



# Airline Passenger Satisfaction Analysis: Enhancing Customer Experience

This project delves into analyzing airline passenger satisfaction by exploring various features that contribute to overall satisfaction levels. Through advanced data analysis and machine learning, we aim to understand key influencing factors and build predictive models to enhance airline services and passenger experiences.

# Project Workflow: From Data to Insight

Our comprehensive analysis of airline passenger satisfaction is structured into two distinct, yet interconnected, notebooks. Each notebook addresses critical stages of the data analysis and modeling process, ensuring a robust and insightful outcome.

## Dataset Overview

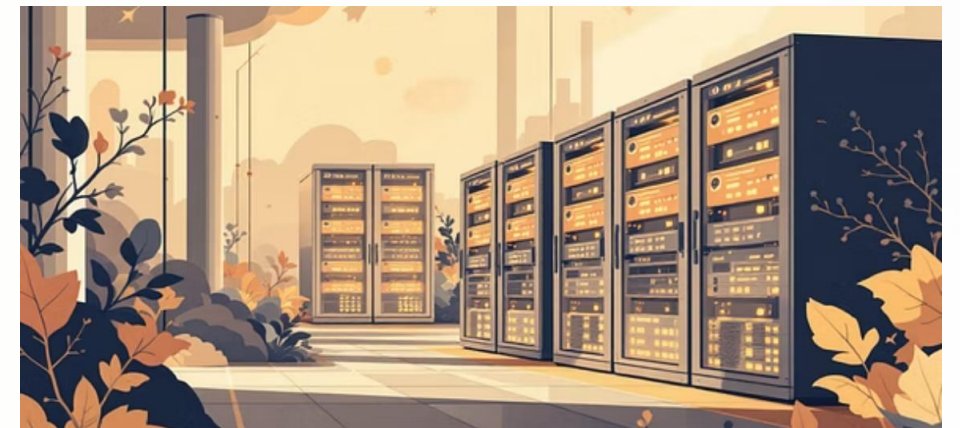
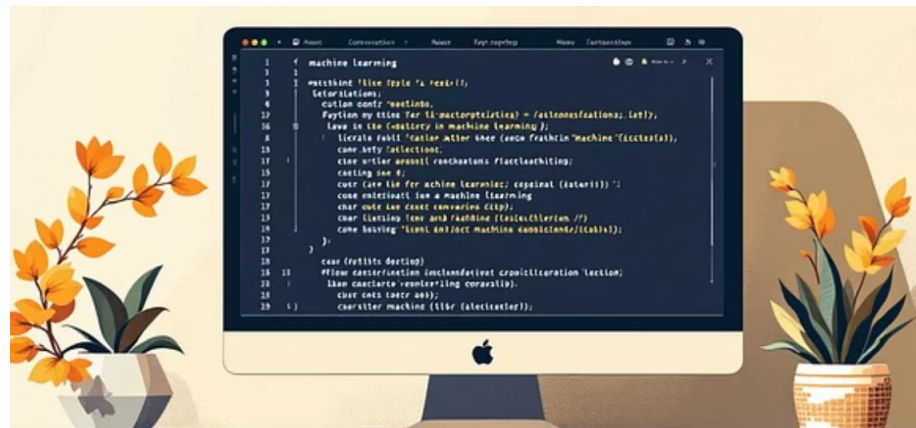
The dataset provides rich feedback on service quality, comfort, and amenities, offering both numerical and categorical features for thorough exploration.

## Notebook 2: Modeling & Evaluation

The second notebook covers model development, hyperparameter tuning, feature selection using SHAP values, and comprehensive model evaluation.

## Notebook 1: EDA & Preprocessing

This initial phase focuses on exploratory data analysis, data cleaning, handling missing values, outlier detection, feature engineering, and data scaling.



# Deep Dive: Modeling and Evaluation for Predictive Insights

In the second crucial phase of our project, we transition from data preparation to developing and evaluating predictive models. This stage is dedicated to transforming processed data into actionable insights for enhancing airline customer satisfaction.



## Load Libraries & Data

Importing essential libraries and the preprocessed dataset is the first step, setting the stage for advanced modeling tasks.



## Baseline Model Evaluation

We begin by evaluating various models to establish a performance baseline, providing a benchmark for subsequent optimized models.



## Hyperparameter Tuning

Utilizing Optuna, we fine-tune hyperparameters for LightGBM, CatBoost, and XGBoost models to maximize predictive accuracy and efficiency.



## Feature Selection with SHAP

SHAP values are employed to identify and select the most impactful features, ensuring our models focus on the most relevant data points.

## Final Model Evaluation

We meticulously compare models built with full features versus those leveraging SHAP-selected features. This allows us to assess the effectiveness of feature reduction and identify the most robust model for predicting passenger satisfaction. Predictions are then generated on the test set, culminating in the calculation of comprehensive evaluation metrics to gauge real-world performance.

The ultimate goal is to deliver actionable insights and a robust predictive model that can significantly improve airline services and passenger experiences.

