

## **10.) Coclusions:**

**Model Performance:** Logistic Regression performed reasonably well in terms of accuracy (85.46%) but struggled with recall (13.4%), meaning it missed a large portion of the actual churn cases. This indicates the model's difficulty in identifying churners, which is critical in a customer retention context. Decision Tree showed superior performance in terms of recall and precision, though it had some limitations regarding generalization (tendency to overfit), suggesting that while it performs well on training data, its ability to generalize to unseen data could be improved.

**Key Features:** The most important features influencing customer churn are Customer Service Calls and International Plan. These features are strongly correlated with churn, indicating that customers who interact more with customer service or have international plans are more likely to churn. Feature Engineering improvements, such as creating interaction terms or new derived features, could help improve model performance further.

**Class Imbalance:** Both models were impacted by class imbalance, where the number of churn cases is much lower than non-churn cases. While SMOTE (Synthetic Minority Over-sampling Technique) was applied to balance the data, it's clear that better handling of this imbalance is critical to improving recall.

**Model Interpretability:** Decision Trees offer better interpretability with clear insights into which features contribute most to the prediction. This is important for understanding customer behavior and informing business decisions, especially in churn prediction.