Project Objective: Predict which customers are likely to churn (stop using the service) and send real-time alerts to the business team.

Key features like:

1. Data Collection
2. Exploratory Data Analysis (EDA)
3. Feature Engineering
4. Model Training
5. Model Deployment with FastAPI
6. Real-Time Dashboard (Streamlit)

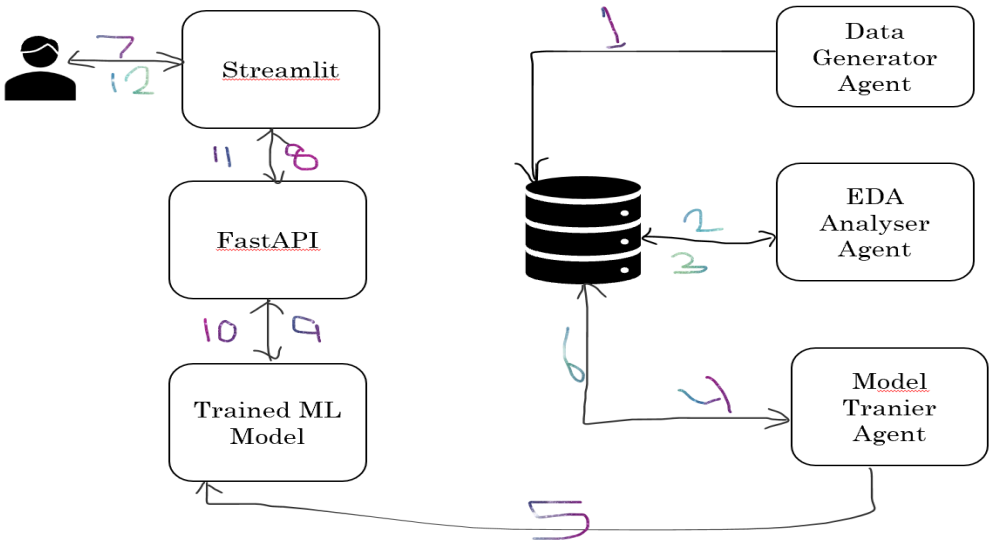
Used Tools & Technologies in Project:

1. Python (main language)
2. Pandas, NumPy, scikit-learn
3. Seaborn, Matplotlib (for EDA/visualizations)
4. Streamlit (interactive dashboard)
5. FastAPI (serve/expose the ML model)

****You can enhance for production grade deployment integrate below features also**

6. Twilio or SMTP (Gmail) (to send SMS/email alerts)
7. Excel/CSV/Database (to store results)

Project architecture:

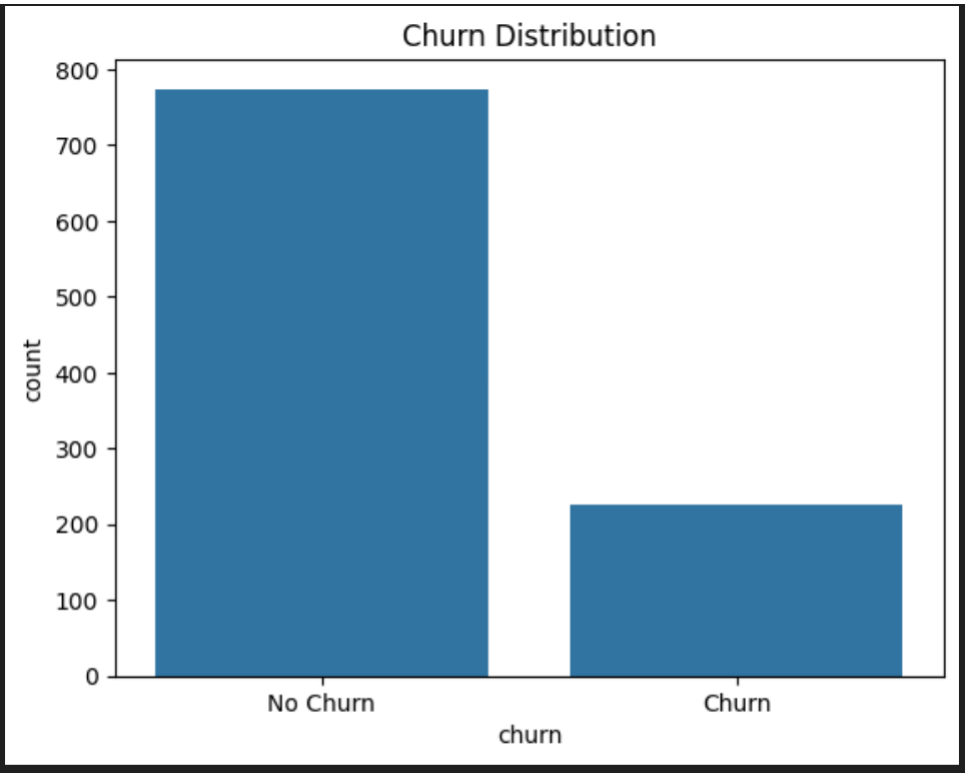


A. Generate The Training Data as below format using NumPy and pandas

	customer_id	tenure	monthly_charges	contract_type	support_calls	payment_method	churn
0	CUST0000	52	105.57	One year	2	Electronic check	1
1	CUST0001	15	103.02	One year	1	Mailed check	0
2	CUST0002	61	59.72	Two year	1	Mailed check	0
3	CUST0003	21	86.81	Month-to-month	0	Bank transfer	0
4	CUST0004	24	40.50	One year	3	Mailed check	0

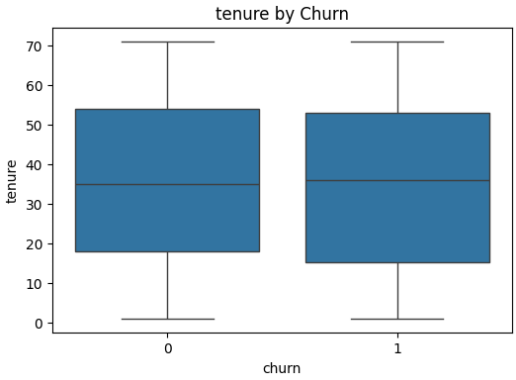
B. Exploratory Data Analysis (EDA): Identify trends in churned vs. retained customers. Visualize correlation between churn and other features.

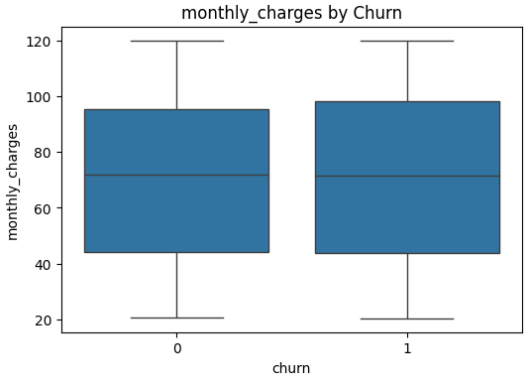
1. Churn Distribution (Churn, No-Churn)

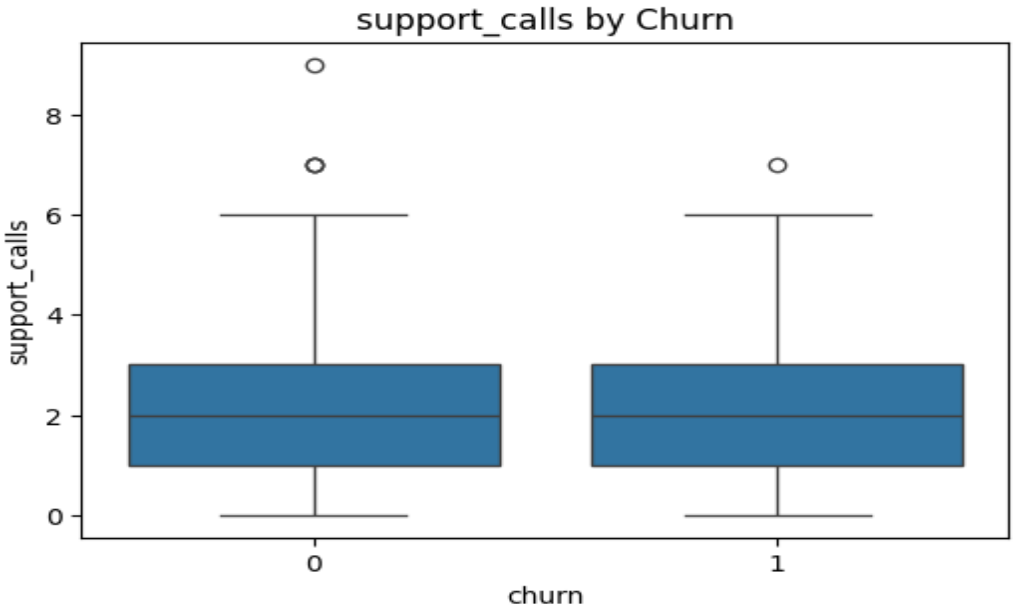



```
churn
0    0.774
1    0.226
Name: proportion, dtype: float64
```

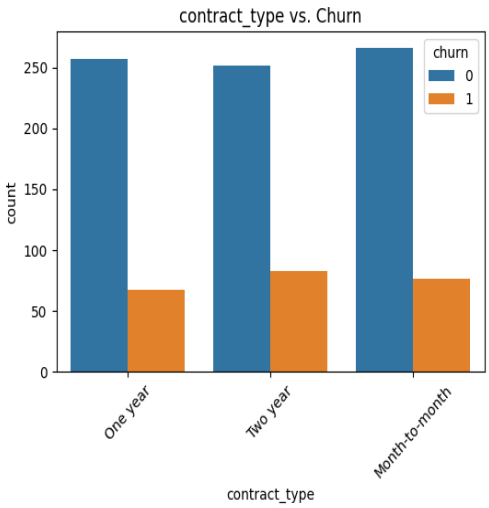
2. Numerical Features vs. Churn based on ('tenure', 'monthly_charges', 'support_calls')

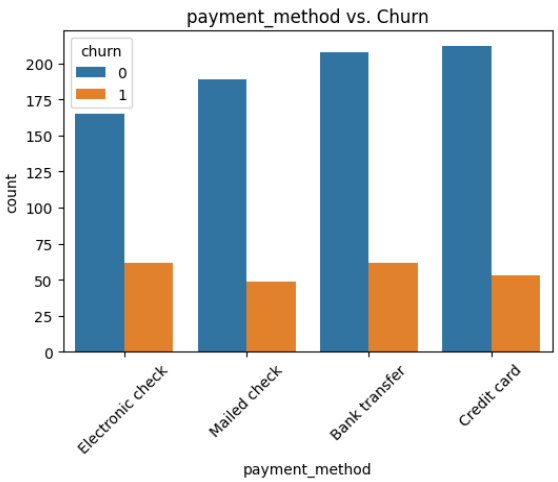






3. Categorical Features vs. Churn by ('contract_type', 'payment_method')





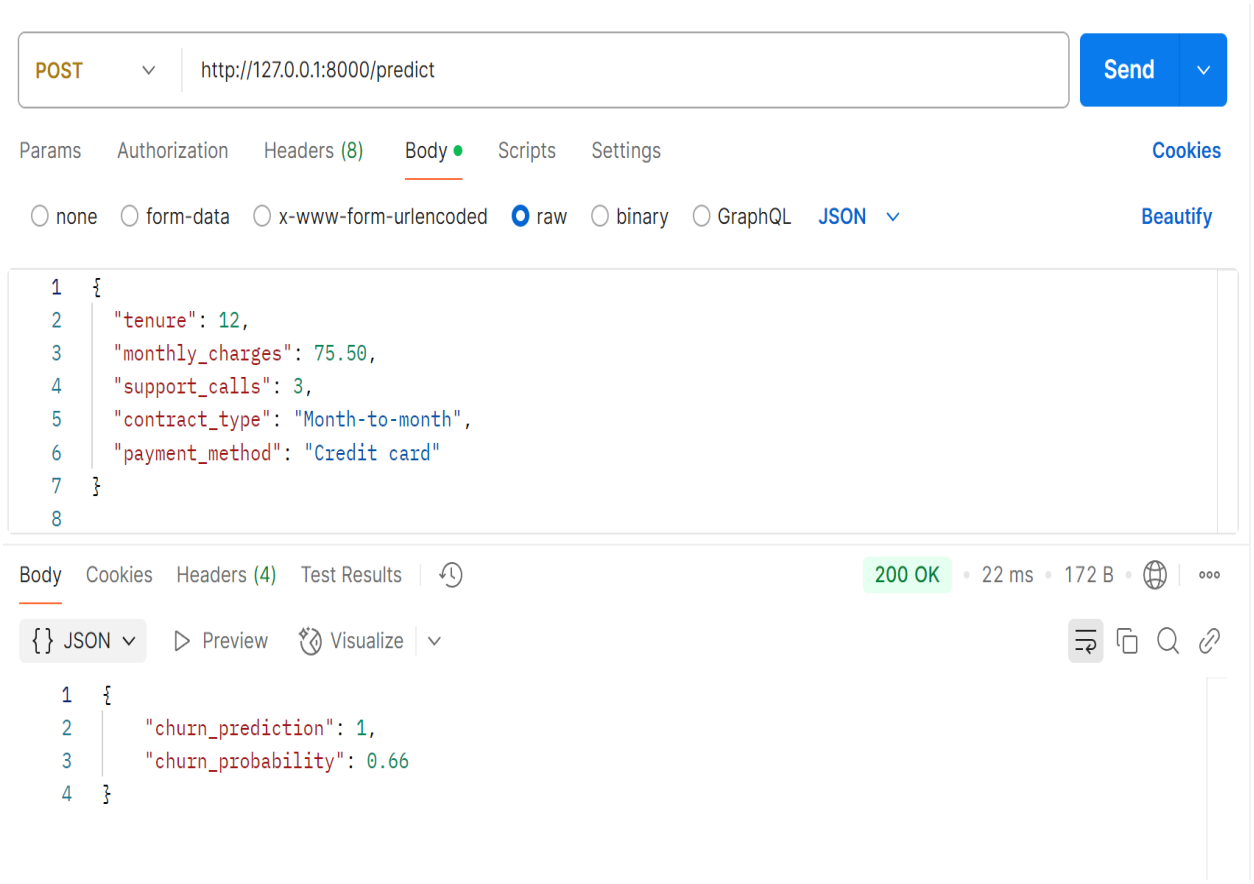
C. Feature Encoding + Model Training (RandomForestClassifier) based on above customer data. Model accuracy is greater than 70%.

```
              precision    recall  f1-score   support

           0       0.78      0.96      0.86       158
           1       0.00      0.00      0.00        42

    accuracy                           0.76       200
   macro avg       0.39      0.48      0.43       200
weighted avg       0.62      0.76      0.68       200
```

D. After Model Training expose the FastAPI for for churn prediction, return churn probability



E. Real-Time Dashboard (Streamlit) Upload or simulate real-time customer activity.
Display: Churn predictions
Filters: contract type, region, tenure
Alert status