FINAL REPORT

TASK 3: Customer Churn Analysis

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- **Reporting and Insights:**
  - **Model performance:**
    - **Model 1(Random Forest): Accuracy: 0.8013**
    - **Classification Report:**
      - **False Class (Churn = No):**
      - Precision: 0.83
      - Recall: 0.92
      - F1-score: 0.87
      - **True Class (Churn = Yes):**
      - Precision: 0.69
      - Recall: 0.46
      - F1-score: 0.55
      - **Overall:**
      - Accuracy: 0.80
      - Macro Average F1-score: 0.71
      - Weighted Average F1-score: 0.79
    - **Model 2(Logistic Regression): Accuracy: 0.79**
    - **Classification Report:**
      - **False Class (Churn = No):**
      - Precision: 0.79
      - Recall: 0.96
      - F1-score: 0.87
      - **True Class (Churn = Yes):**
      - Precision: 0.72
      - Recall: 0.31
      - F1-score: 0.44
      - **Overall:**
      - Accuracy: 0.79
      - Macro Average F1-score: 0.65
      - Weighted Average F1-score: 0.75
    - **Confusion Matrix:**
      - **[[957 79]**
        [201 172]]
        # True Negative (TN), False Positive (FP)
        # False Negative (FN), True Positive (TP)

- **Conclusion:**
  - Model 1 has slightly better accuracy (0.8013 vs. 0.79).
  - Model 1 performs better in identifying customers who will churn, which is critical for predicting customer churn.
  - Model 2 has a slightly better precision for the True class, but it comes at the cost of lower recall.
  - Model 1 has a higher F1-score for Churn prediction, meaning it strikes a better balance between precision and recall.
  - Both models have similar precision and recall values for the False class (0.83 vs. 0.79 precision and 0.92 vs. 0.96 recall). This means both models are very effective at identifying non-churn customers.
  - Model 1 has higher macro (0.71 vs. 0.65) and weighted (0.79 vs. 0.75) average F1-scores, indicating a better balance in performance across both classes.
- **Key factors for churn prediction:**
  - **Contract Type:** Customers on month-to-month contracts are more likely to churn compared to those on one- or two-year contracts. This suggests that long-term commitment reduces churn.
  - **Tenure:** A shorter tenure (how long the customer has been with the company) is a strong predictor of churn. Customers who have been with the company for less time are more likely to leave.
  - **Monthly Charges:** Higher monthly charges correlate with higher churn. Customers with higher bills may be more sensitive to price and therefore more likely to leave.
  - **Payment Method**: Customers paying through methods like electronic checks or mailed checks are more likely to churn compared to those who use automatic payments like credit cards.
  - These insights provide actionable steps to improve customer retention, such as targeting customers on month-to-month contracts or offering discounts to those with high monthly charges.