

Telecom Churn Analysis

1. Dataset Overview

- The dataset includes customer details for a telecom company, with features such as:
 - Customer demographic information (e.g., age, gender, tenure).
 - Service details (e.g., type of internet service, phone service).
 - Payment and contract details
 - Churn information as the target variable (indicates if a customer has left the service).

2. Exploratory Data Analysis (EDA)

- **Churn Rate:** Approximately X% of customers in the dataset has churned.
- **Key Variables Affecting Churn:**
 - Higher churn rates are observed among customers with short tenure.
 - Customers on month-to-month contracts are more likely to churn.
 - Higher monthly charges are associated with increased churn.
 - Fiber optic internet service users show higher churn rates compared to DSL users.
- **Correlation Analysis:**
 - Monthly charges and tenure are negatively correlated with churn likelihood.
 - Strong correlations observed between service features and churn.

3. Data Preprocessing

- **Handling Missing Values:** Techniques used for imputing missing data.
- **Encoding:** Categorical variables are one-hot encoded for model compatibility.
- **Scaling:** Numerical features are normalized or standardized for better performance in model training.

4. Model Building and Evaluation

- **Models evaluated include:**
 - Logistic Regression
 - Decision Trees
 - Random Forest
 - Gradient Boosting (e.g., XGBoost)
- **Performance Metrics:**
 - Accuracy, Precision, Recall, and F1-Score were calculated for each model.
 - Best model identified: [Model Name] with an F1-Score of approximately [Score].
- **Feature Importance:**
 - The most significant predictors of churn include:
 - Monthly Charges
 - Tenure
 - Contract Type
 - Internet Service Type

5. Recommendations

- Offer incentives to customers with month-to-month contracts to switch to longer-term contracts.
- Develop loyalty programs targeting customers with short tenure.
- Monitor and address issues related to high charges for fiber optic users.

Visualization of specific results.

1. Churn Rate

- **Visualization:** Bar chart or pie chart showing the proportion of churned vs. retained customers.
- **Purpose:** Highlights the overall churn rate in the dataset.

2. Churn by Contract Type

- **Visualization:** Grouped bar chart comparing churn rates across different contract types (e.g., month-to-month, one-year, two-year contracts).
- **Purpose:** Shows the impact of contract type on churn likelihood.

3. Monthly Charges and Churn

- **Visualization:** Box plot comparing monthly charges for churned vs. non-churned customers.
- **Purpose:** Illustrates how higher charges correlate with churn.

4. Tenure and Churn

- **Visualization:** Histogram or KDE plot showing the distribution of tenure for churned vs. non-churned customers.
- **Purpose:** Demonstrates that short tenure is associated with higher churn rates.

5. Feature Importance

- **Visualization:** Horizontal bar chart displaying the feature importance scores from the best-performing model (e.g., Random Forest or Gradient Boosting).
- **Purpose:** Highlights the most significant predictors of churn.

6. Model Performance

- **Visualization:**
 - Confusion matrix for the best model.
 - Bar chart showing precision, recall, F1-Score, and accuracy for different models.
- **Purpose:** Compares model performance and explains the final model's evaluation metrics.

Summary of Telecom Churn Analysis

- **Objective:** To identify key factors influencing customer churn and provide actionable insights to reduce churn rates.
- **Dataset Highlights:**
 - Includes demographic, service usage, and payment information for telecom customers.
 - Churn rate: Approximately **X%** of customers left the service.
- **Key Insights:**
 1. **Customer Contracts:**
 - Month-to-month contracts have significantly higher churn rates compared to one- and two-year contracts.
 2. **Monthly Charges:**
 - Customers with higher monthly charges are more likely to churn.
 3. **Tenure:**
 - Customers with shorter tenures (less than 12 months) exhibit higher churn rates.
 4. **Service Type:**
 - Fiber optic internet users show higher churn compared to DSL users.
 5. **Payment Methods:**
 - Electronic check payment method is strongly associated with higher churn.
- **Modeling Results:**
 - The best-performing model achieved an **F1-score of [Score]**, with high precision and recall.
 - Key predictors include **Monthly Charges, Tenure, Contract Type, and Internet Service Type.**

Recommendations

1. **Improve Contract Retention:**
 - Encourage customers with month-to-month contracts to switch to annual contracts through discounts or additional perks.
2. **Loyalty Programs:**
 - Develop loyalty rewards for customers in their early months (0–12 months) to increase retention.
3. **Pricing Strategy:**
 - Review and optimize pricing for high-risk customer segments, particularly those using fiber optic internet services.
4. **Customer Support:**
 - Identify and proactively engage customers using the electronic check payment method to address concerns.
5. **Predictive Monitoring:**
 - Use the churn prediction model to flag high-risk customers and implement targeted retention strategies.

