# Customer Churn Prediction – Business Report

## Summary

This project aims to predict customer churn using historical data and provide data-driven strategies to reduce attrition. By combining SQL for data handling and Python for modeling, we developed a churn prediction solution that can support proactive customer retention initiatives.

## Objective

To identify customers at high risk of churning and recommend actionable steps to improve customer retention and satisfaction.

## Tools & Technologies

* SQL: Data extraction, filtering, and joins across multiple tables
* Python: Data cleaning, visualization, and machine learning
* Libraries: Pandas, Seaborn, Scikit-learn
* Platform: Jupyter Notebook

## Data Overview

* Total Customers Analyzed: 7,043
* Churn Rate: Approximately 26%
* Key Features:  
   - Customer Tenure  
   - Contract Type (Month-to-Month, One-Year, Two-Year)  
   - Monthly Charges  
   - Tech Support and Online Security Usage  
   - Payment Method

## Approach

### Data Acquisition & Preparation

* Used SQL to extract customer demographics, service usage, and billing history.
* Conducted data cleaning and transformation in Python, including handling missing values and encoding categorical variables.

### Exploratory Data Analysis (EDA)

* Used SQL aggregations and Python visualizations to uncover patterns in churn behavior.
* Segmented customers by tenure, contract type, and additional service usage.

### Model Development

* Built a Random Forest Classifier to predict churn.
* Used stratified sampling to ensure class balance.
* Evaluated model performance with accuracy, precision, recall, and AUC metrics.

## Model Performance

|  |  |
| --- | --- |
| Metric | Value |
| Accuracy | 79% |
| Precision | 74% |
| Recall | 66% |
| AUC Score | 83% |

## Key Insights

* Short Tenure = High Risk: Customers with less than 12 months of tenure are more likely to churn.
* Contract Type Matters: Month-to-month customers have a significantly higher churn rate than those on long-term contracts.
* Service Usage Impacts Loyalty: Customers using Tech Support or Online Security are more likely to stay.
* High Bills Contribute to Churn: Customers with high monthly charges are more inclined to leave, particularly if they’re not on bundled plans.

## Business Recommendations

1. Implement Loyalty Programs: Incentivize long-term engagement for new or month-to-month customers.  
2. Promote Value-Added Services: Upsell Tech Support and Online Security to increase retention.  
3. Encourage Long-Term Contracts: Provide discounts or perks for committing to one- or two-year plans.  
4. Deploy Targeted Retention Campaigns: Use model outputs to identify high-risk segments and offer personalized offers or check-ins.  
5. Streamline Payment Options: Promote auto-pay and electronic billing to reduce friction and improve renewal rates.

## Deliverables

* Cleaned and merged customer dataset
* Trained machine learning model
* Churn risk segmentation report
* Strategic recommendations based on analytical insights
* Visualizations highlighting churn drivers

## Business Impact

Implementing the recommendations from this analysis can reduce churn, increase customer lifetime value, and improve operational efficiency. By identifying at-risk customers early, businesses can take targeted actions to retain them and build longer-lasting relationships.