

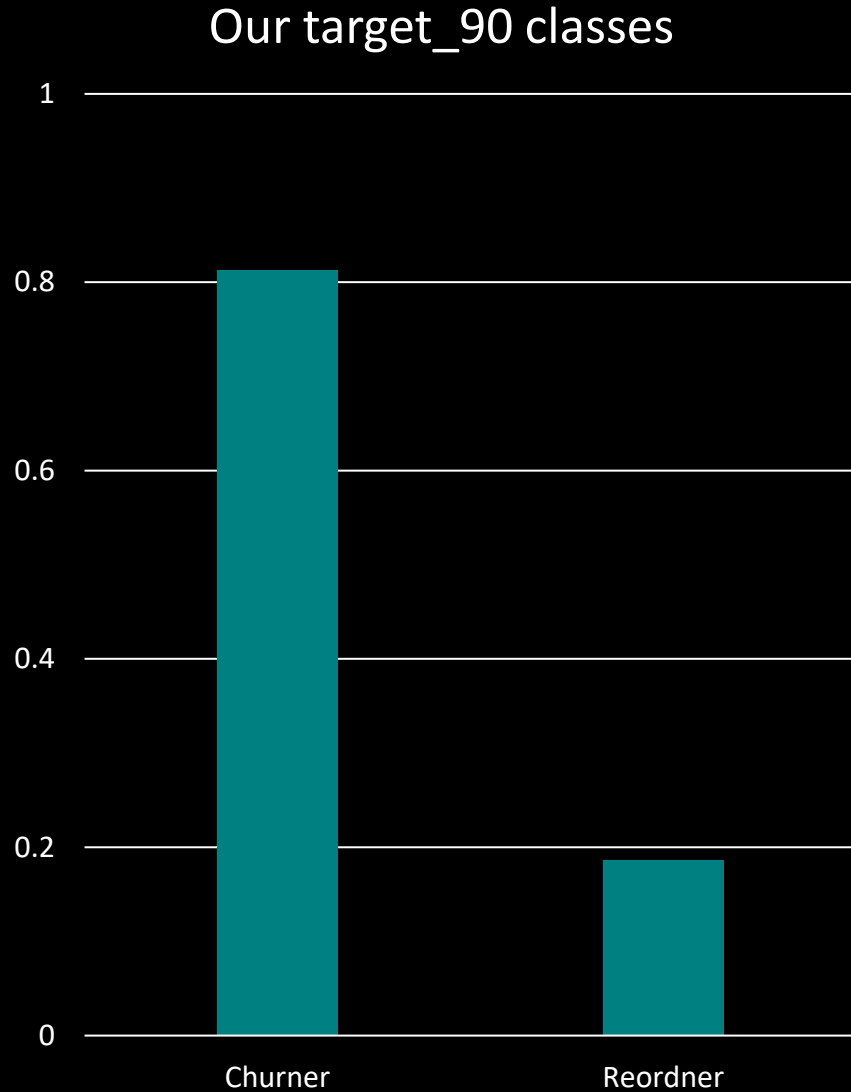
Revenue optimization

FINAL PRESENTATION

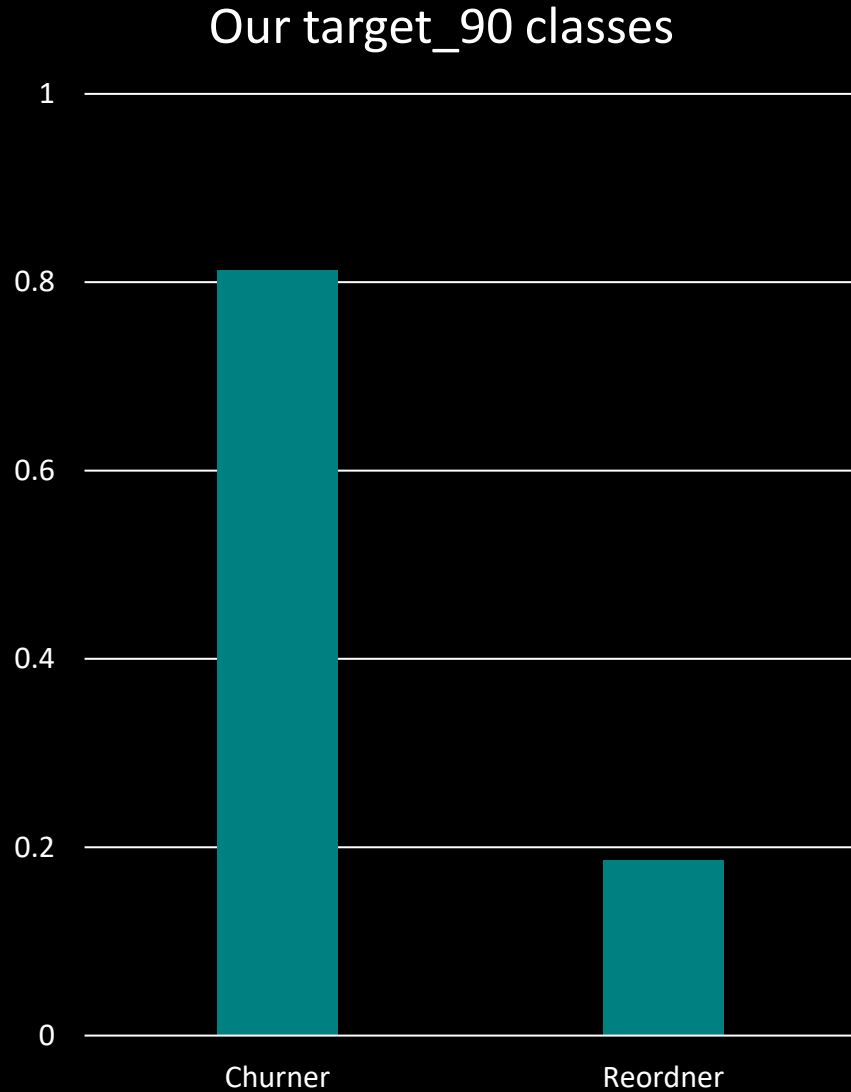
DS405 MACHINE LEARNING APPLICATIONS IN BUSINESS AND ECONOMICS

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First, we need to understand our customers



Our initial situation is a decision problem with asymmetric costs based on a binary outcome



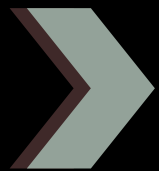
Sending vouchers out to everyone

Not send vouchers out at all

Either we spend too much money on our loose potential customers

How do we decide who gets a voucher?

Decision	True outcome	Revenue
Send voucher	No reorder	+ 1.25 €
	Reorder	- 5 €
No voucher	Any	0 €



Voucher decisions are made using predicted reorder probabilities and their expected revenue impact

Naive voucher strategies destroy value



Gradient Boosting is the best-performing model

1 We tuned the model's hyperparameters to maximize revenue

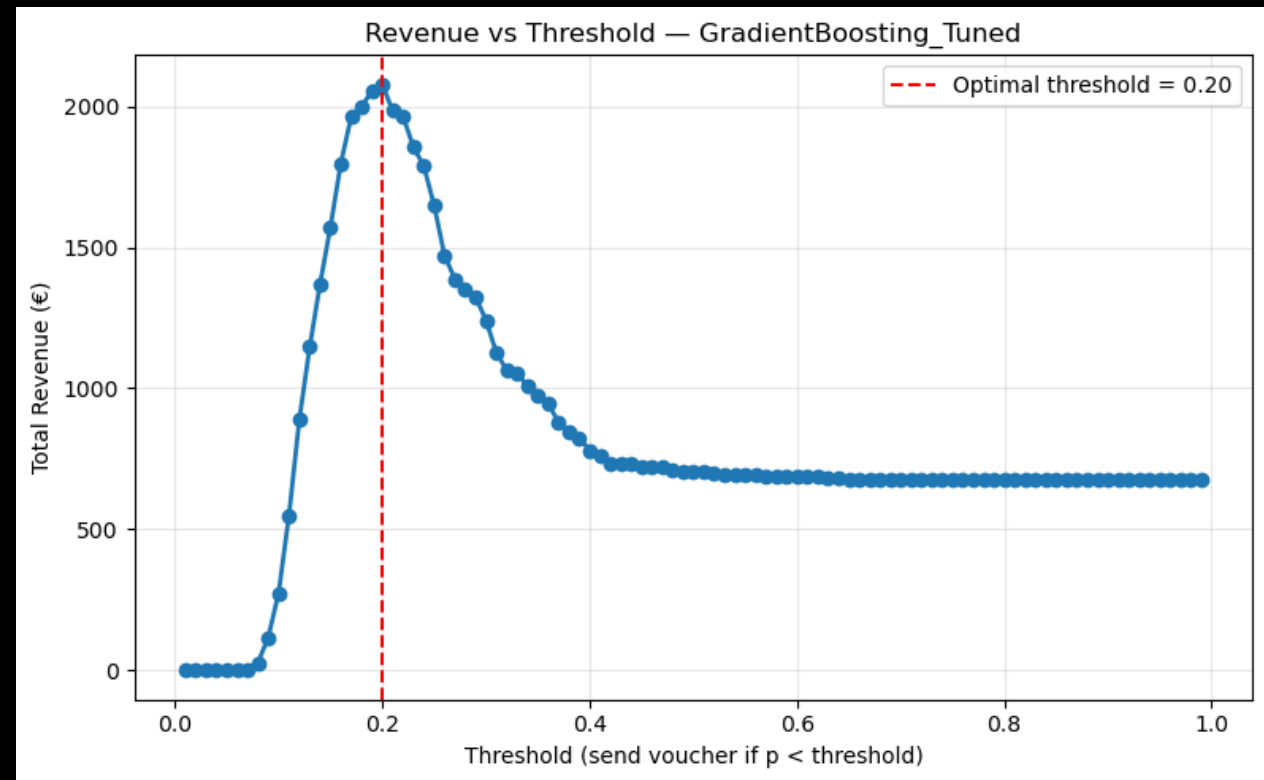
Hyperparameters:

- subsample: 0.6,
- n_estimators: 600,
- min_samples_split: 5
- min_samples_leaf: 1
- max_features: None
- max_depth: 4
- learning_rate: 0.01

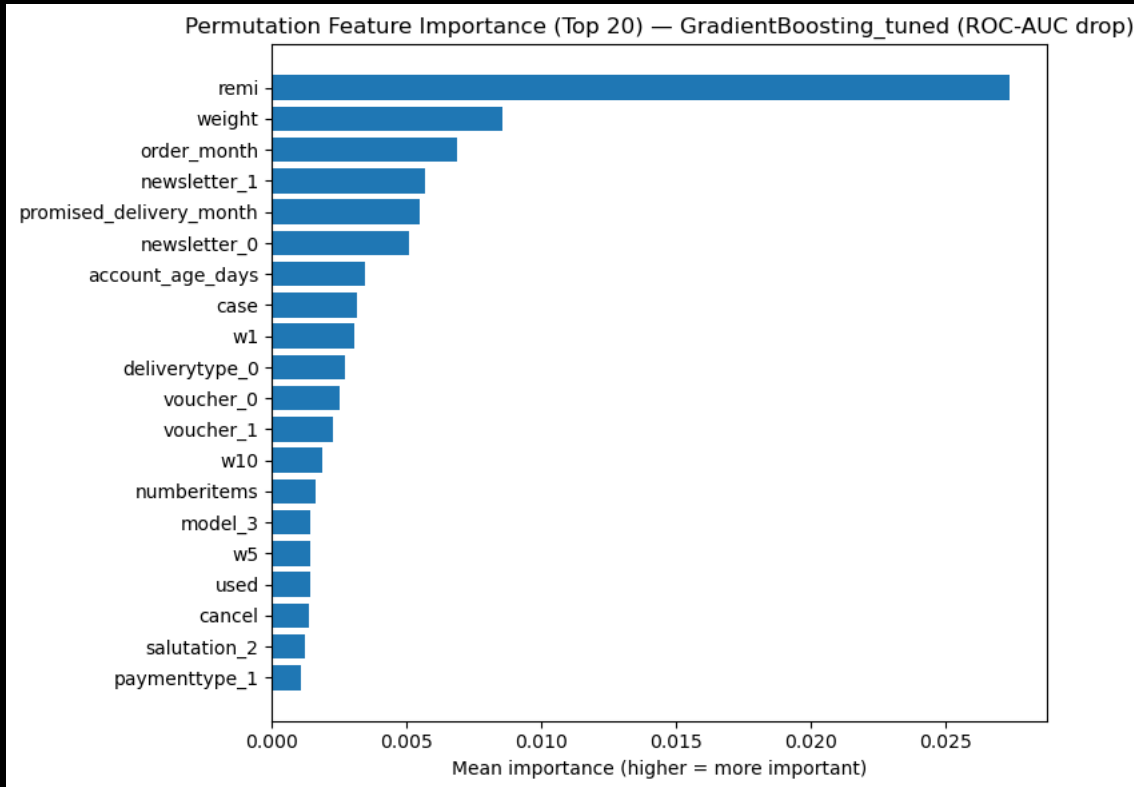
2 We boosted expected revenue to 2077.50 €

A revenue-optimal threshold determines who receives a voucher

True Label	Action	
	Don't send	Send
No Reorder	2016	4578
Reorder	784	729

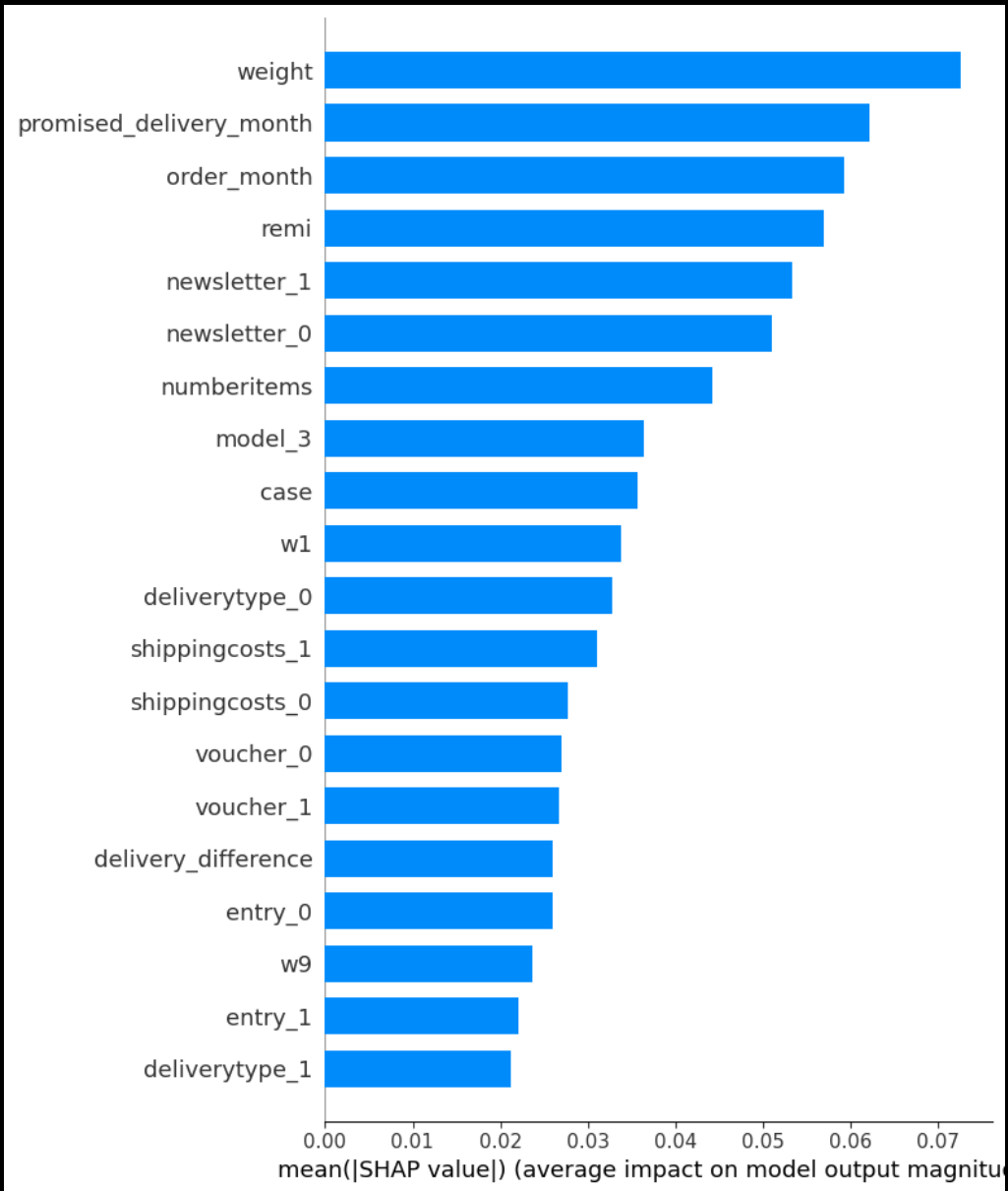


Customer behavior and Operational factors drive reorder predictions



Key insights

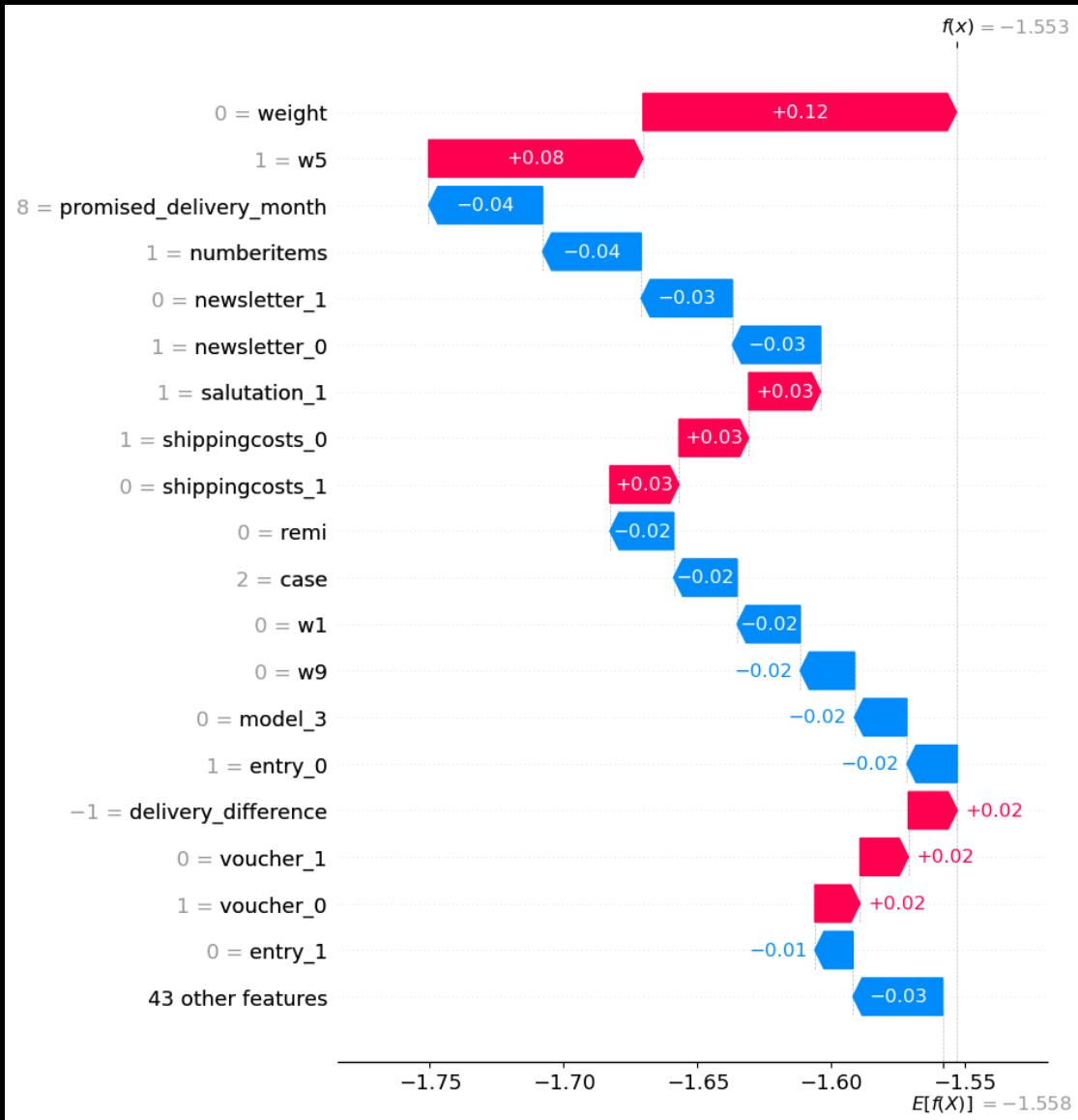
- Return behavior (remi) is the strongest signal
- Operational factors (e.g. weight, delivery) also influence reorders
- Seasonal effects (order month) matter



SHAP feature importance

Key insights

- Bars show average impact of each feature on predicted reorder probability
- Both customer behavior and order characteristics matter
- No single feature dominates



Explaining an individual voucher decision

Key insights

- Several features reduce the predicted probability of reordering
- Weight and w5 contribute positively to the predicted reorder probability
- The final predicted probability falls below the revenue-optimal threshold
- A voucher is therefore sent to this customer