# Predicting Purchase Intent for Airline Bookings

**Machine Learning Driven Insights for Business Growth**

- This project aims to predict which customers are likely to complete their airline booking using historical booking data. By leveraging machine learning, we can improve marketing strategies, increase conversions, and optimize resource allocation.

**Patterns That Drive Purchase Intent**

- Early bookings (> 60 days before travel) show higher conversion rates.
- Certain origins, such as Malaysia and Australia, have stronger purchase intent.
- Customers requesting in-flight meals or preferred seating are more likely to complete bookings.

**Our Machine Learning Approach**

- Algorithm: Random Forest Classifier selected for its ability to handle mixed data types and interpret results via feature importance.
- Data Split: 80% training / 20% testing.
- Validation: Cross-validation to ensure stability of results.
- ML workflow diagram (Train → Predict → Evaluate)

**Most Influential Factors in Purchase Prediction**

- Top three drivers of purchase intent:
- **Purchase Lead:** Early planners are more likely to book.
- **Flight Hour:** Specific departure times correlate with higher conversions.
- **Length of Stay:** Certain stay durations boost purchase likelihood.

**Top 10 Feature Importance bar chart from the code output.**

The chart shows that how early a customer books, flight timing, and trip length are the biggest drivers of bookings, along with some passenger preferences and origin countries
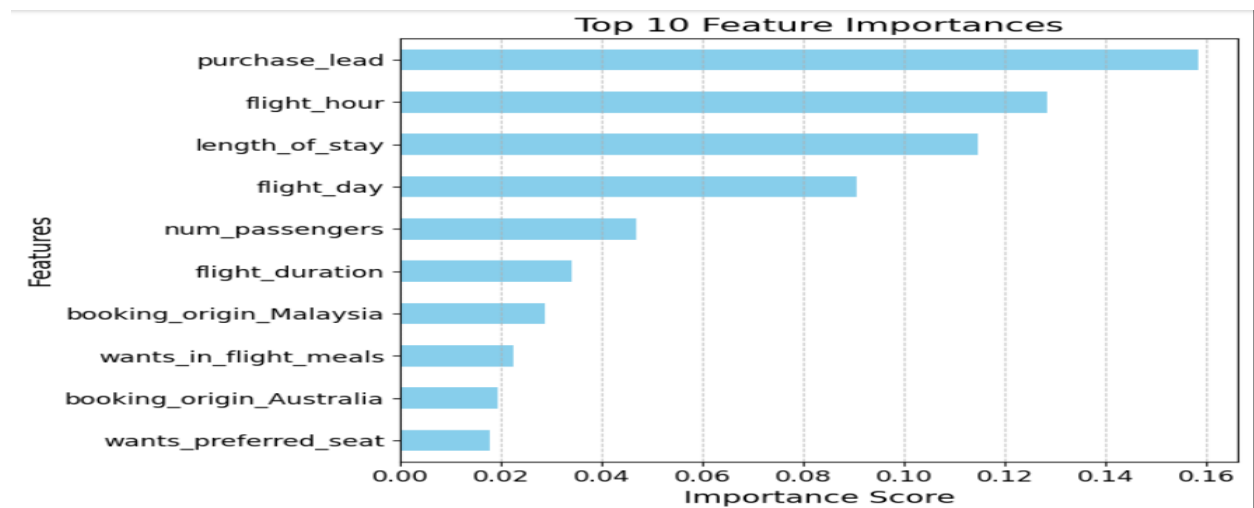
**Model Performance**

- **Accuracy**: 85.3%
- High precision for "no purchase" predictions; recall for "purchase" needs improvement.
- Opportunity to rebalance data to better capture purchase cases.

```
✅  Model Accuracy: 85.41 %

Classification Report:
              precision      recall    f1-score     support

           0       0.86        0.98        0.92        8520
           1       0.54        0.11        0.18        1480

    accuracy                               0.85       10000
   macro avg       0.70        0.55        0.55       10000
weighted avg       0.82        0.85        0.81       10000
```

**Turning Data into Action**

- Focus marketing on customers from high-conversion origins.
- Encourage early bookings with promotions.
- Bundle seat and meal preferences into offers to increase purchase rates.

**Building on Success**

- Improve purchase recall through data balancing techniques (e.g., SMOTE).
- Deploy model for real-time scoring in the booking platform.
- Test personalized marketing campaigns based on predictive insights.