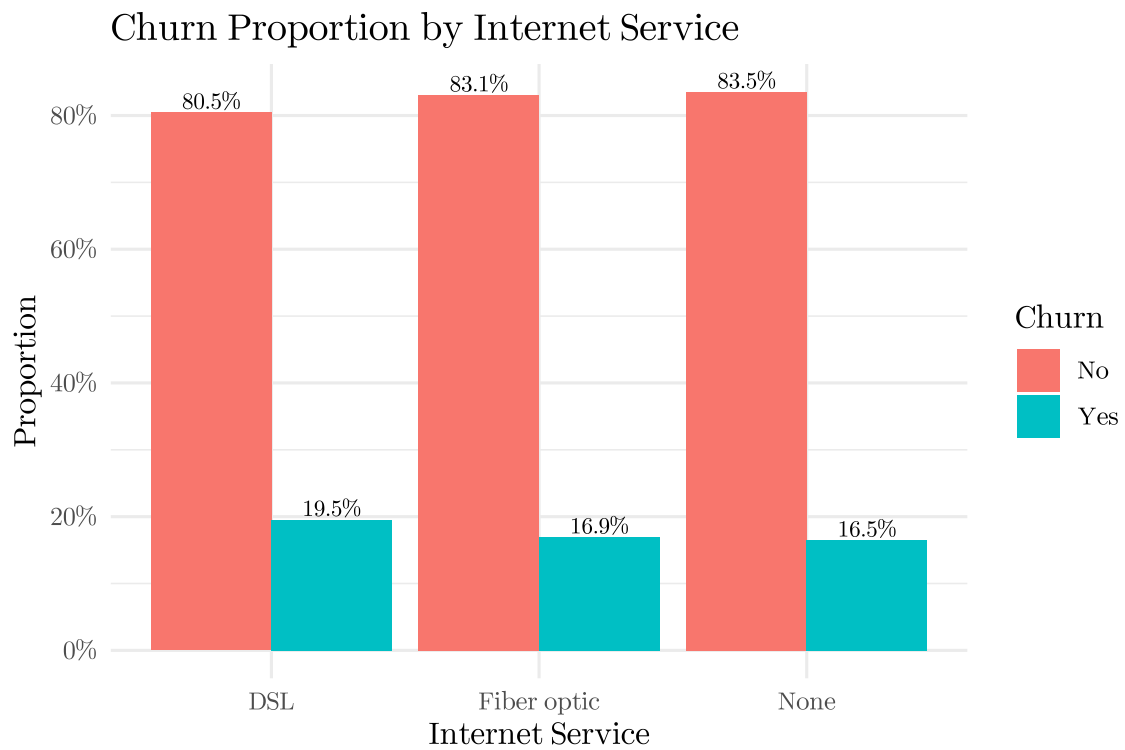
2.2 Contract Type vs. Churn

Goal: Show how churn differs by contract type. Hypothesis: Month-to-month has higher churn than One/Two year contracts.

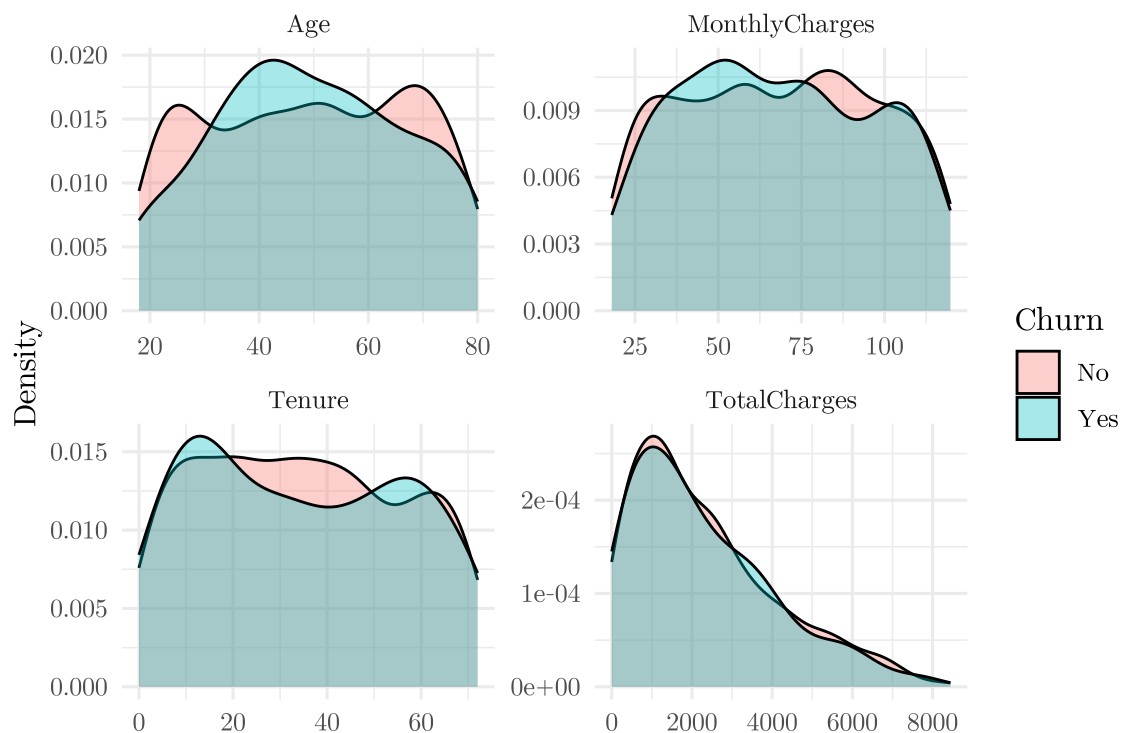


2.3 Internet Service vs. Churn

Goal: Compare churn across DSL / Fiber optic / No Internet.



2.4 Numeric Densities by Churn



2.5 Numeric Box Plots by Churn

