







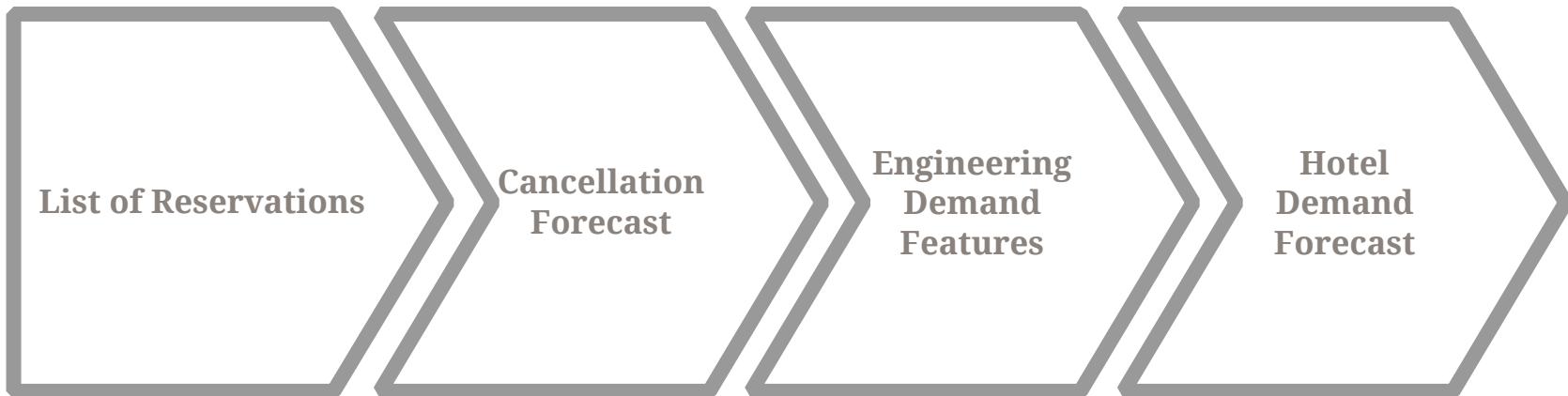
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*Selling the right room, at the right price, to
the right customer, at the right time*



HOTEL REVENUE MANAGEMENT SYSTEM

PROJECT WORKFLOW



THE DATA

A List of Reservations



The Data

The dataset contains reservations for stays between July 1, 2015 - August 31, 2017

Resort Hotel (H1)

- 40k reservations
- Capacity: 187 rooms

City Hotel (H2)

- 80k reservations
- Capacity: 226 rooms

Cancellation Forecast



Cancellation forecasts are critical to answer the question...

How many rooms should I sell on this night?

- Each predicted cancellation is added back onto the ‘shelf’ for sale
 - This can get us into trouble very easily...



XGBoost Classification Results

F-1 Scores

Hotel 1 (Resort): **0.78**

Hotel 2 (City): **0.82**



Confusion Matrix (Both Hotels)

		Prediction	
		will_come	will_cancel
Actual	will_come	13807 57.82%	1262 5.29%
	will_cancel	1932 8.09%	6877 28.80%

Upset guests & front desk agents!

F-1 Scores

Hotel 1 (Resort): **0.78**

Hotel 2 (City): **0.82**

Lose \$\$

Engineering Demand Features



Transforming List of Reservations into hotel statistics by day....

Start with this...

Reservation Num	Arrival Date	Checkout Date	Rate Booked	will_cancel	More info...
1	2017-08-01	2017-08-03	150	True	...
2	2017-08-02	2017-08-04	100	False	...

Go back in time to Aug 1, 2017, and count *only* the reservations that have *already* booked at that point, for each future arrival date.

We can then calculate how many rooms actually booked after that. That number is **demand** – which is what we’re trying to predict for each future date.



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After transformation...

Stay Date	Rooms Booked	Avg. Rate	Proj. Cancellations	More stats...
2017-08-01	1	150	1	...
2017-08-02	2	125	1	...
2017-08-03	1	100	0	...



Features generated for each future stay date:

- **Remaining supply**
 - ↳ Num available rooms for sale
(includes cancellation forecast)



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 - ↳ Num available rooms for sale
(includes cancellation forecast)
- **On the books**
 - ↳ Num rooms already sold



Features generated for each future stay date:

- Remaining supply
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(includes cancellation forecast)
 - On the books
 - ↳ Num rooms already sold
- **Pickup**
 - ↳ Num rooms booked over the last 5/
15/ 30 days



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- **Pace**
 - ↳ This-year variance to same-time last-year (STLY) for all above stats



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- Remaining supply
 - ↳ Num available rooms for sale
(includes cancellation forecast)
- On the books
 - ↳ Num rooms already sold
- Pace
 - ↳ This year variance to same-time last year (STLY) for all above stats
- **Gap to last-year actuals**
 - ↳ Num rooms left to book in order to reach last year's final sales

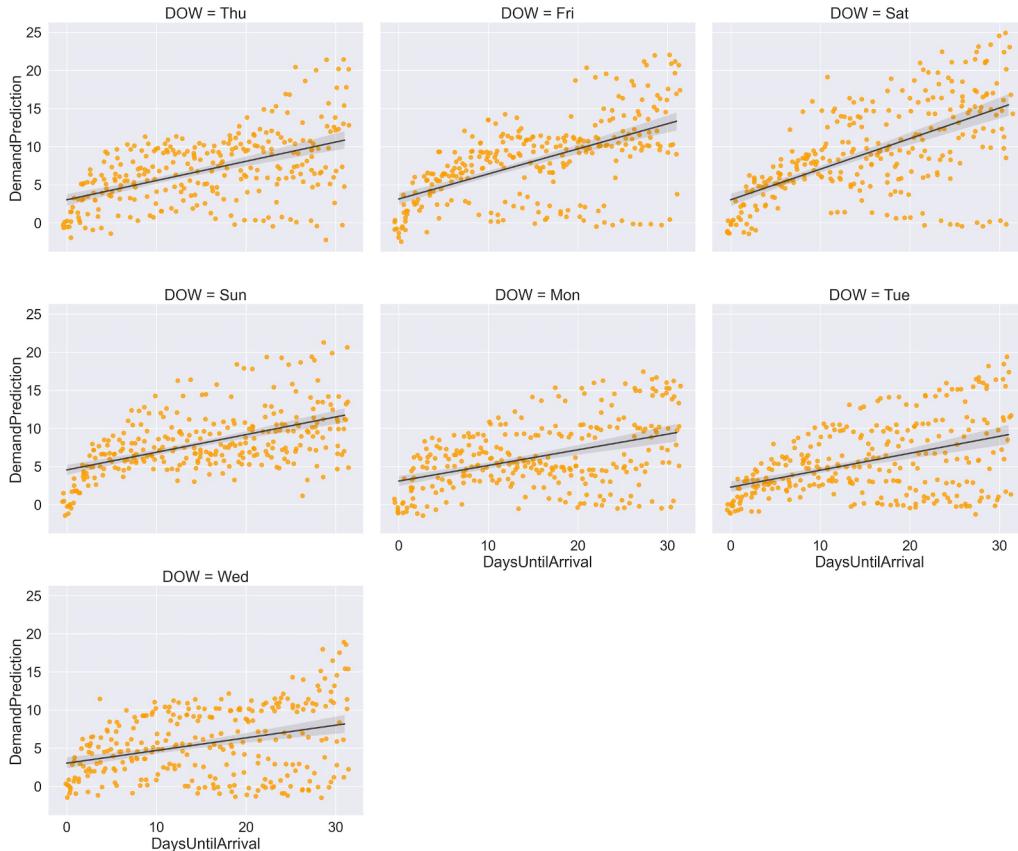
Modeling Demand



H1 Model Results

Resort Hotel
187 Rooms

R² Score: 0.79
Mean Abs. Error: 2.1 Room Nights





Several Use Cases for Hotels

- Pricing insights
- Allow for calculated and effective overselling
- Staff scheduling & financial planning

THANK YOU!

You can find me:

- Via email: wilensel@gmail.com
- On [GitHub](#) (github.com/edubu2)
- On [LinkedIn](#) (linkedin.com/in/elliotwilens)

Sources:

- [Metis Data Science Bootcamp](#) (ML techniques)
- [ScienceDirect](#) (hotel dataset)
- [SlidesCarnival.com](#) (for slide deck template)

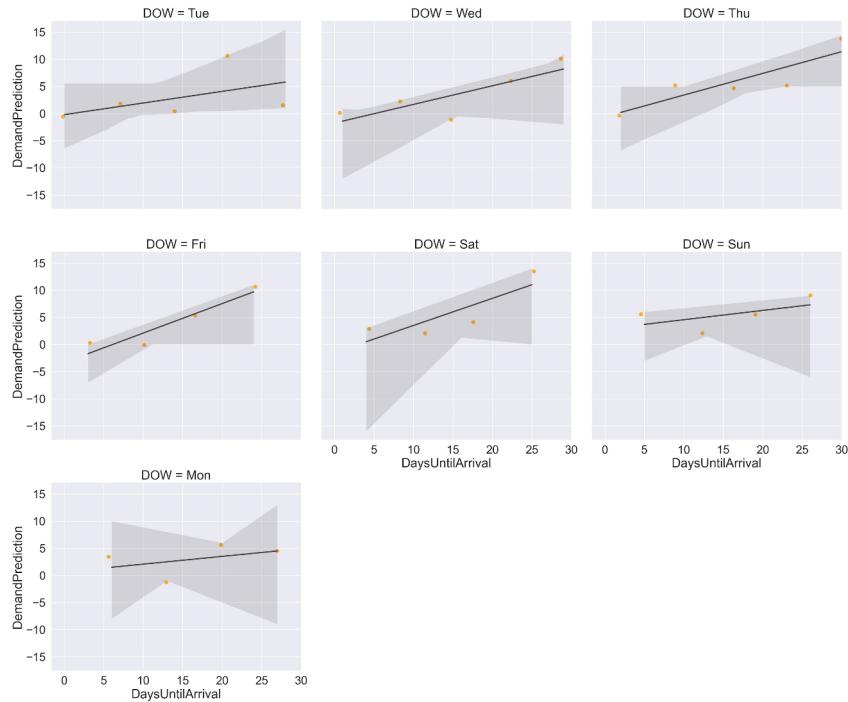


ScienceDirect

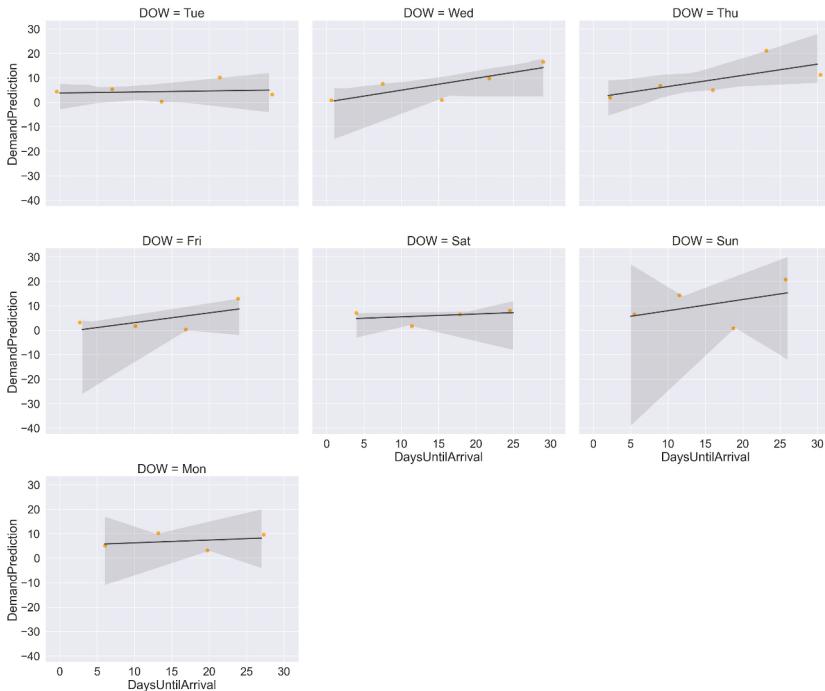


APPENDIX A: DOW PREDICTION EVALUATION

Hotel 1



Hotel 2



H2 Demand Model Results

Resort Hotel
226 Rooms

R2 Score: 0.76
Mean Abs. Error: 3.1 Room Nights

APPENDIX B

