

# Title: Random Forest Model Performance Analysis

Subtitle: Evaluating Model Effectiveness for Classification

## ➤ ISSUE / PROBLEM

The objective of this project was to evaluate the effectiveness of a **Random Forest** model in classifying customer satisfaction levels. The problem stemmed from the need to improve predictive accuracy over a Decision Tree model while maintaining balance in precision and recall.

## ➤ IMPACT

- Implementing the tuned Random Forest model could significantly improve decision-making in customer satisfaction analysis.
- With an accuracy exceeding 94.2% and precision surpassing 95%, this model provides a robust framework for organizations to better understand customer sentiment.
- By reducing misclassification errors, businesses can enhance customer experience and optimize resource allocation.

## ➤ RESPONSE

- A Random Forest model was developed, tuned, and compared against a Decision Tree model with optimized hyperparameters. The analysis involved essential steps such as data exploration, cleaning, encoding, and validation.
- The performance metrics, including accuracy, precision, recall, and F1 score, were carefully analyzed to determine the best model for classification tasks.

## ➤ KEY INSIGHTS

- The Random Forest model outperformed the Decision Tree model across multiple performance metrics, including accuracy, recall, and F1 score.
- F1 score is a better measure than simple accuracy in cases where the cost of false positives and false negatives differs significantly.
- A separate validation set was used for hyperparameter tuning, preventing bias in the model evaluation.
- The final model demonstrated strong generalization capabilities and robustness, making it a preferred choice for predictive analytics in customer satisfaction classification

