Context

Big Mountain Resort is a ski resort in Montana that attracts 350,000 annual visitors of varying levels and abilities. They recently installed an additional chair lift to facilitate visitor distribution, increasing operating costs by $1,540,000 this season. The current pricing strategy is charging a premium above the average price of resorts in its market segment. However, it could be that Big Mountain is not utilizing its facilities effectively. In this report, we explore opportunities to increase revenue or reduce operating costs through increasing ticket prices or cutting services and amenities offered to visitors. We will also review potential solutions proposed by Big Mountain resort management (refer to **Figure 2**).

Model and Analysis

Exploratory analysis was performed on a dataset of 277 U.S. resorts with 35 different attributes. A random forest regression model was also trained on this dataset using 5-fold cross-validation, yielding a mean absolute error of about 9.64 and a standard deviation of about 1.35. This means, on average, that our model is expected to be off-target in its estimation of ticket price by around $9.64.

Key Findings

- Our model suggests that the ticket price should be increased to $95.37. The current ticket price at Big Mountain resort is $81, which would mean an increase of $14.37 in consumer price per ticket.
- By raising the ticket price by $0.88, the resulting increase in revenue will compensate for the $1,540,000 increase in operating costs caused by installing a new chair lift.
- The most predictive features in determining resort ticket prices through our model-based approach were the total number of fast four-person chairs, the number of runs offered, the total area covered by snow-making machines, and the highest vertical drop in feet. Big Mountain Resort is about the 90th percentile in vertical drop, 84th percentile in the area covered by snow-making machines, 92nd percentile in the total number of runs offered, 94th percentile in the total number of chairs, and 94th percentile in the number of fast four-person chairs based on a dataset of U.S. resorts. However, they are only in the 81st percentile in ticket price. Refer to **Figure 1**.
- Out of all the scenarios outlined in **Figure 2**, Scenario 2 is estimated to have the highest positive impact on revenue ($3,474,638) in that adding 150 feet more height to the highest vertical drop offered at the resort (in addition to an extra chair lift) should warrant a $1.99 increase per ticket.

Recommendations

- Because we found that the ticket price at Big Mountain is likely underpriced, we recommend avoiding any reduction in features offered at the resort and instead, focusing on a price increase to adjust for recent losses.

- Using the most conservative approach, we recommend raising the ticket price by at least $0.88 to $81.88 in order to compensate for the increase in operating costs due to the additional chair lift.
- Any further increase in ticket price can be done so incrementally and have its effects on revenue measured quarterly through consumer demand statistics like the number of tickets purchased seasonally. When considering the modeled ticket price increase of $14.37, management should consider the mean absolute error of $9.64 before making any pricing adjustment.
- Based on the results in **Figure 2**, if management wants to increase long-term revenue further, Scenario 2 seems to be the most economical investment in justifying a greater ticket price, which would involve increasing the highest vertical drop by 150 feet in addition to the extra chair lift.

Considerations

- This analysis was performed on a dataset of 277 U.S. resorts with 35 different attributes.
    - Resort entries with missing ticket prices were removed and other missing feature values were imputed using the feature median.
    - This dataset did not have uniform representation across all U.S. states. New York, Michigan, and Colorado account for about 30% of the dataset, where states like Colorado have the highest mean averages of weekday and weekend ticket prices. As a result, our estimation of ticket prices may be heavily influenced by other states where ticket prices tend to be greater. Some states or regions outside Montana may impose additional costs that require the resort to increase ticket prices. Treating all resorts equally regardless of state may have weakened or obfuscated otherwise strong predictors of price.
    - We assume that this data is accurately reported and that resort ticket prices don’t fluctuate from year to year or season to season. For example, some resorts may have invested heavily the prior year which led to a temporary increase in ticket price while the number of features they offer to visitors remains fixed. In this lens, the reason why Big Mountain's modeled price was so much higher than its current price may be that other resorts in the dataset have already priced in their additional operating costs to prepare for the upcoming season.
- The dimensions used in this dataset are limited. Features like resort operating costs and regional demand would be useful in this prediction task.
- Ticket price estimation was based on the weekend price offered at U.S. resorts and did not account for both weekday prices.
- To continue using this model for ticket price estimation, this dataset should be updated to account for new prices (inflation supply and demand, etc.), amenities, and geographic and demographic statistics.

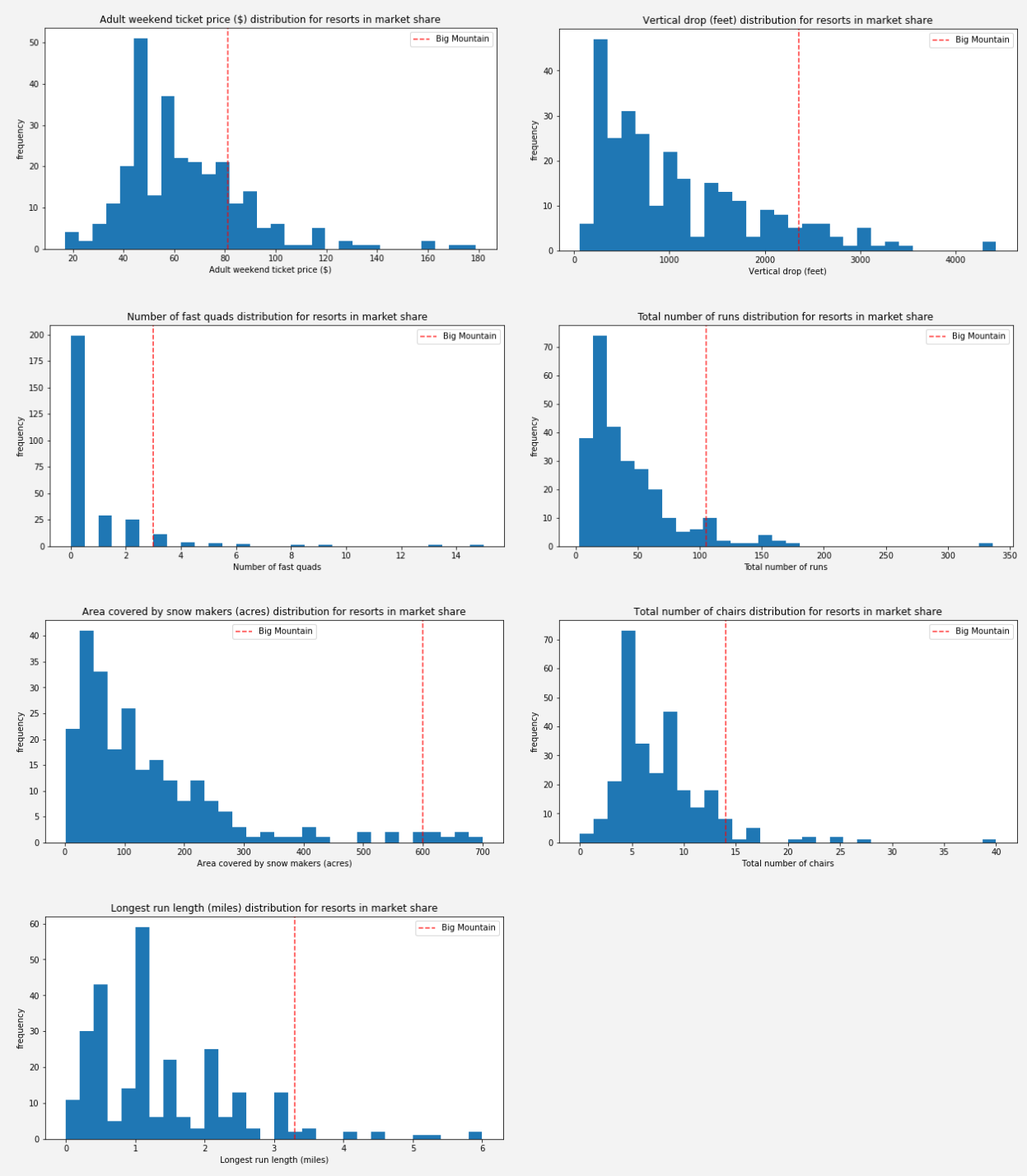

Figure 1. Distributions of the ticket price and important features in estimating ticket price. Big Mountain resort (marked in red) tends toward higher percentiles within these distributions. Left to right (a) The distribution of resort ticket prices where Big Mountain tickets cost $81. (b) The distribution of vertical drop height in feet. (c) The distribution in the number of fast four-person chairs (d) The distribution in the amount of runs offered at the resort (e) The distribution in the

area covered by snow-making machines in acres (f) The distribution of the total number of chairs (g) The distribution of the longest run length in miles

Proposed Solution	Est. Revenue Change
Permanently closing down up to 10 of the least used runs	-$3,170,290 to $0 *
Increase the vertical drop by adding a run to a point 150 feet lower down but requiring the installation of an additional chair lift to bring skiers back up, without additional snowmaking coverage	$3,474,638
Increase the vertical drop by adding a run to a point 150 feet lower down but requiring the installation of an additional chair lift to bring skiers back up, and add 2 acres of snowmaking coverage	$3,474,638
Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snowmaking coverage of 4 acres	$0

Figure 2. Potential solutions proposed by Big Mountain resort management and their corresponding expected revenue increase estimated by our model. * Closing down only one run does not affect revenue based on our model but upon closing two, we expect to see a pretty significant decrease in revenue of $710,144. The revenue decrease of closing down 10 runs is estimated to be $3,170,290.