

Overview: Customer Churn Analysis Prediction

Skills: Power BI, SQL Server & Machine Learning

Objective:

The objective of this project was to analyze customer churn using **SQL Server, Power BI, and machine learning** to help a telecom company identify at-risk customers, understand the reasons behind churn, and implement retention strategies. The insights enabled data-driven decision-making for improving customer satisfaction, optimizing revenue, and reducing attrition.

Key Steps:

Data Collection and Preparation:

- **Source Identification:** Gathered customer data from CSV files, including demographics, service usage, billing information, tenure, and churn status.
 - **Database Creation:** Designed a structured database in SQL Server (db_Churn) to store and process customer data efficiently.
 - **Data Import & Cleaning:** Imported data into SQL Server using **SQL Server Management Studio (SSMS)**. Performed missing value imputation using ISNULL(), standardized categorical values, and removed inconsistencies in contract types and payment methods. Data was aggregated to generate key metrics such as average tenure and service usage distribution.
 - **Final Data Preparation:** Transferred cleaned data into a production table (prod_Churn) and created SQL views (vw_ChurnData, vw_JoinData) for seamless integration with Power BI for visualization.
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Data Transformation and Analysis:

- **Feature Engineering in Power BI:** Created calculated columns to facilitate analysis. Transformed churn labels into binary values (1 = Churned, 0 = Active). Grouped customers based on monthly charges (<20, 20-50, 50-100, >100), age brackets (<20, 20-35, 36-50, >50), and tenure categories (<6 months, 6-12 months, 1-2 years, 2+ years).
 - **Churn Insights & Key Findings:**
 - **Customer Segmentation:** Identified high-risk customers based on factors such as contract type, payment method, and monthly charges.
 - **Key Metrics Computed:** Analyzed total customer count, churn rate, new customer acquisition trends, and revenue impact due to lost customers.
 - **Predictive Modeling:** Implemented a **Logistic Regression** model to predict churn probability using variables such as **tenure, contract type, payment method, and monthly charges**. Evaluated model performance using precision, recall, and F1-score metrics.
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Power BI Dashboard Development:

- **Visualized Key Metrics:** Designed interactive reports displaying churn trends, revenue impact, and demographic-based churn patterns. Analyzed the relationship between service usage and attrition rates.
 - **Filters & Interactivity:** Integrated drill-through and filtering options for exploring churn trends based on contract type, payment method, and customer tenure. Enabled date slicers for real-time churn trend analysis.
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Key Techniques and Tools:

Techniques:

- **ETL & Data Processing:** Structured data transformation in SQL Server for optimized querying and reporting.
- **Data Visualization:** Power BI dashboards for interactive insights.
- **Machine Learning:** Logistic Regression for churn prediction.
- **Feature Engineering:** Categorical encoding, numerical transformation, and segmentation.

Tools and Libraries:

- **SQL Server:** Used for database management, data cleaning, and querying.
 - **Power BI:** Designed dashboards and interactive reports for churn analysis.
 - **Python (for ML):** Leveraged Pandas, NumPy, and Scikit-learn for predictive modeling.
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Output:

- **Churn Risk Analysis:** Identified customer segments with high churn risk, aiding targeted retention strategies.
 - **Revenue Forecasting:** Estimated revenue loss due to churn, allowing proactive business planning.
 - **Customer Segmentation Reports:** Provided insights on demographic and service-based churn patterns.
 - **Predictive Model Results:** Delivered an interpretable churn prediction model for proactive decision-making.
 - **Power BI Dashboard:** Developed a real-time churn monitoring system for data-driven customer engagement strategies.
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Business Impact:

- Enabled targeted retention efforts by identifying high-risk customers based on data-driven insights.
 - Optimized revenue by forecasting churn-related financial impact and implementing corrective actions.
 - Empowered marketing teams with customer behavior insights to personalize retention campaigns.
 - Provided a scalable and adaptable approach applicable across various industries, including retail, banking, and healthcare.
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Conclusion:

This project demonstrated how **SQL Server, Power BI, and machine learning** can be leveraged to understand churn patterns, predict customer behavior, and drive strategic decisions. The integration of advanced analytics and visualization enhanced customer retention strategies, ensuring long-term business growth.
