Customer Churn Analysis Project Report

1] Introduction

Customer churn analysis identifies why customers leave the service and what factors contribute to churn. The goal is to reduce churn and improve customer retention strategies.

This project focuses on analyzing churned data to detect churn patterns using Python, SQL, and Power BI. The output includes a fully interactive 3-page dashboard, providing insights on churn analysis.

2] Dataset Overview

The dataset includes demographic, service usage, and billing information for telecom customers.

Total Rows: 500   Total Columns: 13

Column Name	Discription
customer_id	ID of cusomers
gender	Gender of customers
senior_citizen	1=yes,0=no
tenure_months	total tenure months
internet_service	Fiber, DSL, None
payment_method	Credit, card, Debit card, UPI, Cash
contract_type	Month-to-Month, One year, Two year
monthly_charges	Charges in one month
total_charges	Total Charges
online_security	Yes or No
tech_support	Yes or No
is_active	Yes or No
churn	Yes or No

3] Data Cleaning & Preparation (Python) :

Data preprocessing was performed using Python (Pandas, NumPy).

Steps performed:

1. Removed duplicates

2. converted data types

3. Handled missing values with mean, median and mode.

```python
df['monthly_charges'] = df['monthly_charges'].fillna(df['monthly_charges'].mean())
df['tenure_months'] = df['tenure_months'].fillna(df['tenure_months'].median())
df['total_charges'] = df['total_charges'].fillna(df['total_charges'].mode()[0])

df['internet_service'] = df['internet_service'].fillna('Unknown')

df.isnull().sum()
```
Python

4. Created new features:
  o **Churn_flag (1=Yes,0=No)**

  o **is_active_flag (1=Yes,0=No)**

```python
df['churn_flag'] = df['churn'].map({'Yes':1, 'No':0})
df['is_active_flag'] = df['is_active'].map({'Yes':1, 'No':0})
df.head()
```
Python

4] EDA (Exploratory Data Analysis) :
Key insights found:
  a] Bar plot (Churn Distribution)

  b] Bar Plot (Churn rate by Payment Method)

  c] Box Plot (Monthly Charges by churn states)

```python
df['churn_flag'].value_counts().plot(kind='bar')
plt.title("Churn Distribution")
plt.show()

df.groupby('payment_method')['churn_flag'].mean().plot(kind='bar')
plt.title("Churn Rate by Payment Method")
plt.ylabel("Churn Rate")
plt.show()


df.boxplot(column='monthly_charges', by='churn_flag')
plt.title("Monthly Charges by Churn Status")
plt.suptitle('')
plt.xlabel("Churn Flag")
plt.ylabel("Monthly Charges")
plt.show()
```
Python

5] SQL Analysis :
SQL queries were created to extract important fraud insights.

  1]Churn by Contract type.

```
14      -- 3. Churn by Contract Type
15 •    SELECT
16          contract_type,
17          COUNT(*) AS total_customers,
18          SUM(CASE WHEN churn = 'Yes' THEN 1 ELSE 0 END) AS churn_count,
19          (SUM(CASE WHEN churn = 'Yes' THEN 1 ELSE 0 END) * 100.0) / COUNT(*) AS churn_rate
20      FROM cleaned_customer_churn_dataset
21      GROUP BY contract_type;
```

contract_type	total_customers	churn_count	churn_rate
Month-to-Month	289	76	26.29758
One Year	133	43	32.33083
Two Year	78	20	25.64103

2]Churn by payment method.

```
23      -- 4. Churn by Payment Method
24 •    SELECT
25          payment_method,
26          COUNT(*) AS total_customers,
27          SUM(CASE WHEN churn = 'Yes' THEN 1 ELSE 0 END) AS churn_count,
28          (SUM(CASE WHEN churn = 'Yes' THEN 1 ELSE 0 END) * 100.0) / COUNT(*) AS churn_rate
29      FROM cleaned_customer_churn_dataset
30      GROUP BY payment_method;
31
```

payment_method	total_customers	churn_count	churn_rate
Cash	122	40	32.78689
Credit Card	142	36	25.35211
Debit Card	113	35	30.97345
UPI	123	28	22.76423

3] Top 5 high churn segments.

```
32      -- 5. Top 5 High-Churn Segments
33 •    SELECT
34          customer_id,
35          monthly_charges,
36          tenure_months,
37          contract_type,
38          internet_service
39      FROM cleaned_customer_churn_dataset
40      WHERE churn = 'Yes'
41      ORDER BY monthly_charges DESC, tenure_months ASC
42      LIMIT 5;
```

customer_id	monthly_charges	tenure_months	contract_type	internet_service
174	1481.6	48	One Year	Fiber
137	1462.19	47	One Year	DSL
432	1460.55	37	Month-to-Month	DSL
330	1456.07	13	Month-to-Month	Fiber
306	1447.94	7	One Year	DSL

4] Average tenure of churned vs active customers.

```
56      -- 8. Average tenure of churned vs active customers.
57 •    SELECT churn, AVG(tenure_months) AS avg_tenure
58      FROM cleaned_customer_churn_dataset
59      GROUP BY churn;
60
```

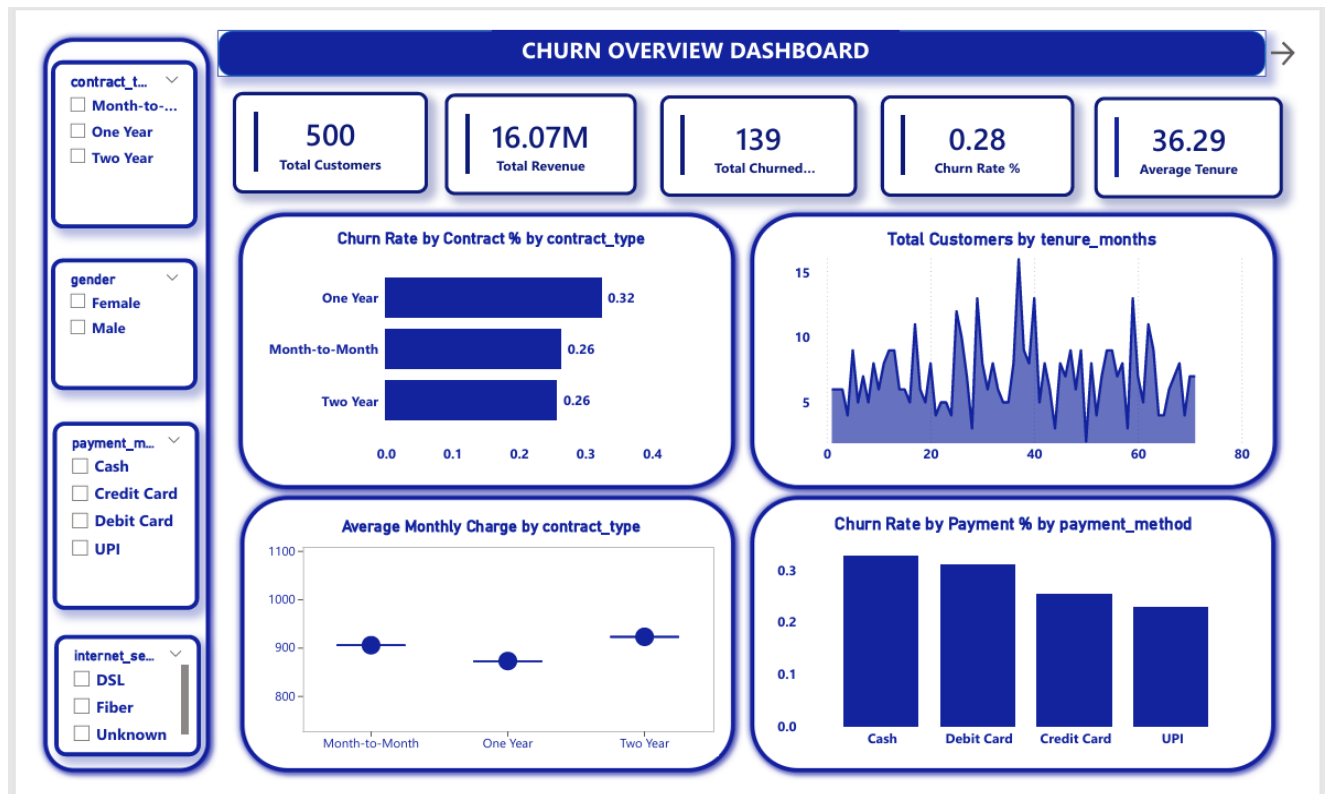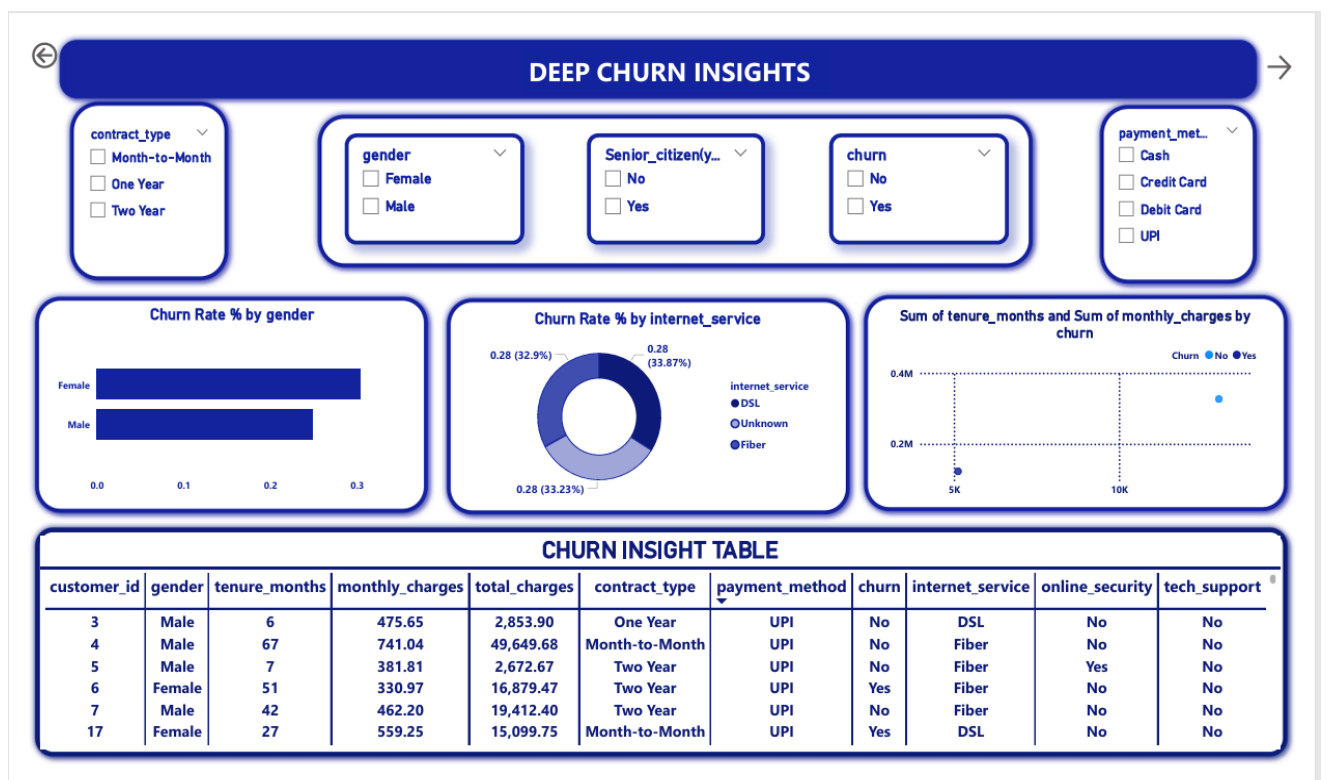| churn	avg_tenure
No	36.07202216066482
Yes	36.841726618705_04

And more…….

6] Power BI Dashboards :
The dashboard consists of three pages, each providing different levels of insights.

Page 1:Churn Overview Dashboard
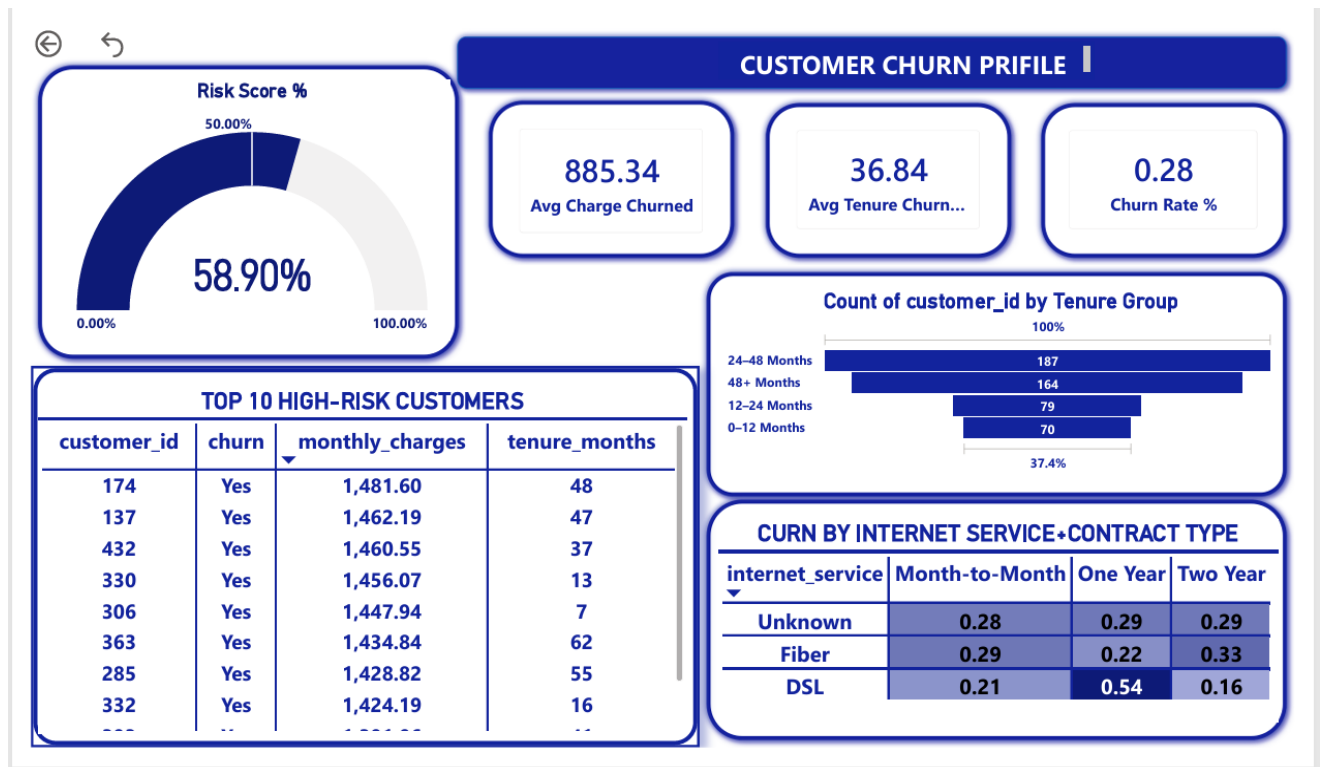**(KPIs cards + Charts + Filters)**

CHURN OVERVIEW DASHBOARD

500	16.07M	139	0.28	36.29
Total Customers	Total Revenue	Total Churned...	Churn Rate %	Average Tenure

Filters: contract_t... (Month-to-..., One Year, Two Year), gender (Female, Male), payment_m... (Cash, Credit Card, Debit Card, UPI), internet_se... (DSL, Fiber, Unknown)

Churn Rate by Contract % by contract_type
- One Year: 0.32
- Month-to-Month: 0.26
- Two Year: 0.26

Total Customers by tenure_months

Average Monthly Charge by contract_type

Churn Rate by Payment % by payment_method
- Cash, Debit Card, Credit Card, UPI

Page 2 : Deep Churn Insights:
(Filters ,Charts and Churn insight Table)

DEEP CHURN INSIGHTS

Filters: contract_type (Month-to-Month, One Year, Two Year), gender (Female, Male), Senior_citizen(y... (No, Yes), churn (No, Yes), payment_met... (Cash, Credit Card, Debit Card, UPI)

Churn Rate % by gender
- Female
- Male

Churn Rate % by internet_service
- 0.28 (32.9%)
- 0.28 (33.87%)
- 0.28 (33.23%)
- internet_service: DSL, Unknown, Fiber

Sum of tenure_months and Sum of monthly_charges by churn
- Churn: No, Yes

CHURN INSIGHT TABLE

customer_id	gender	tenure_months	monthly_charges	total_charges	contract_type	payment_method	churn	internet_service	online_security	tech_support
3	Male	6	475.65	2,853.90	One Year	UPI	No	DSL	No	No
4	Male	67	741.04	49,649.68	Month-to-Month	UPI	No	Fiber	No	No
5	Male	7	381.81	2,672.67	Two Year	UPI	No	Fiber	Yes	No
6	Female	51	330.97	16,879.47	Two Year	UPI	Yes	Fiber	No	No
7	Male	42	462.20	19,412.40	Two Year	UPI	No	Fiber	No	No
17	Female	27	559.25	15,099.75	Month-to-Month	UPI	Yes	DSL	No	No

Page 3 : Customer Churn Profile :
(Guage for Risk Score, Charts ,Tables, Cards)

CUSTOMER CHURN PRIFILE

Risk Score %

50.00%

58.90%

0.00%   100.00%

885.34	36.84	0.28
Avg Charge Churned	Avg Tenure Churn...	Churn Rate %

Count of customer_id by Tenure Group

100%

24–48 Months	187
48+ Months	164
12–24 Months	79
0–12 Months	70

37.4%

TOP 10 HIGH–RISK CUSTOMERS

customer_id	churn	monthly_charges	tenure_months
174	Yes	1,481.60	48
137	Yes	1,462.19	47
432	Yes	1,460.55	37
330	Yes	1,456.07	13
306	Yes	1,447.94	7
363	Yes	1,434.84	62
285	Yes	1,428.82	55
332	Yes	1,424.19	16

CURN BY INTERNET SERVICE+CONTRACT TYPE

internet_service	Month-to-Month	One Year	Two Year
Unknown	0.28	0.29	0.29
Fiber	0.29	0.22	0.33
DSL	0.21	0.54	0.16

7] Key Insights :

1] Month-to-Month contract customers churn the most

- **Churn rate for Month-to-Month customers is 0.32, the highest among all contract types.**

- **One-year and Two-year contracts have significantly lower churn (~0.26).**

2] Fiber Internet users show higher churn risk

- **"Churn by Internet Service" graph shows Fiber customers have the highest churn %.**

- **DSL and Unknown categories churn much less.**

3] Customers paying via UPI and Debit Card churn more

- **UPI/Debit payment categories linked with higher churn.**

- **Credit Card customers churn the least.**

4] Low-tenure customers (0–12 months) have the highest churn

- **70 customers in 0–12 months segment — largest churn-prone segment.**

- **Customers with 24–48 months and 48+ months tenure churn very little.**

5] High monthly charges contribute to churn

- **Top 10 high-risk customers all have very high monthly charges (₹1400–1500).**

- **Average charge of churned customers is ₹885.34 — much higher than average paying customer.**

8] CONCLUSION :
churn is driven by contract flexibility, billing behavior, tenure, and service type. Month-to-month customers who pay via UPI and have high monthly charges—especially Fiber users—are the most likely to churn.

A focused retention strategy on these segments can significantly reduce churn and protect revenue.

9] Business Recommendations:

--- **Improve Fiber Internet service experience**

--- **Promote auto-pay using Credit Cards / Bank Transfers**

--- **Target 0–12 month customers with onboarding & support**

--- **Special offers for high-charge customers.**

--- **Build a Churn Alert System (Optional Next Step)**

10] Deliverables

- *Clean dataset*
- *Python preprocessing code*
- *SQL queries*
- *Power BI dashboard (.pbix)*
- *PDF dashboard*
- *Full project report (this document)*