

# Reducing Customer Churn at Telco: A Data-Driven Case Study

A Statistical Analysis of Customer Behavior

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Tools: Python, Power BI

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# Business Problem & Context

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## **Company**

*Telco – A major telecom service provider*

## **Context**

*The Sales Manager has observed a rise in customer churn, but the causes are unclear due to the number of customer variables.*

## **Broad Problem**

*What is causing customer churn at Telco?*

## **Narrow Problem**

*Which customer factors are driving churn?*

## **Why This Matters**

 **Lost Revenue** from exiting customers

 **Brand Risk** if churn continues

 **High Re-acquisition Costs** to win

customers back

# Data Summary (KPI + Bullets)

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## 🎯 Overall Churn Rate: 26.5%

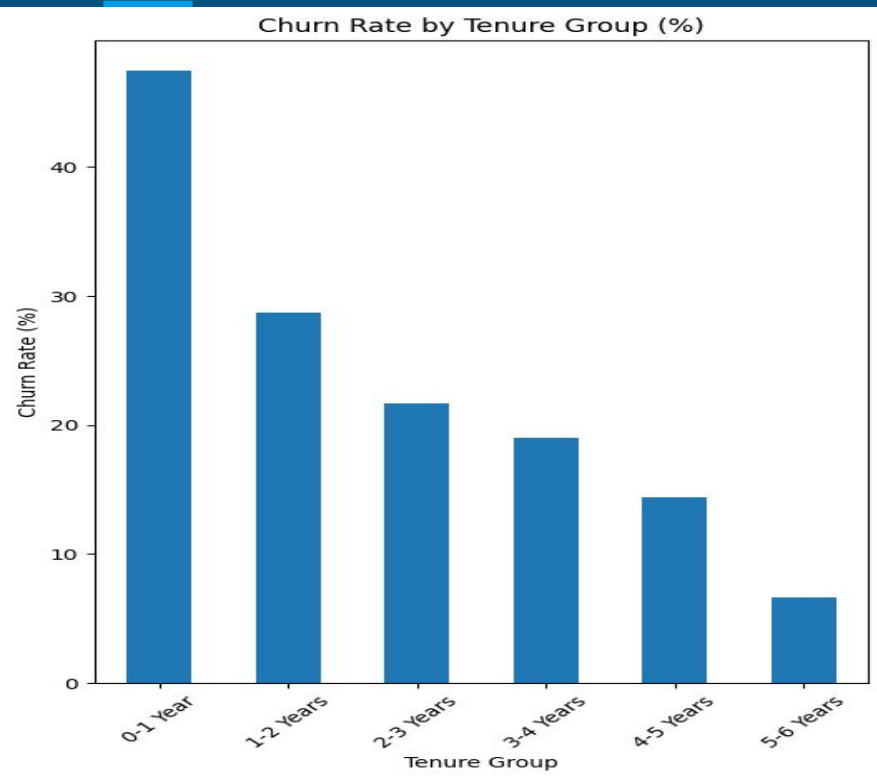
Out of 7,043 customers, roughly 1 in 4 churned.

## 📌 Initial Observations

- Most churners are **month-to-month** customers
- **Tenure** is strongly related to churn — short-tenure = high churn
- **Fiber optic** users churn more than DSL users
- **Monthly charges** appear slightly higher among churners

🧠 *We explore these variables further in the next section.*

# Short-tenure Customers Are Most at Risk

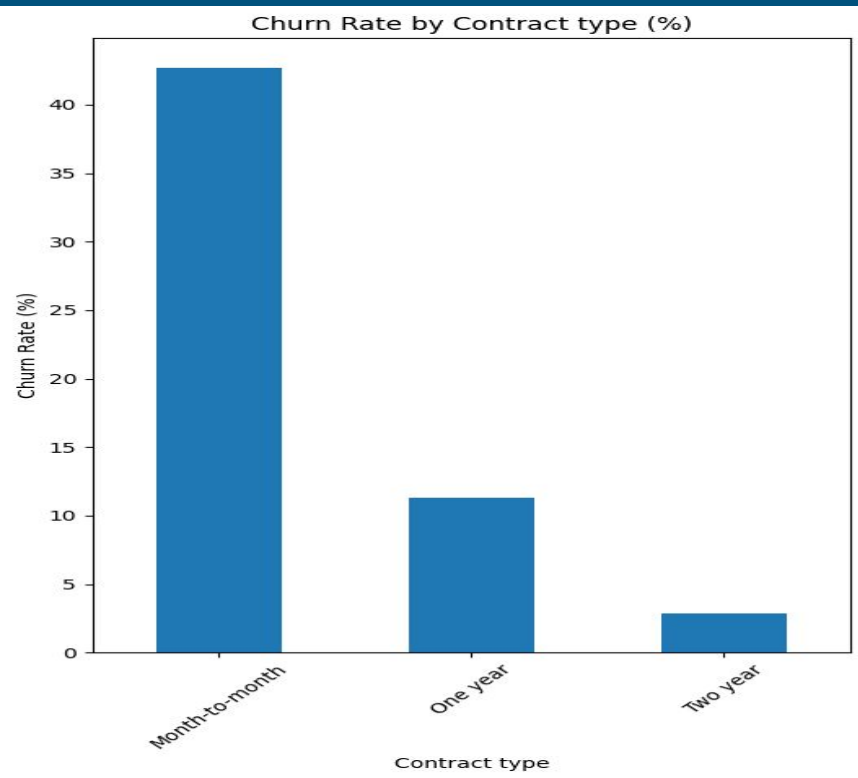


- Key Insight

Over **47% of customers in their first year churned.**

Retention efforts should target new customers early.

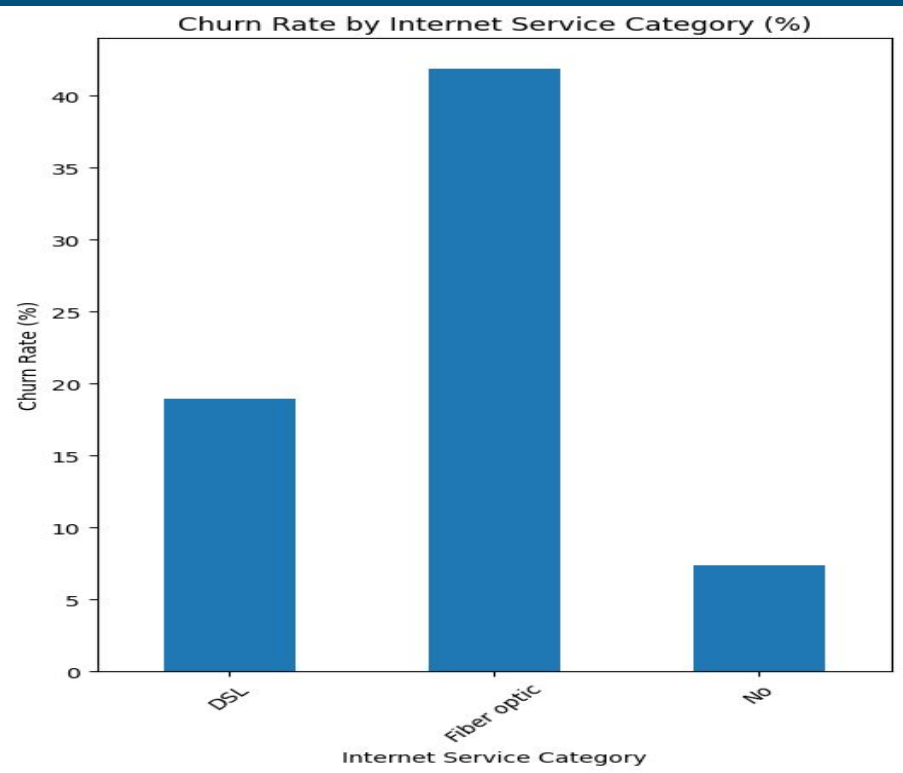
# Month-to-Month Contracts Drive High Churn



- **Key Insight:**

Customers with **month-to-month contracts** have a **churn rate of ~43%**, compared to **~11% for 1-year** and **~3% for 2-year contracts**.

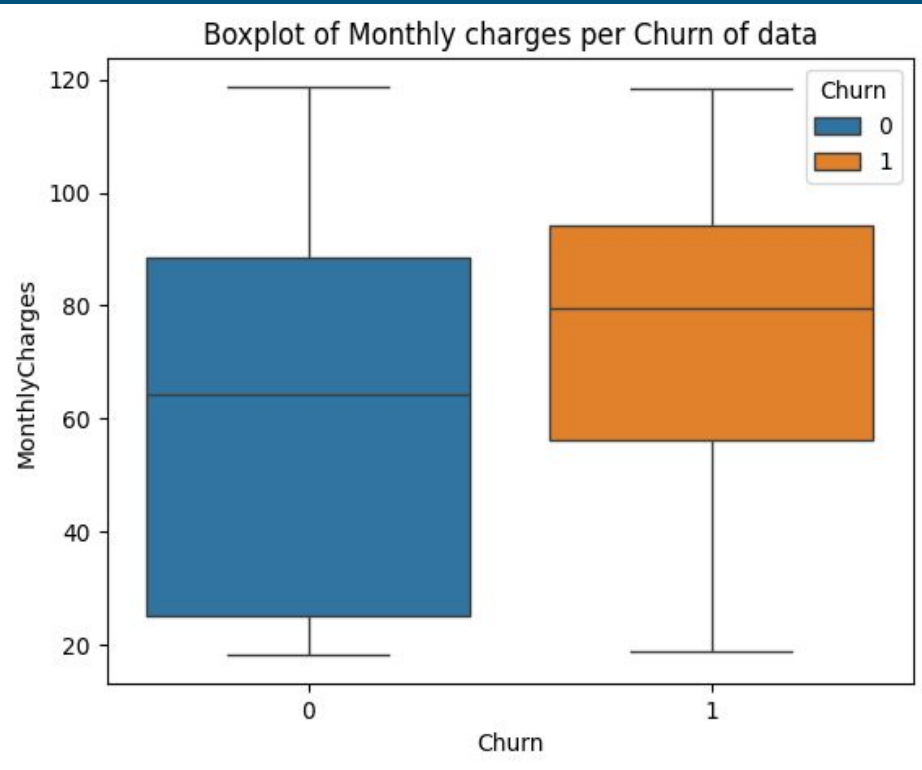
# Fiber Optic Users Are More Likely to Churn



- Key Insight:

**42% of fiber optic users churned**, likely due to **higher costs or service dissatisfaction**. DSL customers churn less.

# High Monthly Charges Linked to Churn







- **Key Insight:**

**Churned customers** tend to have **higher monthly bills**.

Price-sensitive segments may need **discounts or alternative plans**.

# What the Data Reveals About Churn Risk

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-  **Short-tenure customers** churn at the highest rate — retention efforts should start early.
-  **Month-to-month subscribers** churn more than contract customers — longer contracts reduce churn.
-  **Fiber optic users** have significantly higher churn — investigate service experience and pricing.
-  **Higher monthly charges** are associated with churn — pricing sensitivity may be driving loss.



# Are these Differences Statistically Significant?

Test	p-value	Significant?	Confidence Interval (approx.)
Tenure (Churned vs. Not)	< 0.001	✓ Yes	Churned mean tenure ≈ 18 months, Non-churned mean tenure ≈ 37 months
Monthly Charges (Churned vs. Not)	0.0002	✓ Yes	Churned mean ≈ \$75, Non-churned mean ≈ \$61
Contract Type (Proportion test)	< 0.001	✓ Yes	Month-to-month churn rate ≫ long-term
Internet Service (Proportion test)	< 0.001	✓ Yes	Fiber optic users churn significantly more




# Which factors predict Churn? (Model summary)

 Feature	 Impact on Churn	 Significance
 Tenure	 Reduces churn	 Yes
 Monthly Charges	 Slightly increases churn	 No
 1-Year Contract	 Strongly reduces churn	 Yes
 2-Year Contract	 Very strongly reduces churn	 Yes
 Fiber Optic	 Substantially increases churn	 Yes
 No Internet	 Reduces churn	 Yes

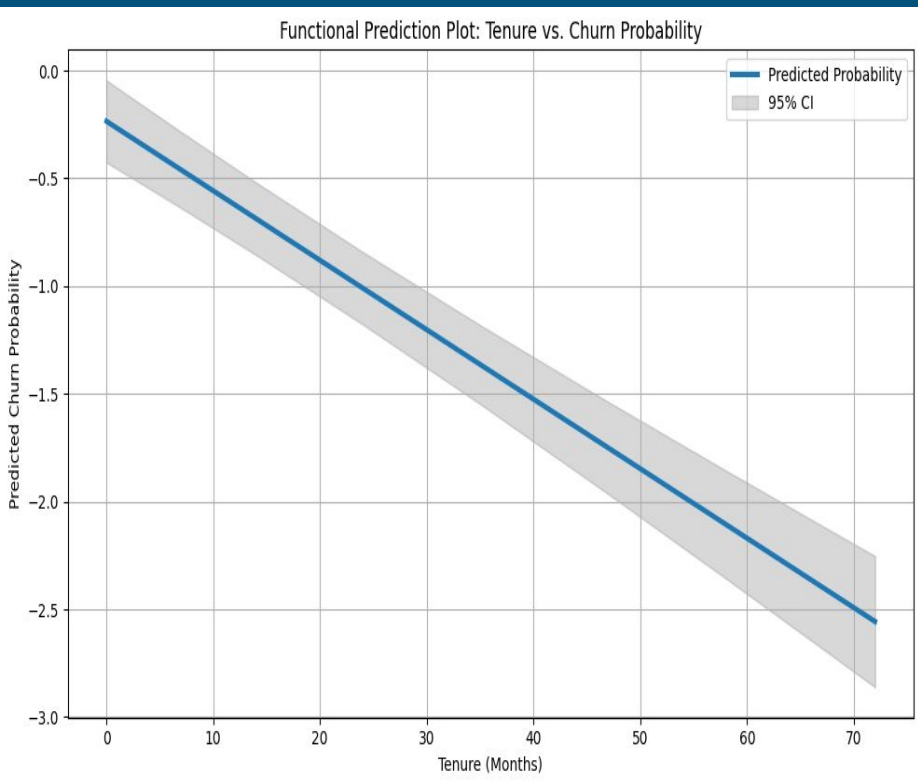
*See appendix for detailed coefficient values, odds ratios, and statistical interpretations*

# Churn Drivers - Key Insights

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-  **Longer contracts** reduce churn by **58–82%**
-  Fiber-optic users are 2.85× more likely to churn
-  Every extra month reduces churn odds by ~3.2%

# Churn Risk Over Tenure



## Objective:

Understand how customer **tenure** influences their **likelihood of churning**, based on the GLM model.

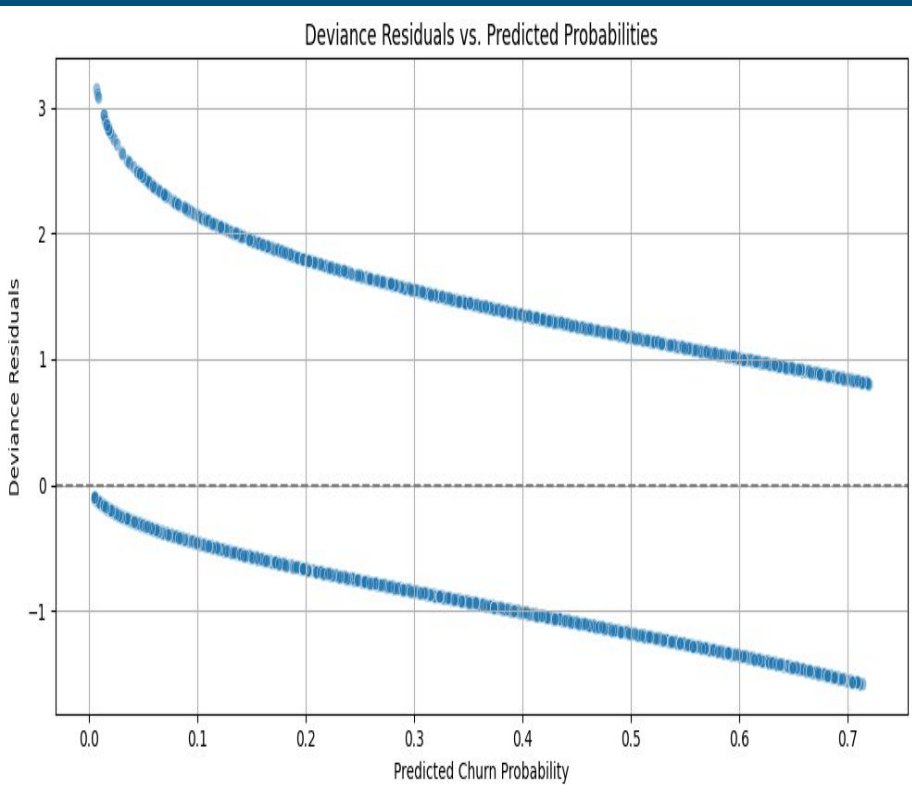
## Method:

We used **predict\_functional()** to estimate churn probabilities across different tenure values, holding other variables constant.

## Insight:

- **Churn probability decreases** steadily with increasing tenure.
- **Early-tenure customers (0–10 months)** have the **highest risk**.
- Retention efforts should focus on **newer customers** in their first year.

# Residual Diagnostics: Model Fit & Assumptions



## Deviance Residuals vs. Predicted Probabilities






### What It Shows:

- Each dot = one customer
- X-axis = predicted churn probability
- Y-axis = deviance residual (model error)

### Key Takeaways:

- Residuals are fairly symmetric around 0 → no major bias
- No strong pattern or funnel → model is well specified
- A few outliers exist, but most points fall within  $\pm 2$
- Indicates a reasonable model fit

# What Do These Results Mean for the Business?





-  **Short-tenure customers** are far more likely to churn — they need stronger onboarding and retention efforts.
-  Customers on **month-to-month contracts** show the **highest churn rate** — fixed contracts significantly lower churn.
-  **Fiber-optic internet users** have the **highest likelihood to churn**, possibly due to performance or pricing concerns.
-  **Monthly Charges** were **statistically significant in hypothesis testing** but **not in the final model** — this suggests a **non-linear or interaction effect**, or that its impact overlaps with other variables like contract type.
-  Customers without internet churn less — likely less engaged or legacy users.

## **Implication:**


Retention strategy should **combine behavioral insights from EDA and statistical rigor from modeling**, especially when signals (like Monthly Charges) appear in one but not both stages.

# Final Recommendations – “Action Plan”

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Area	Action
 Contract Strategy	Offer tiered discounts for 1–2 yr plans
 Retention Programs	Trigger campaigns at months 3 & 9
 Service Quality	Launch fiber-optic satisfaction surveys
 Dashboard Rollout	Use BI dashboards to track churn drivers in real-time

# Appendix Page 1: GLM Model Summary

 **Model Formula:**  
Churn ~ tenure + MonthlyCharges + C(Contract) + C(InternetService)

 **Model File:**  
Saved as: assets/glm\_churn\_model.pkl

 **Key Evaluation Metrics:**

Metric	Value
Log-Likelihood	-3032.0
Deviance	6063.9
Pseudo R <sup>2</sup> (Cragg-Uhler/CS)	0.2564



# Appendix Page 2: GLM Coefficient Table

Variable	Coefficient	Std. Error	z-score	P >  z	Significance
Intercept	−0.34	0.16	−2.10	0.036	✓
tenure	−0.0322	0.0028	−11.50	0.000	✓
MonthlyCharges	+0.0043	0.0030	+1.44	0.150	✗
Contract_One year	−0.8693	0.102	−8.52	0.000	✓
Contract_Two year	−1.7251	0.130	−13.27	0.000	✓
Internet_Fiber Optic	+1.0491	0.090	+11.66	0.000	✓
InternetService_No	−0.9130	0.131	−6.97	0.000	✓