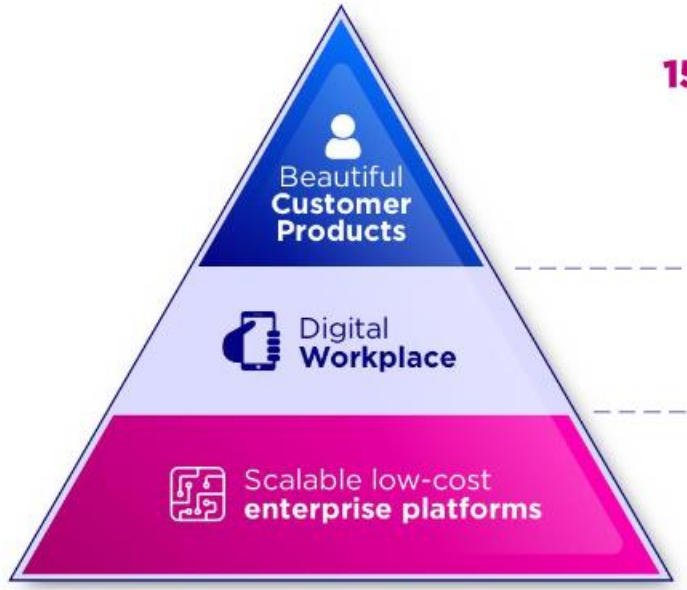
FLIGHT LOAD OPTIMIZATION USING ML

ULCC MODEL AND DIGITAL TRANSFORMATION

- Young and Uniform Fleet
- Secondary Airports
- Point to Point Network
- High Seat Density and Load Factor
- High Aircraft Utilization
- Outsourced Business Model
- Direct distribution via web and app
- High revenue share from Ancillary
- High Employee Productivity



15 Digital Strategy initiatives

5 Digital Strategies

3 Digital Strategies

7 Digital Strategies

Scalable Platforms

Optimized Processes

Data Analytics

Automation

Microservices

Cloud First

A/B Testing

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OPTIMIZATION PROBLEMS

Top Data Analytics Initiatives

- Network optimization
- Fuel consumption optimization
- Predictive maintenance
- Dynamic pricing
- ***Flight Load Optimization***
- Personalization
- Fuel uplift optimization
- Passenger re-accommodation
- …

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WHAT IS THE FLIGHT LOAD OPTIMIZATION PROBLEM?

- The phenomenon is not travel or airline specific
- 5-7% of confirmed passengers don’t travel
- Overbook capacity to compensate missing passengers
- A wrong sales lid may cause empty seats or denied boarding
- Overbooking is applied in a dynamic pricing environment

Hypothesis: no-show passengers can be predicted with precision generating extra revenue and minimizing denied boarding

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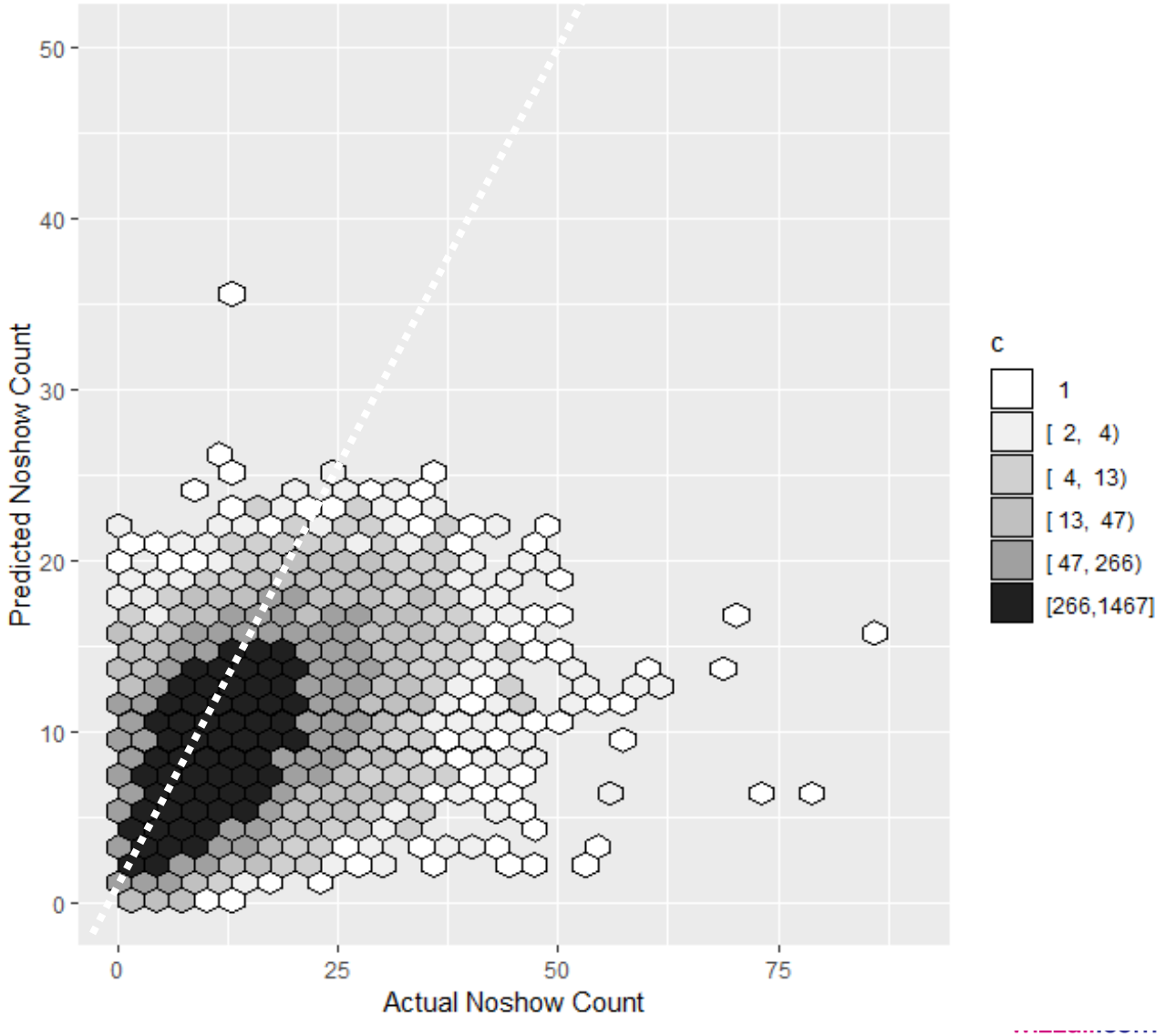
WHY MACHINE LEARNING?

- Large amount of historical data available for feature engineering, model training and validation
- Data cleaning can be applied following few basic rules eg. treat flights with 25 or above actual no-shows as outliers
- ~100 customer and flight features collected in the database

A/B tested against the previous simple rule based models, the ML model gave a much better prediction



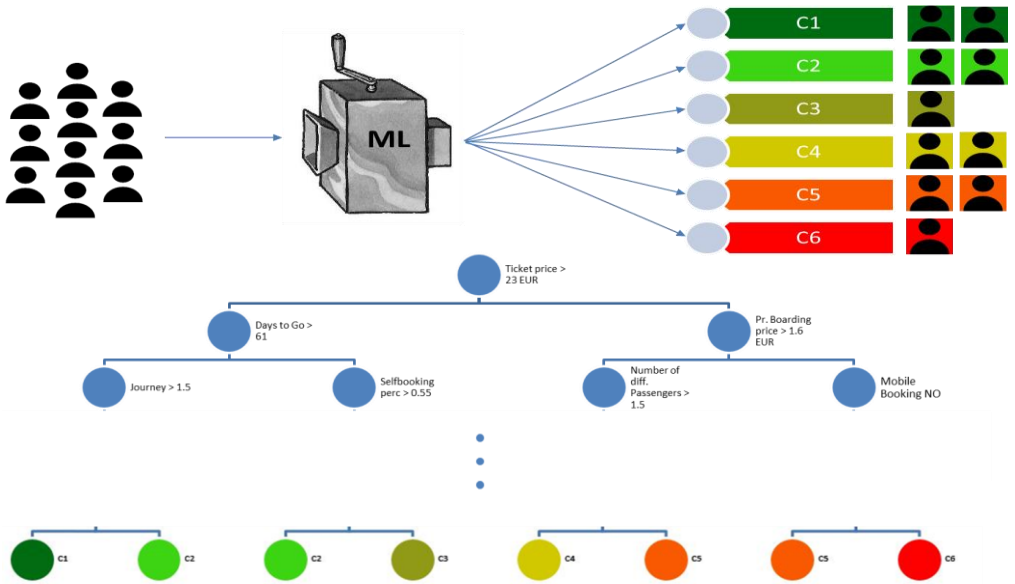
THE COMBINED ML MODEL

- Prediction to be made on flight level
- Customer, Passenger, Booking and Flight data are available
- Final model combines 3 techniques:
    1. Create customer clusters: **Who is on the flight?**
    2. Add in flight attributes: **What flight is it?**
    3. Track last minute customer activity and refine recommendation: **Are the actuals in line with the prediction?**

CUSTOMER CLUSTERING AND FLIGHT INFORMATION

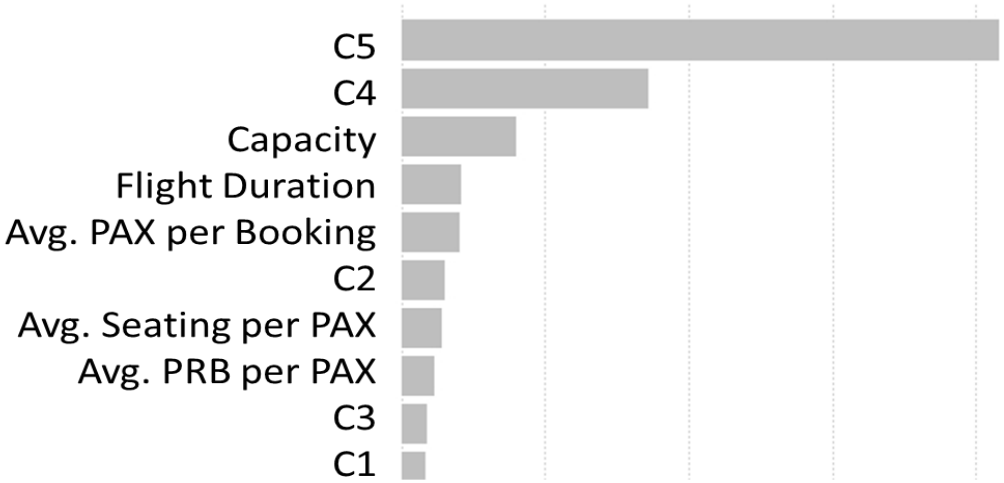
Customer clustering

- Use booking attributes to create customer clusters
  - Main drivers: Outbound leg no-show, Historical no-show, Ticket price, Length of Stay
- Higher cluster index > higher no-show rate.
- ML model: ***Decision Tree***

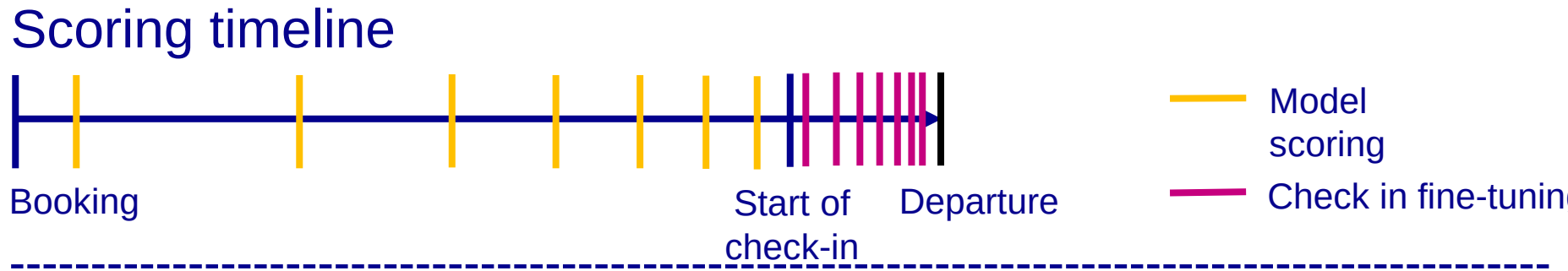


Flight information

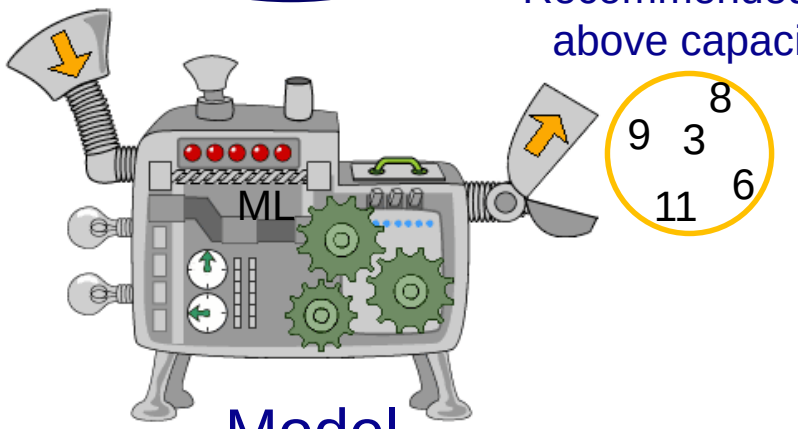
- Use flight parameters to create categories
  - Main drivers: Frequency, Duration, Capacity, Next available flight time
- ***XGBoost*** for combining customer and flight parameters
- Combined relevance of attributes in predicting no-show:



THE COMBINED MODEL, WITH LAST MINUTE FINE TUNING

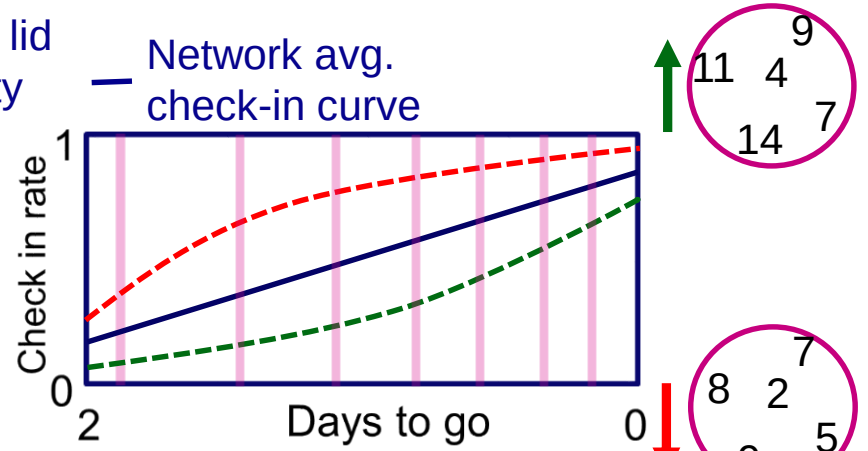


Customer clustering + Flight attributes



Recommended lid above capacity

Model scoring



Check in fine-tuning

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PROJECT MILESTONES

1. Model selection, feature engineering
2. Train no-show prediction model based on a 2-year history
3. Introduce actual denied boarding measurements at airports
4. Automatic / semi-manual lid recommendation for pilot base, comparing old and new model. Gradually introduce automatic recommendations. Implementation ca. 2 months:
   i. integrate with existing revenue management system
   ii. Sales warm-up period
   iii. Operational period
5. Verify business case
   i. No more denied boarding due to overbooking than predicted
   ii. Extra sold seats confirmed, go-no go decision for network
6. Roll out model to the entire network, go-live date should align schedule seasonality (preferably off- or end of season)
7. Continuous monitoring, alerting, verification
8. Re-train model every 6 months

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