

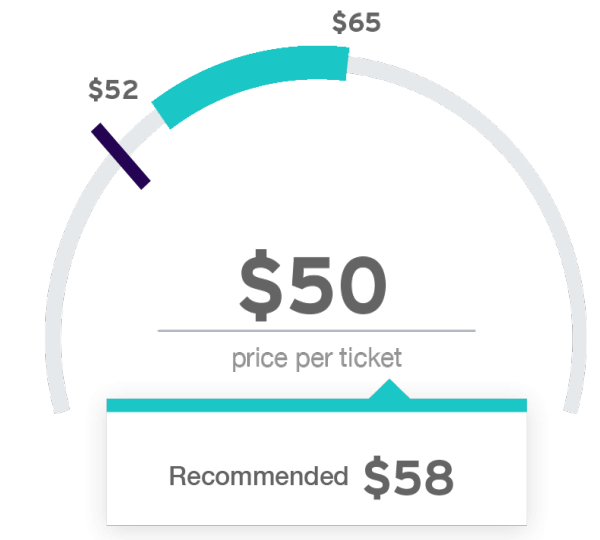


INTRODUCTION

StubHub is the world's largest ticket resale platform. In this online marketplace, sellers have the flexibility to set their own prices. However, determining the 'best' price for a ticket is a non-trivial task, since each individual ticket is unique and the value of the ticket can fluctuate depending on a multitude of factors.

Problem Statement: How can we develop a (i) bidding and (ii) diversification strategy for an off-market bidding platform where sellers can instantly sell their tickets?

DATA



We primarily used:

- Marketplace data for NBA, MLB 2018
- Proprietary Internal Models for Price Recommendation & Seat Quality

KEY RESULTS

Significant improvements Relative to Baseline. Based on simulation results, our proposed data-driven optimization approach could increase operating income by ~200% and return on investment by ~4 compared to the heuristic baseline strategy.

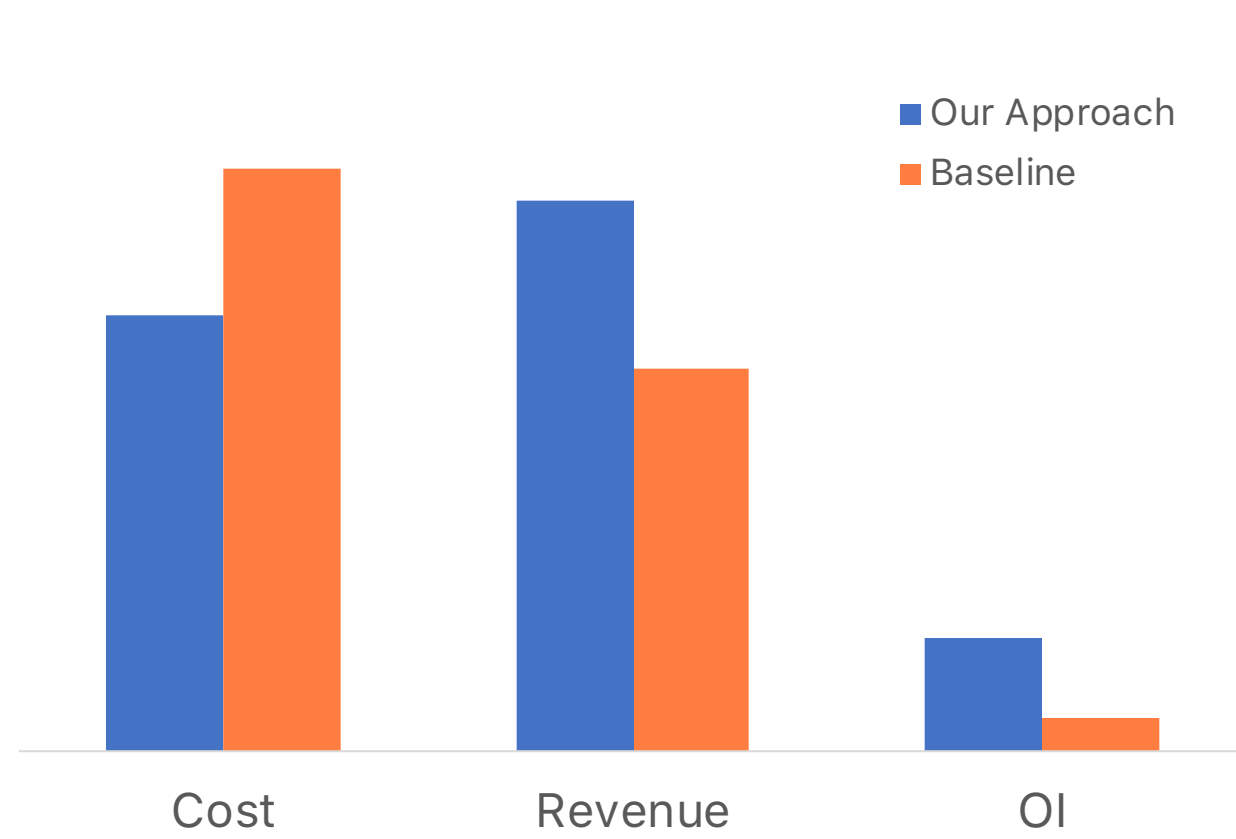


Figure 1: Business Impact of our Proposed Methodology

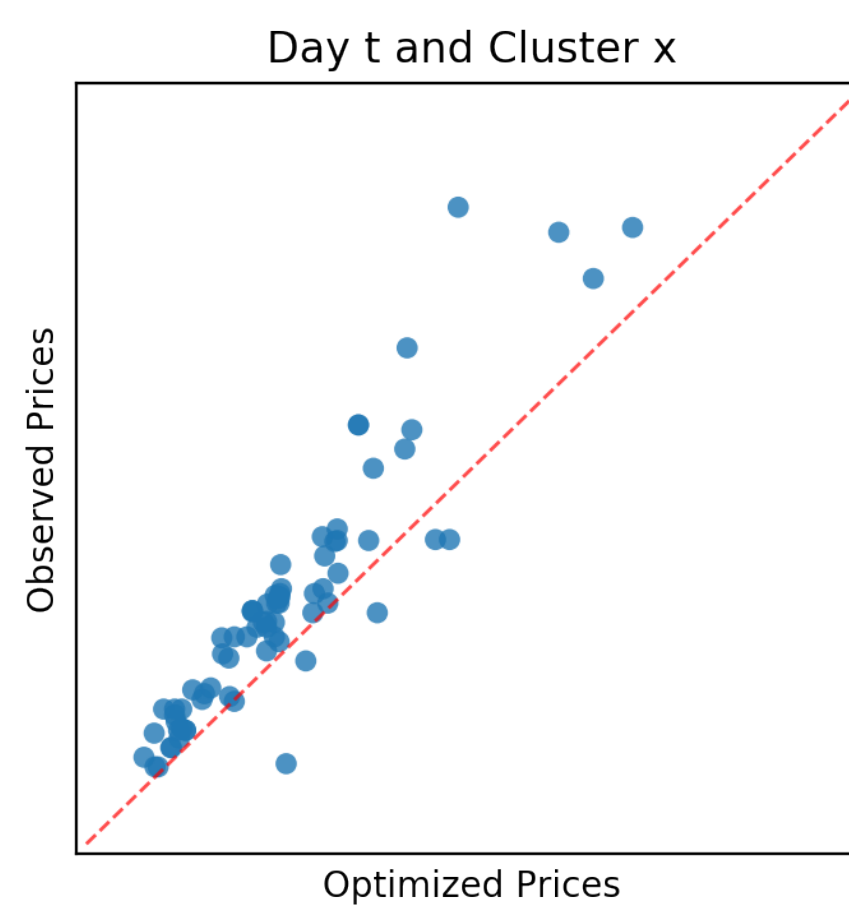


Figure 2: Price Validation by Comparing Optimized Prices with Observed Prices

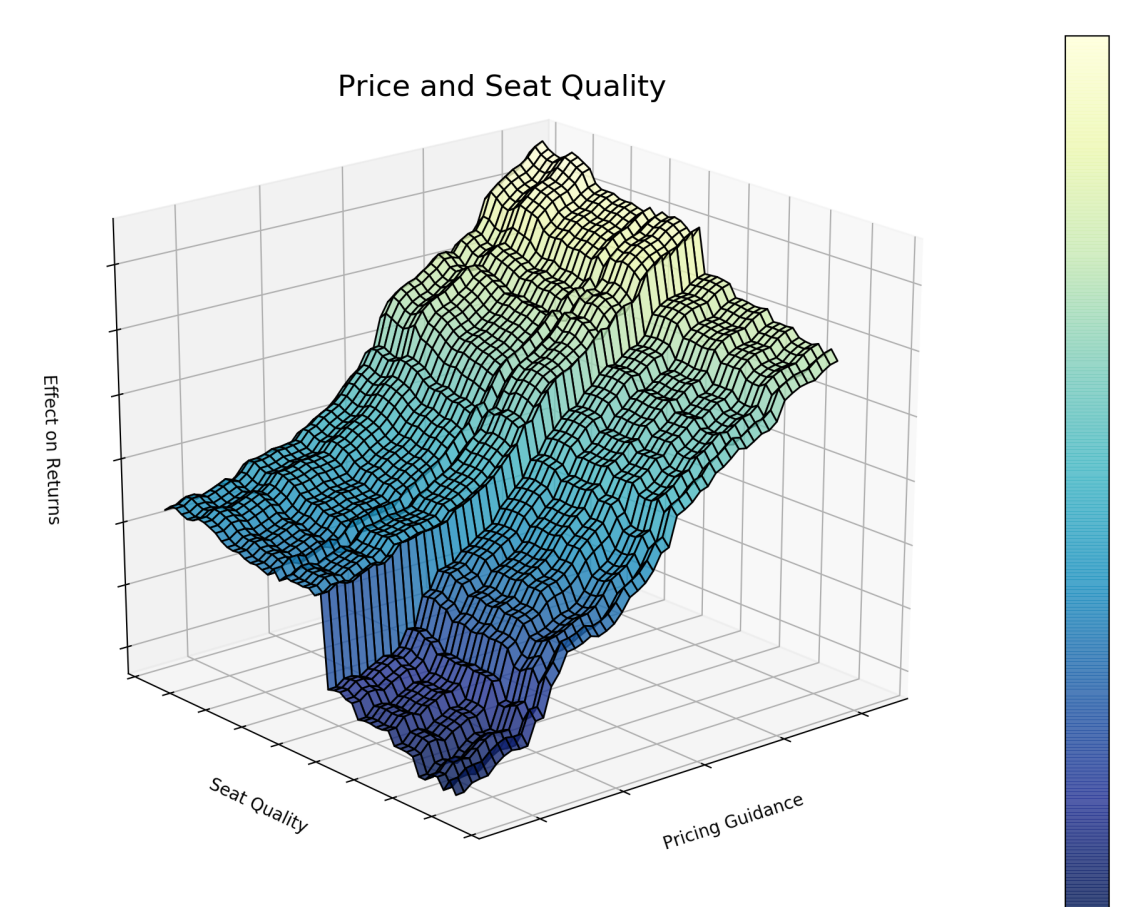


Figure 3: 3D Partial Dependence Plot of Gradient Boosted Trees Analyzing Simulation Results

METHODOLOGY

We propose an ensemble of models that use historical transactions to estimate the probability of a ticket selling at price p_i and historical listings to estimate the probability of a bid b_i being accepted. Using these probability estimates, we formulate an optimization model to decide whether to make an offer at all (z_i).

Key Challenges: Absence of counterfactuals for $P(\text{accept})$ and $P(\text{sell})$ for validation

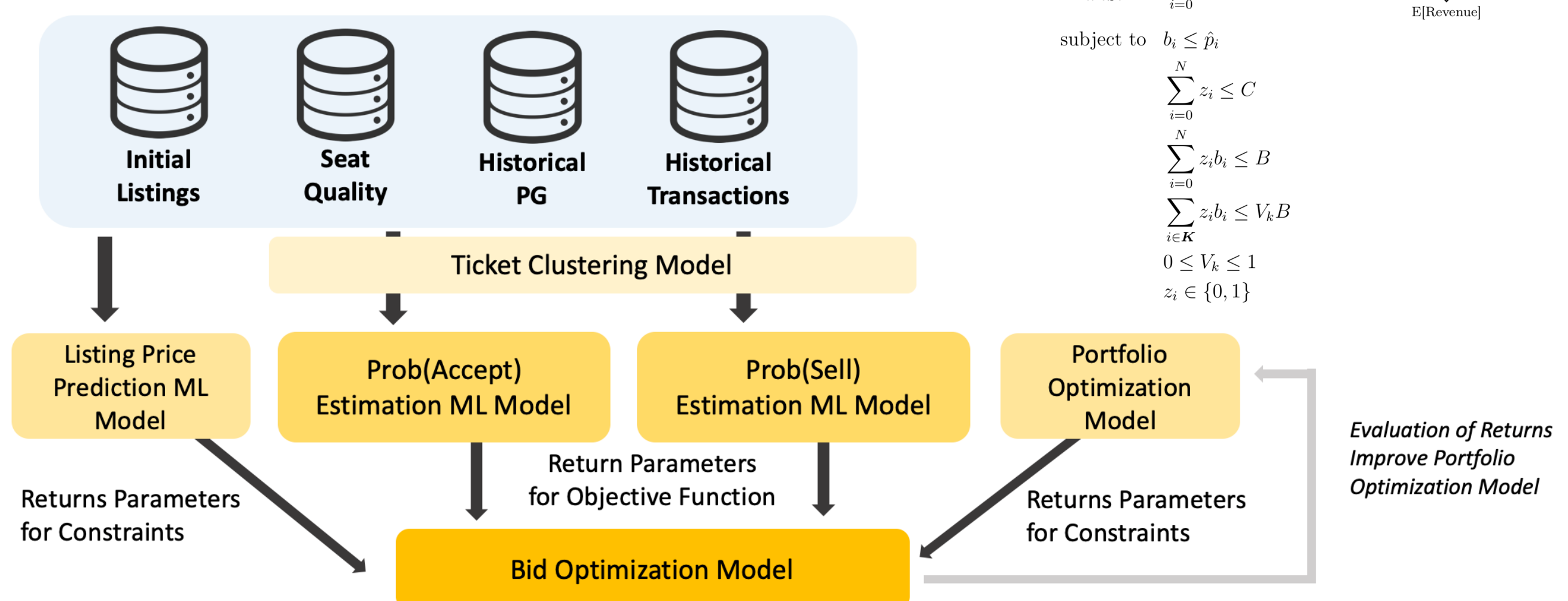


Figure 4: Summary of Proposed Methodology

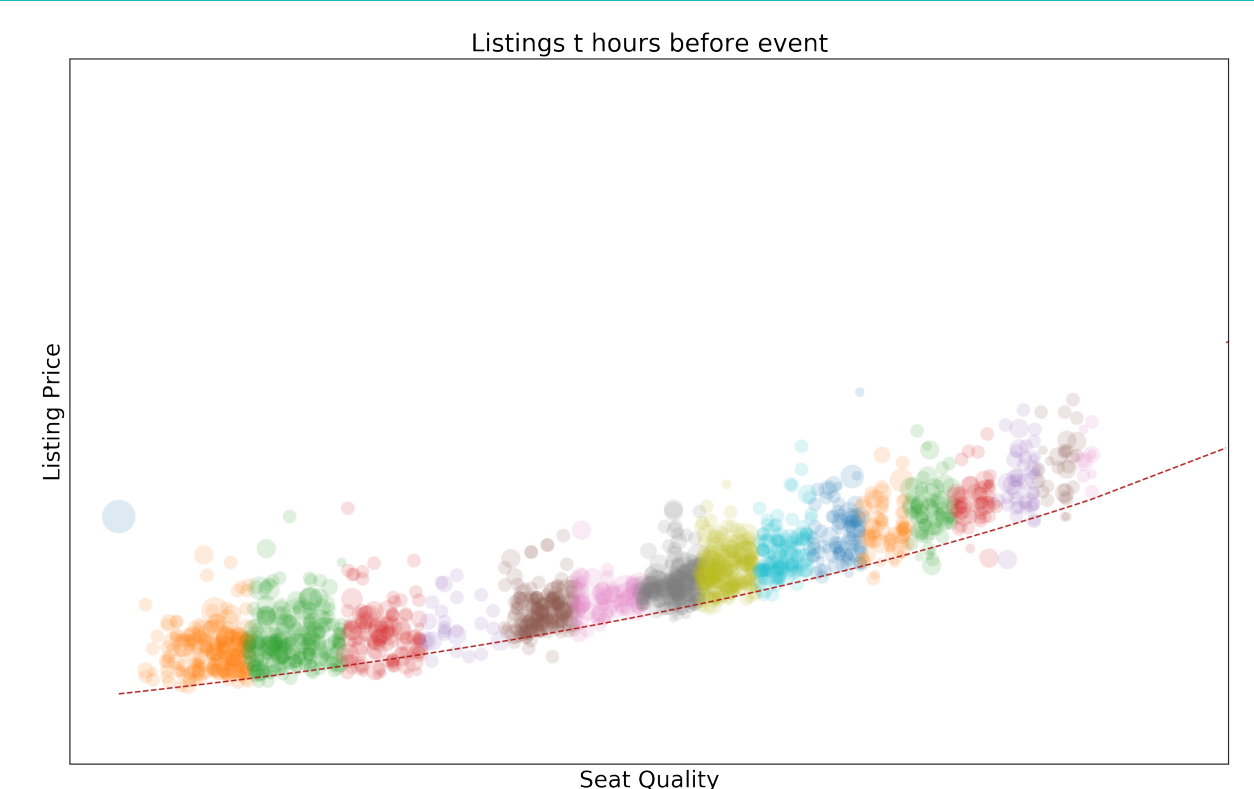


Figure 5: Ticket Clustering

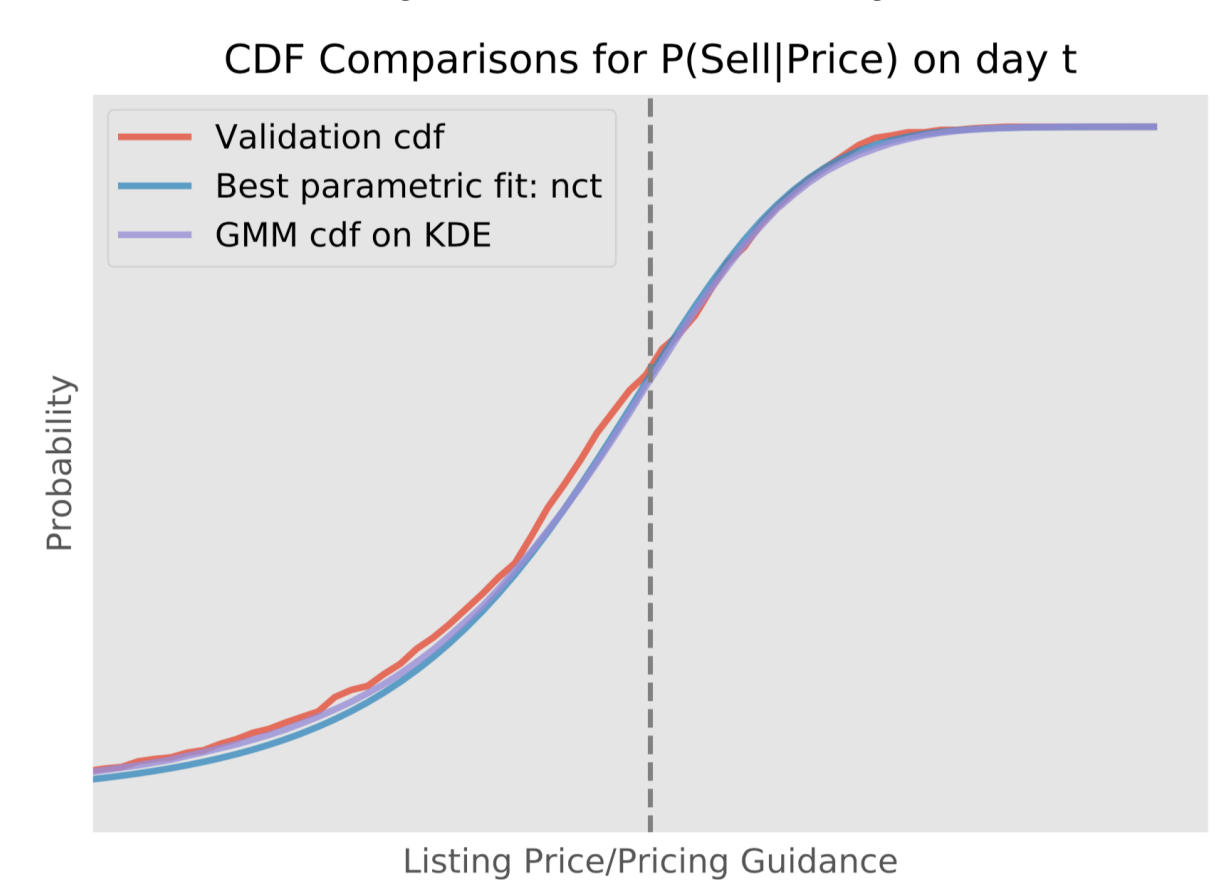
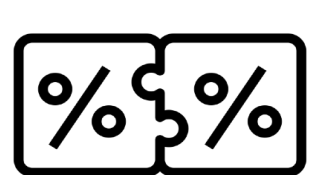


Figure 6: Comparisons of Prob(Sell) Estimates

PROJECT TIMELINE



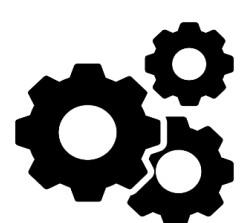
JAN
Matched with StubHub



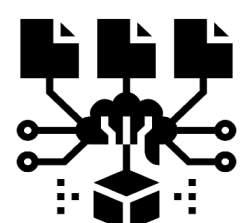
FEB
Project Scoping; Literature Review



MAR
Data Extraction, Cleaning & EDA



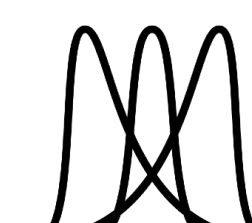
APR
Feature Engineering



MAY
Predictive Model for initial listing price



JUNE
Causal inference model to estimate price sensitivity



JULY
Generative Models; Price and Bid Optimization; Simulation Model



AUG
Optimal Policy Prediction; Variance Estimation & Risk Diversification