Predicting Hospital NoShows

(or “Putting Predictions to work”)

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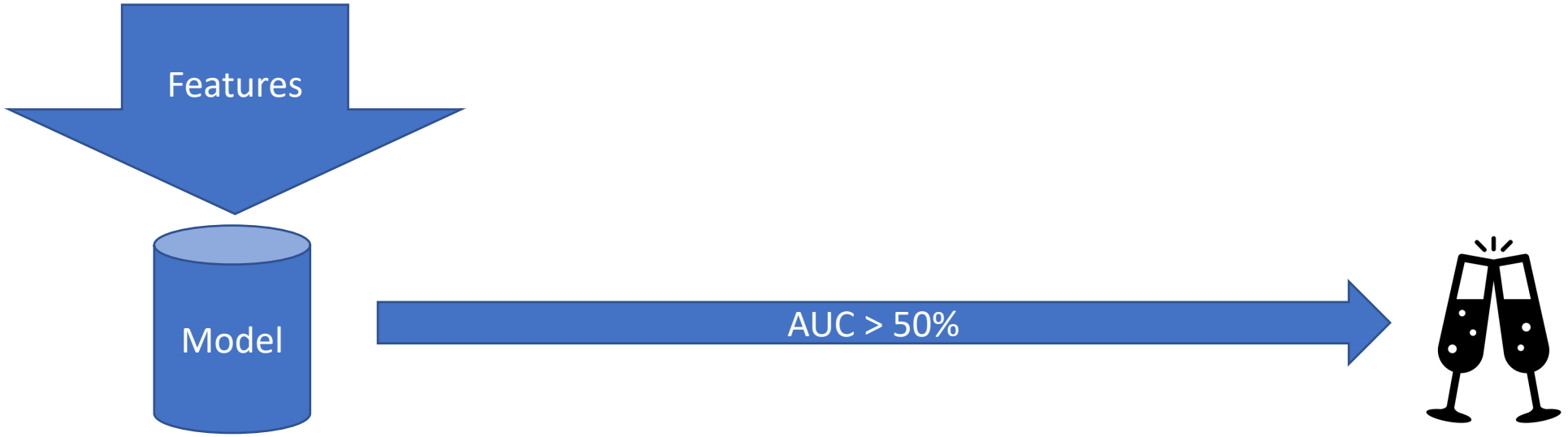
NoShows

NoShows: *Anything less than a cancellation more than 24hrs out*

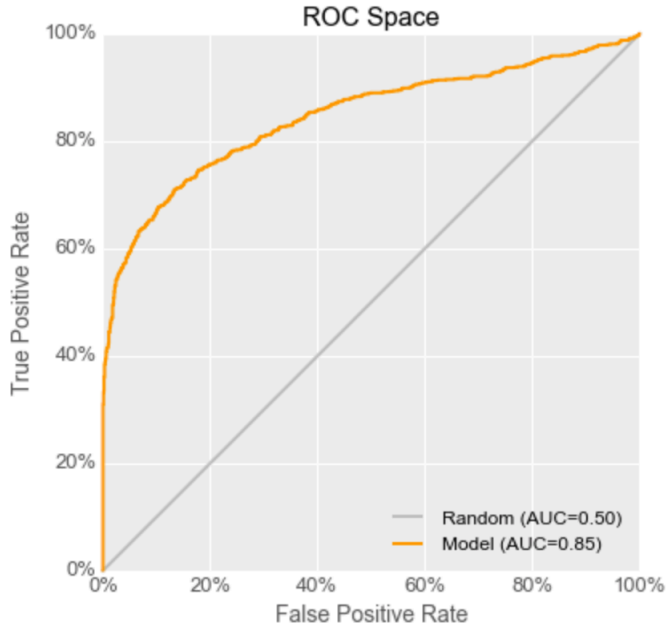
Implications of NoShows

- Unfilled appointment cost
- Cost of clinician idle time
- Additional wait-time for some other patient (potentially quit sever)

Create a Model


Features
Model
AUC > 50%

Mitigating the cost factor with a confusion matrix



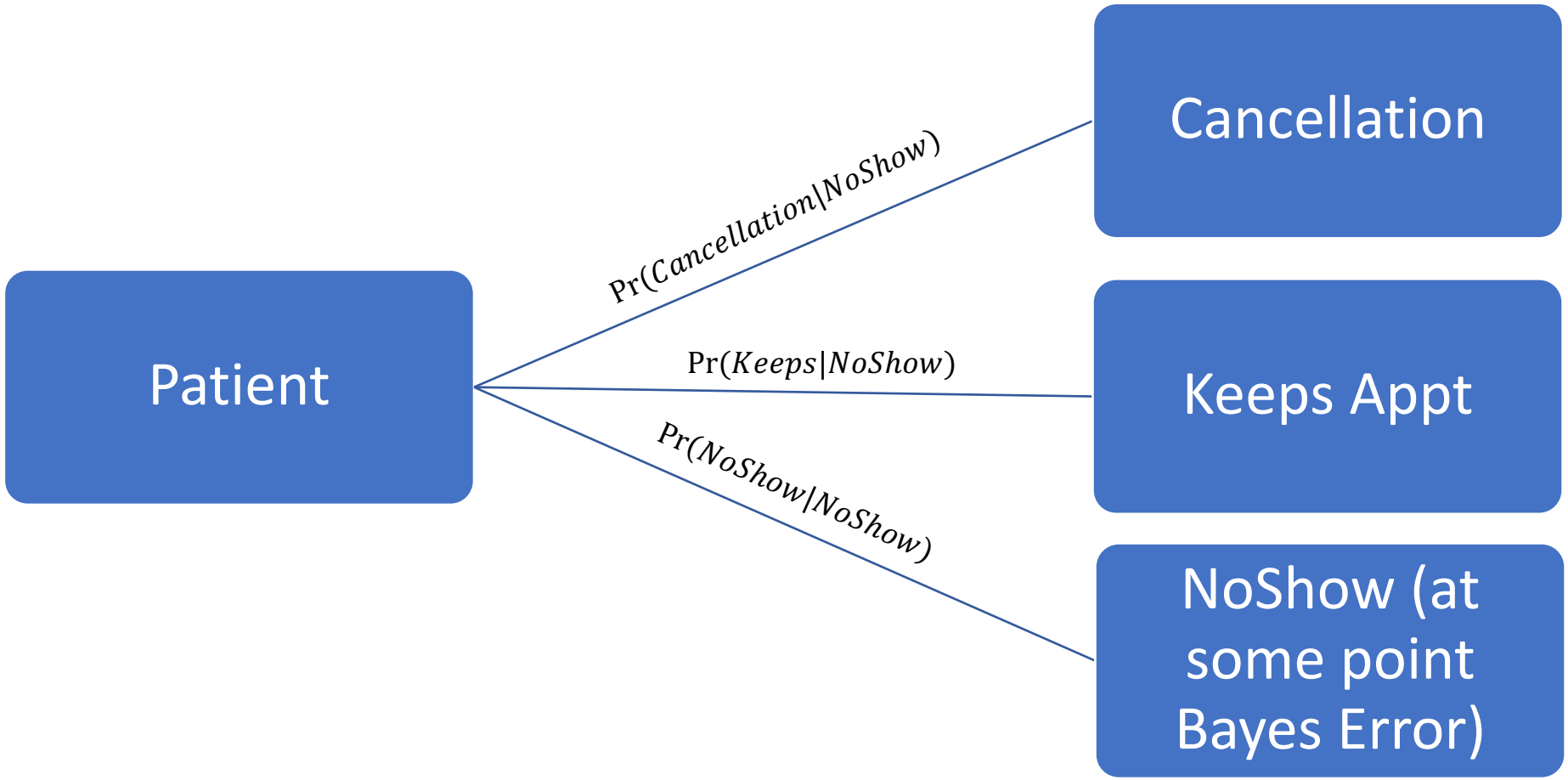
NoShow Output at threshold t		Actual Patient NoShow	
		Action Needed	No Action Needed
	Positive	**True Positive** • Utility(t) = $ It depends • Rate(t) = TPR(t) * 92%	**False Positive** • Utility(t) = - $ call center • Rate(t) = FPR(t) * 8%
	Negative	**False Negative** • Utility(t) = - $ operational • Rate(t) = (1-TPR(t)) * 92%	**True Negative** • Utility(t) = + $ • Rate(t)=(1-FPR(t)) * 8%

Expected utility of model (or "average utility")

$$E[u] = u_{tp} r_p TPR + u_{fn} r_p (1 - TPR) + u_{fp} r_n FPR + u_{tn} r_n (1 - FPR)$$

So you’re going to be a NoShow…

Converting NoShows



Optimization Goal

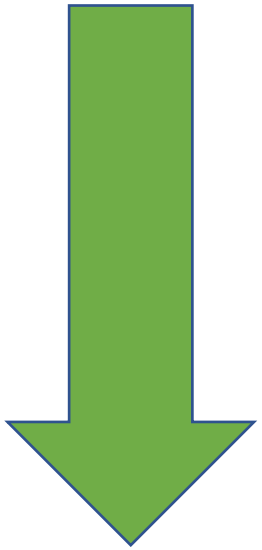
Overall goal:

$$\min(\Pr(NoShow|NoShow, FNR)$$

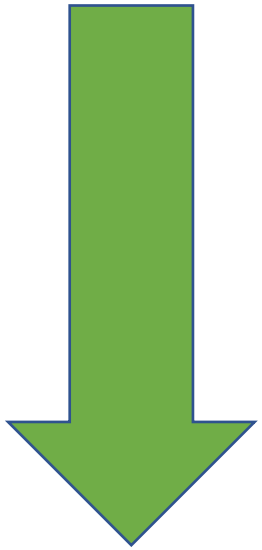
- **FNR (False Negative Rate)** Can be minimized primarily through modeling choices
- $\boldsymbol{Pr(NoShow|NoShow)}$ could be minimized through strategic outreach.
  - A/A testing models for effectiveness
  - A/B testing different outreach methods
- **Wait list optimization:** How to best fill the predicted empty spot?

At the end of the day…

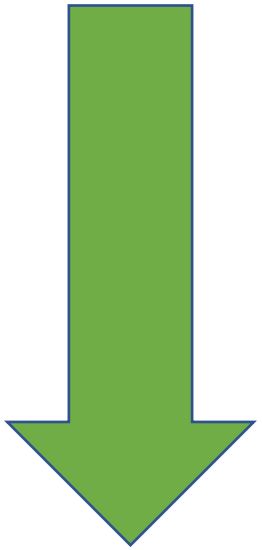
Costs



Wait Times



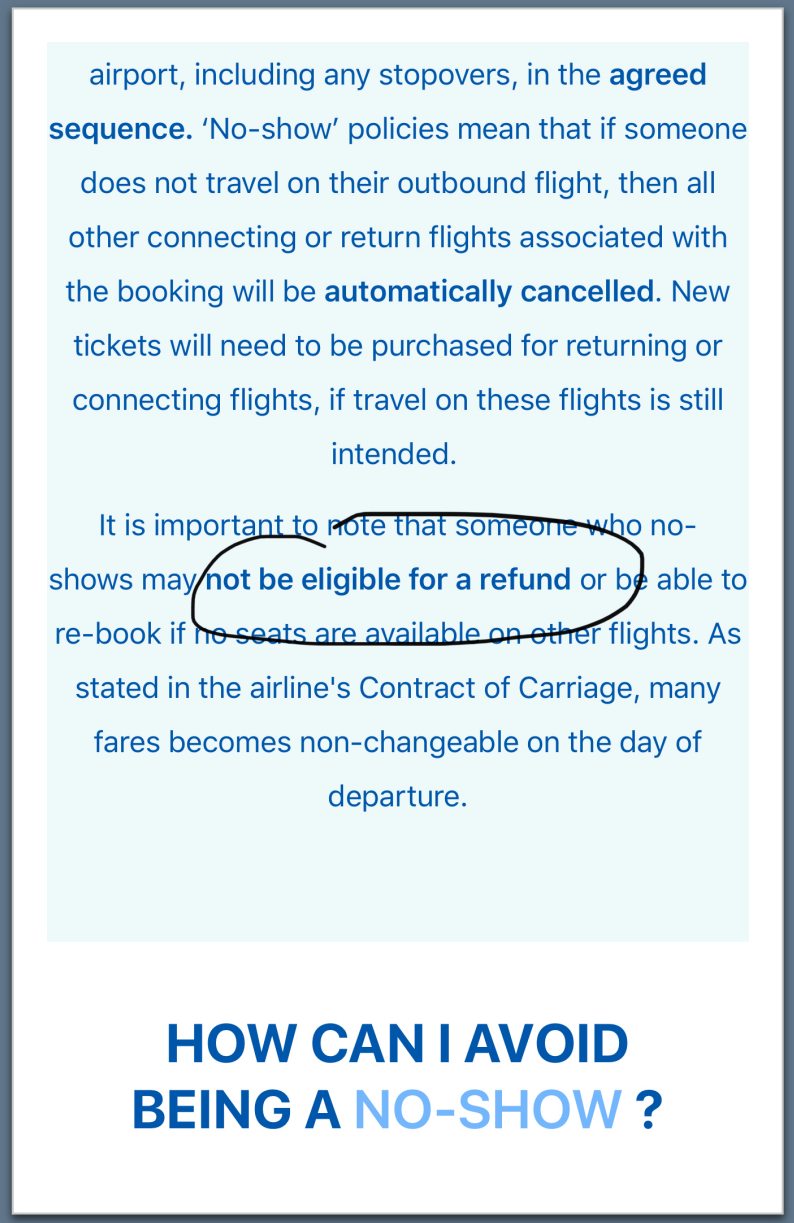
Less Bias




Thank you!

Appendix

(Slides that didn’t make the cut)



Industry Comparison: Considerations for actions

	Airlines	Hospital
Charges	Charges up front	Charges after service
Overbooking	Yes	No
Bayes Error	< 5%	< 15%