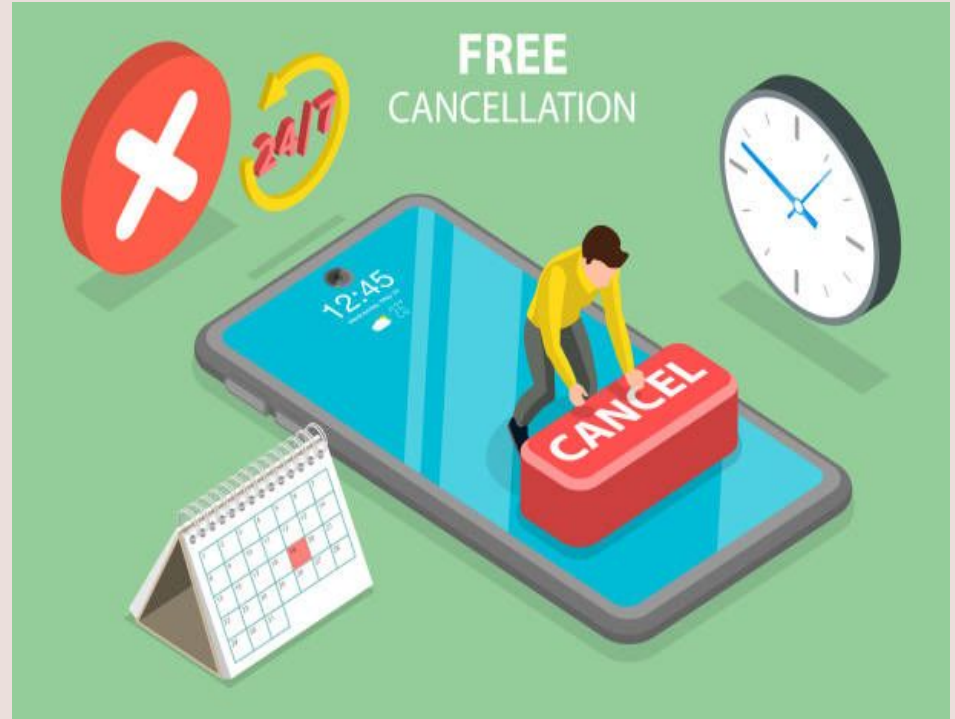# Predicting Hotel Reservations

Morgan Nash
December 2025

Occupancy Battles

- Competitor Pricing

- Short term rentals (Air BNB)

- Outdated systems

- Ease of online cancellation

Classification Model

- What: Predict "Cancelled" or "Not Cancelled" for hotel reservations beforehand

- Why: Allows your team to intervene with incentives, when appropriate

- Benefit: Secure the booking

Hotel Reservations Dataset

- 36,275 records x 19 columns

- Average room price

- Required parking space

- Number of special requests

- Booking status

- Missing: competitor pricing, local event schedule, recent data, etc

Prioritize Precision:

- Of all the model's predicted "Cancelled" reservations, how many correct?

- Minimize False Positives =

  - Model Prediction: "Canceled"   Actual: "Not Canceled"

  - Cost: Wasted Intervention Cost, used incentives to save a booking that was

    not actually at risk of cancelling
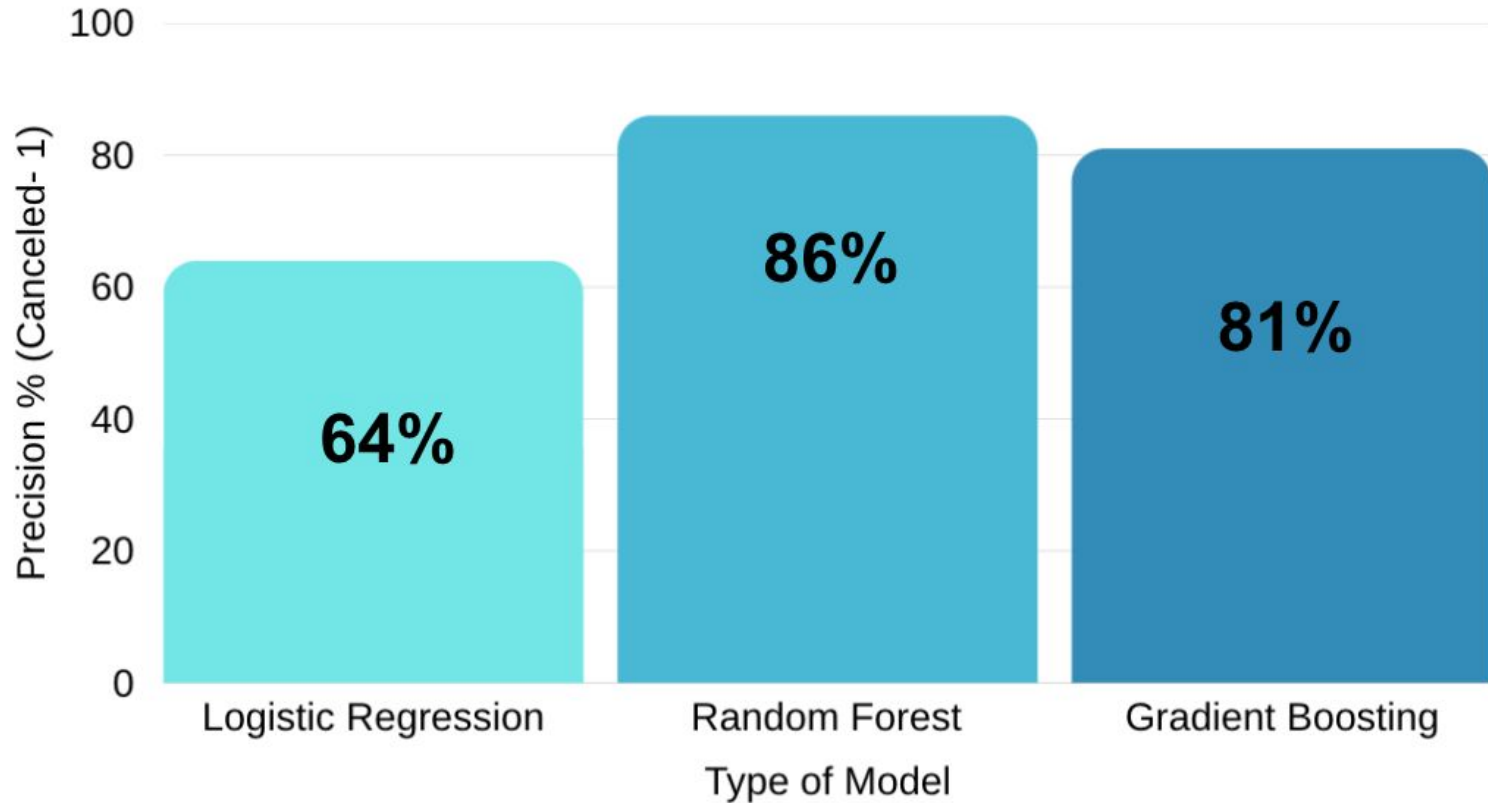
Precision Score:
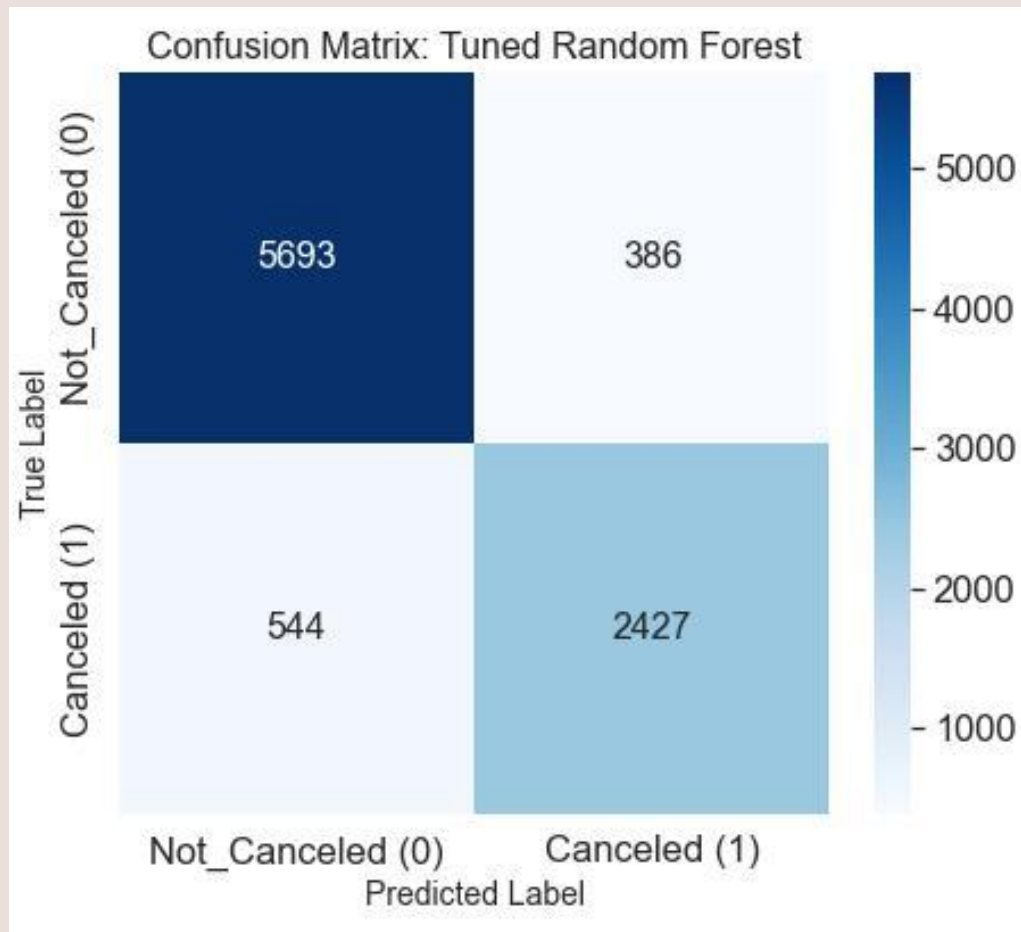
$$\frac{\text{True Positives}}{(\text{True Positives}+\text{False Positives})}$$

$$\frac{2427}{(2427+386)}$$

86%

Confusion Matrix: Tuned Random Forest

Final Model Evaluation:

Precision: 86%

Recall: 82%

Accuracy: 90%

Will this new reservation be cancelled? Yes / No

Cancellation Probability Groups:

High Risk >0.70

- Bigger incentive
- High-Value Offer
- (Can't say no)
- Discount/Upgrade

Medium Risk (0.50-0.70)

- No direct cost
- Value Reminder
- Amenities Email

Low Risk <0.50

- No action needed
- Guest very likely to show up

Vouchers / Discounts

Bonus Loyalty Points

Complimentary Breakfast

Room Upgrade

Reserved Parking Space

Late Check Out

Strong Predictors:

- Long lead time points towards cancellation

- Loyalty/Commitment signals:

    ○ requiring a parking spot

    ○ having numerous special request

    ○ repeat guest

    ○ booking offline

Conclusion

Deploy model to score reservations with Probability of Cancellation

Implement Intervention System

Monitor the model

Develop Automated Alerting for High-Risk

Continue to retrain and update using more (and more recent) data

Thank You!

Any Questions?

GitHub: morgannash1

Repository Name: hotel_reservations