Hotel Breakfast Budgeting

USING MACHINE LEARNING

Presented by

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Introduction

Portugal is a top tourist destination, offering a unique combination of fascinating history, beautiful scenery, and lively culture. The capital city, Lisbon, is particularly appealing to visitors. It's known for its stunning views and distinctive appearance, featuring colorful buildings decorated with ceramic tiles, impressive monuments from various periods, hills throughout the city that offer spectacular panoramic views.

By 2029, Portugal's thriving tourism sector is set to experience a significant boost, with online sales projected to drive a remarkable 69% increase in total revenue within the Travel & Tourism market. At the forefront of this growth, the Hotels market is poised to emerge as the industry leader, anticipating an impressive user base of 4.46 million by the same year.

Hotel Competitive Advantages

Competitive advantage is vital in the hotel industry as it allows businesses to stand out in a crowded market. It enables hotels to attract and retain guests, command higher prices, and increase profitability. Whether through unique services, superior amenities, or exceptional experiences, a strong competitive edge helps hotels thrive in an increasingly competitive and global hospitality landscape.

1. LOCATION   31%

Location, accounting for 31% of booking decisions, is the primary factor in hotel selection. Accessible and strategic sites significantly increase a hotel's booking potential.

2. RATINGS AND REVIEWS   29%

Customer reviews and ratings, accounting for 29% of booking decisions, are the second most influential factor in hotel selection.

3. PRICE   24%

Price is the third most significant factor in hotel bookings, accounting for 24% of cooking. Overpricing deters bookings while underpricing may raise concerns on revenue.

4. CUSTOMER EXPERIENCE   23%

Customer experience, accounting 23% of booking decisions, plays a crucial role in ratings and reviews. This indirect influence driving future bookings and overall hotel success.
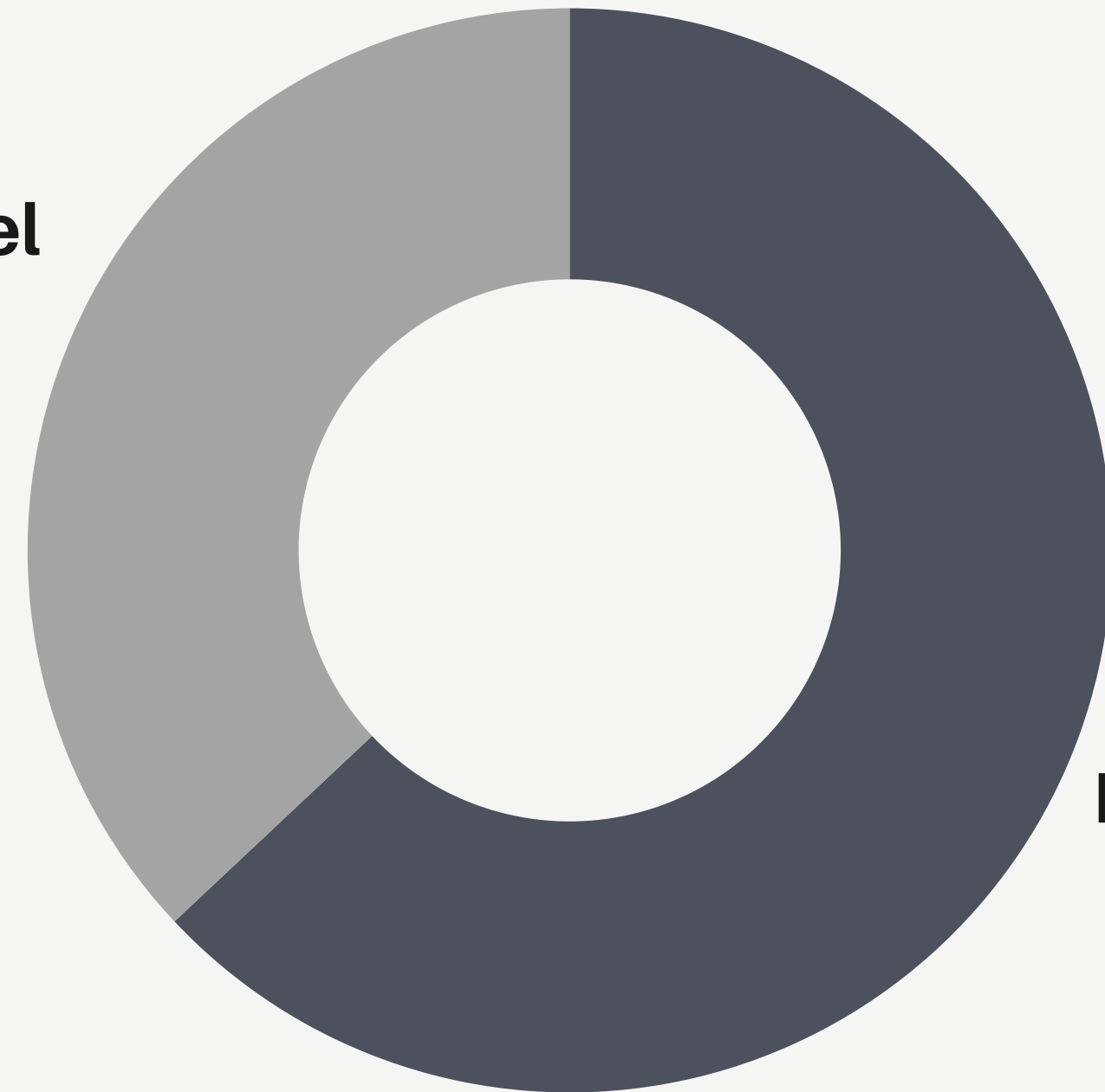
Current Business Analysis

Cancellation Rate Analysis

The pie chart indicates a high rate of booking cancellations, which poses significant challenges for hotels' budgeting and resource allocation. For instance, hotels prepare rooms and allocate resources for guests who subsequently cancel their reservations, it results in unnecessary expenses. This situation leads to wasted expenditures and ultimately reduces revenue.

Cancel 37%
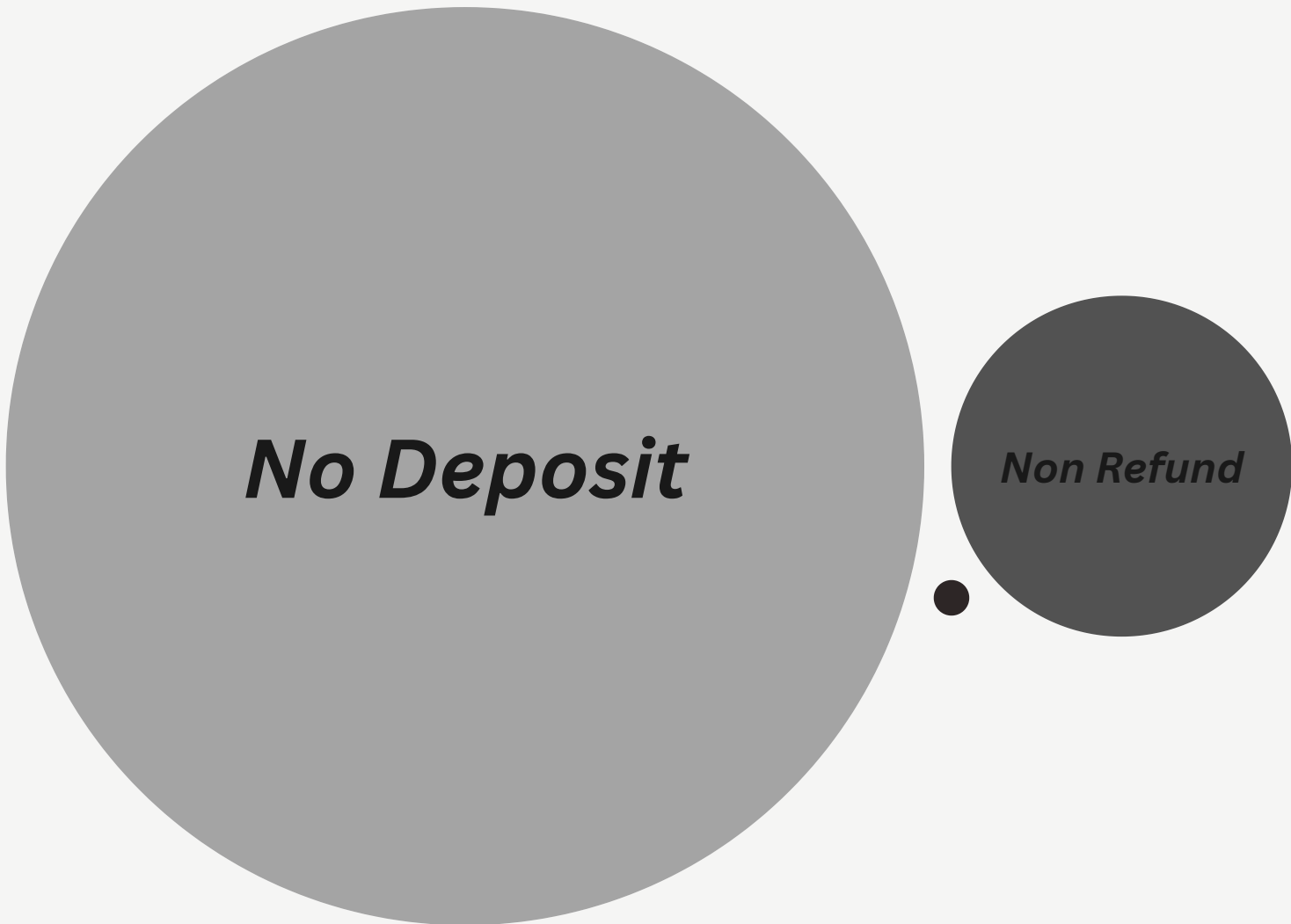
Proceed 63%

Current Business Analysis

Most hotel bookings are made without deposits, creating challenges for management due to high cancellation rates. This practice increases the risk of incurring costs for unrealized bookings, potentially leading to wasted expenses.

Demographic data shows Portuguese guests dominate, followed by British visitors. However, a diverse international customers collectively represents over 20,000 guests, making them the second largest.

No Deposit

Non Refund
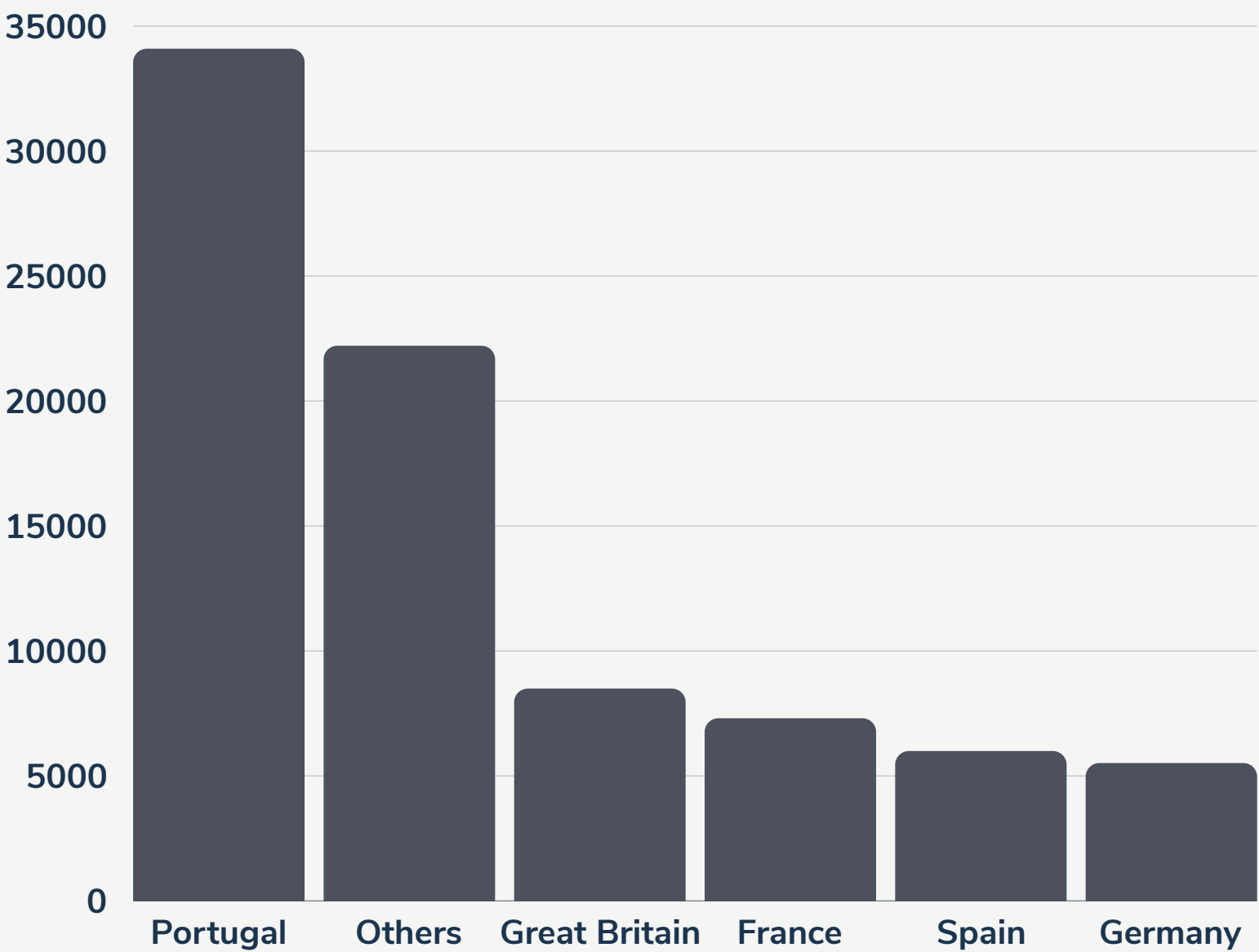
Current Business Analysis

Breakfast Absences

One significant factor affecting customer satisfaction is the provision of breakfast. However, this hotel does not offer breakfast service. By introducing a breakfast option, the hotel could potentially **increase customer satisfaction by 62%,** which would likely also lead to improved hotel ratings. This addition could significantly enhance the overall guest experience and contribute to better reviews and ratings, ultimately boosting the hotel's reputation and competitiveness in the market.

Customer Satisfaction → **Rating** → **Customer Booking** → **Revenue**
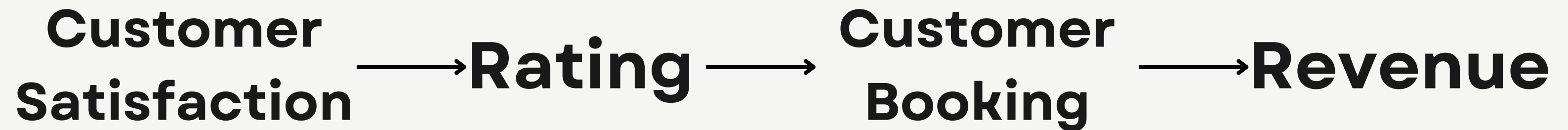
Therefore for increasing customer satisfaction to the hotel by providing free breakfast is beneficial investment for the Hotel

Breakfast Program Analysis

Sustainability

Compared to campaigns or discounts, offering breakfast is more sustainable for hotels. While discounts may lead to customer loss when discontinued, breakfast targets improved ratings and long-term customer retention.

Reduce Cancellation

Data indicates a high rate of repeat bookings, suggesting a customer base majority composed of frequent travelers. For this demographic, the availability of meal plans is a crucial factor in their accommodation preferences.

Added Values

Implementing meal plans can add significant value for group and business traveler segments. These plans provide convenient dining and meeting spaces, enhancing the hotel's appeal to corporate clients and work-oriented guests.

Meal Plan Challenges

1. High Cancellation

High cancellation rates lead to significant food waste and financial losses, as hotels pre-allocate meals for expected guests.

2. No Deposit Payment

Since the majority of the customer made without deposit payment. A cancellation could lead to bigger financial loss.
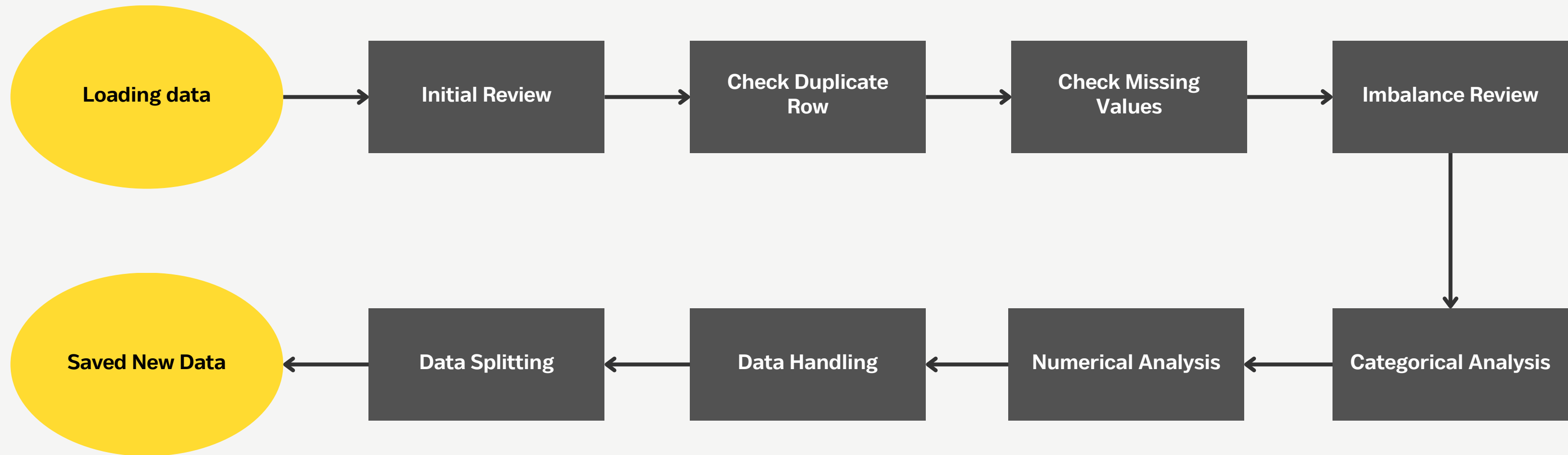
Based on these challenges, we need machine learning to precisely calculate hotel budget. the metrics that suitable for meal plan performance is precision

Focused Metrics

$$Precision = \frac{TP}{TP + FP}$$

	0	1
0	TN	FP
1	FN	TP

We will employ precision as our key metric in this scenario. The hotel aims to reduce and limit breakfast costs, thus emphasizing the importance of minimizing false positives - cases where customers are predicted to cancel but actually do not.

Benchmarking

To determine the success of a program a benchmark of minimum and maximum budget is needed. If the program exceeds the budget limit, the program is considered unsuccessful.

Data Cleaning & Preparation

Loading data → Initial Review → Check Duplicate Row → Check Missing Values → Imbalance Review

Saved New Data ← Data Splitting ← Data Handling ← Numerical Analysis ← Categorical Analysis

Initial Review

feature	type	null	null %	category	n_outliers	rare values < 5%	nunique	unique
country	object	351	0.419992	categorical	NaN	157	162	[IRL, FRA, PRT, NLD, ESP, UMI, CN, LUX, BRA, B...
market_segment	object	0	0.000000	categorical	NaN	4	8	[Offline TA/TO, Online TA, Direct, Groups, Cor...
previous_cancellations	int64	0	0.000000	numerical	0.0	306	15	[0, 1, 25, 2, 3, 11, 24, 13, 6, 26, 14, 4, 19,...
booking_changes	int64	0	0.000000	numerical	0.0	3737	19	[0, 1, 2, 5, 3, 4, 6, 7, 9, 8, 17, 10, 13, 12,...
deposit_type	object	0	0.000000	categorical	NaN	1	3	[No Deposit, Non Refund, Refundable]
days_in_waiting_list	int64	0	0.000000	numerical	0.0	2585	115	[0, 3, 39, 87, 77, 215, 97, 162, 46, 79, 4, 31...
customer_type	object	0	0.000000	categorical	NaN	2	4	[Transient-Party, Transient, Contract, Group]
reserved_room_type	object	0	0.000000	categorical	NaN	7	10	[A, E, D, F, B, G, C, H, L, P]
required_car_parking_spaces	int64	0	0.000000	numerical	0.0	25	5	[0, 1, 2, 8, 3]
total_of_special_requests	int64	0	0.000000	numerical	2051.0	2051	6	[0, 2, 1, 3, 4, 5]
is_canceled	int64	0	0.000000	numerical	0.0	0	2	[0, 1]

Data Modelling Process
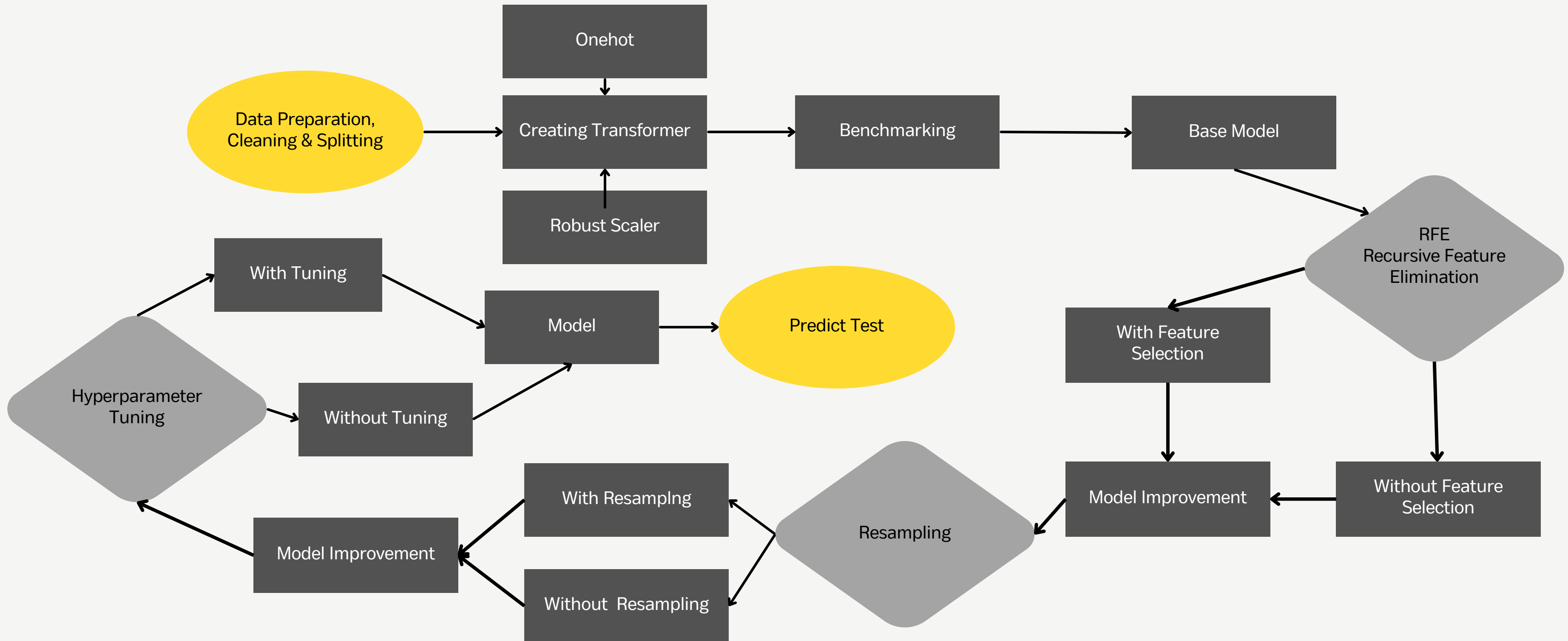
Random Forest

Handling categorical features

Directly use categorical features without complex encoding.

5 →
- Country
- Market Segment
- Deposit Type
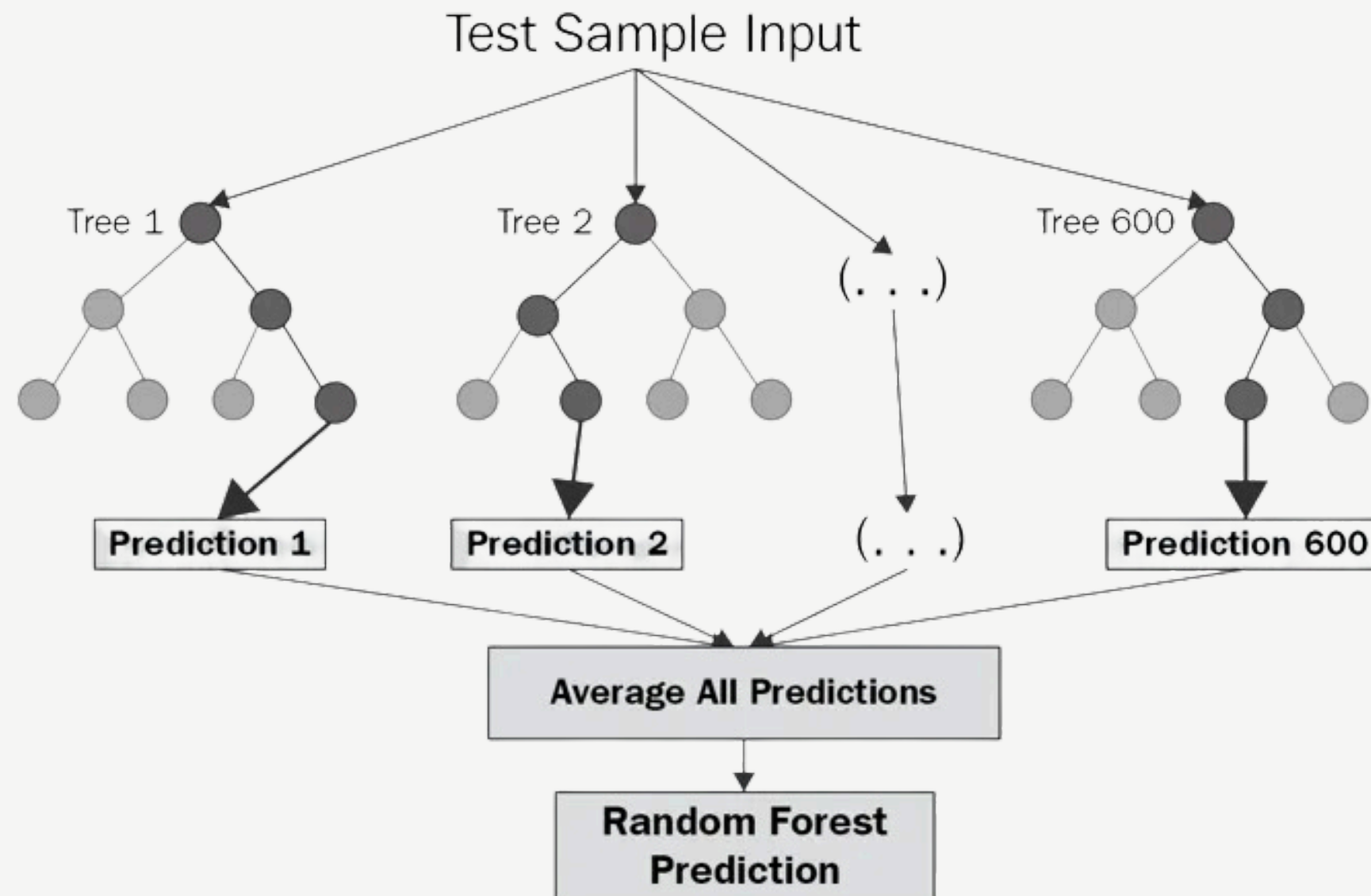- Customer Type
- Reserved Room Type

Strong performance

Learning method that combines multiple weak learners to create a strong learner accuracy.

Feature importance

Provides a measure of the importance of each feature in prediction.

Model Advantages & Disadvantages

Model Advantages

Various Data

It can accurately predict outcomes even for customers from countries that have never visited the hotel before.

Resist Data Duplication

By removing duplicate entries from the training set, the model becomes more resilient to data duplication while maintaining accurate predictions.

Model Disadvantages

Outliers

The model's reliability is limited due to the presence of numerous outliers. Since the dataset for the training only consist of few outliers
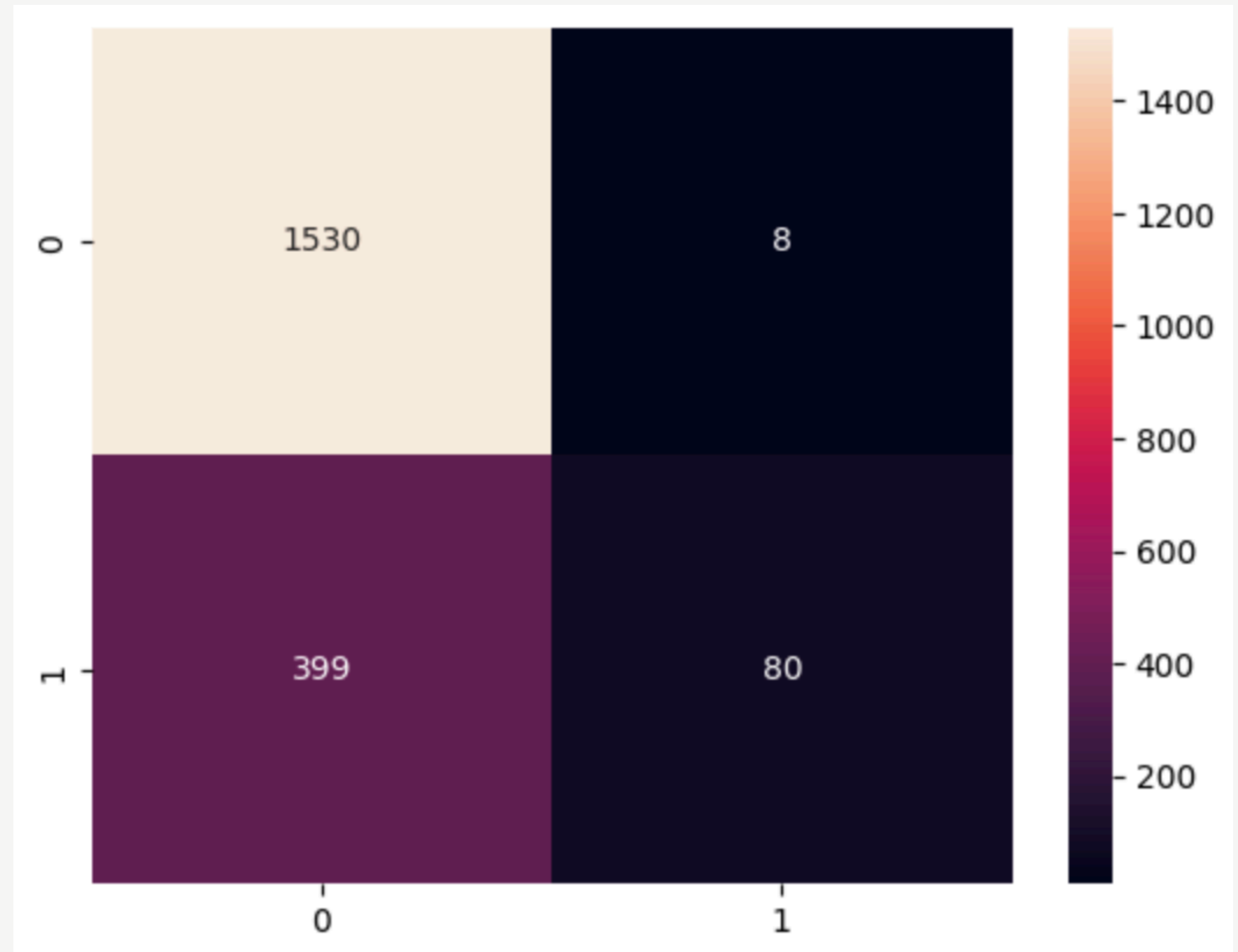
Numerical Features

Tree-based models excel with categorical data, introducing more numerical features may reduce accuracy.

Precision Score Achieved is 0.91

From 2017 People
- 1530 customers proceed the booking
- 399 customers might proceed or cancel
- 80 customers trully cancel

Without Machine Learning

From 2017 People, 479 will cancel their booking. The budget without ML is:
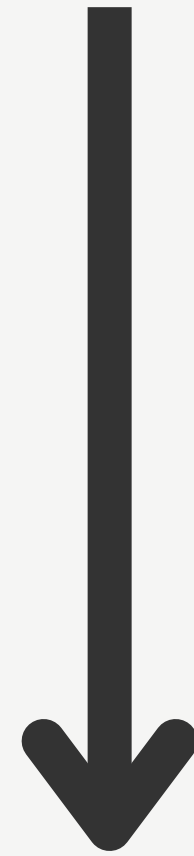
16.136 EUR

With Machine Learning

MAX 15.432 EUR

MIN 12.240 EUR

Can save up to

3.896 EUR

Conclusion & Recommendation

24%

Machine learning is very important since it can save budgeting for the hotel.

The benchmarking for the budget is the minimum by 12.240 EUR and Maximum is 15.432 EUR

Thank You