Big Mountain Resort

Model-based recommendations on increasing yearly revenue

About Big Mountain Resort

- Big Mountain Resort is a ski resort in Montana that attracts about 350, 000 visitors per season
- The current ticket price is $81
- An additional chair lift was recently installed, **increasing operating costs by $1, 540, 000 this year**

How can Big Mountain resort increase yearly revenue to compensate for increased operating costs?

Relevant Unanswered Questions

- What is the most pragmatic approach to increasing revenue: ticket pricing or cutting costs?
- Which resort characteristics are the best drivers of ticket price?
- Given what Big Mountain Resort currently offers, what is the largest justifiable ticket price increase based on other U.S. resorts?

Recommendations

Recommendations

- Big Mountain resort tickets are likely underpriced so we recommend focusing on pricing strategies rather than cost-cutting measures
- **We recommend raising the ticket price by at least $0.88 to $81.88** in order to fully 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
- To warrant a further increase in ticket price, **investing in an additional 150 feet to the highest vertical drop offered is estimated to increase ticket prices by $1.99**, resulting in $3,474,638 in additional revenue.

Modeling and Analysis

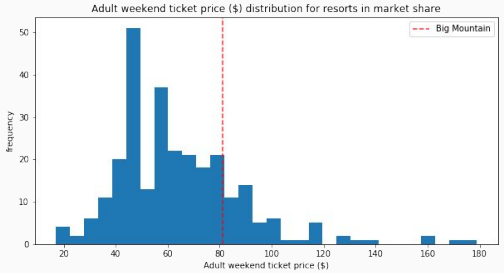
Observed data

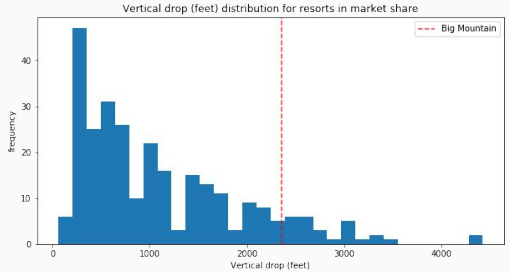
- Analysis and modeling was performed on a dataset of 277 U.S. resorts across 35 different attributes. All states were treated equally.
- Missing values were imputed with the median of the feature.
- Weekend prices represented ticket price in our predictive task, where resorts with missing weekend prices were removed.

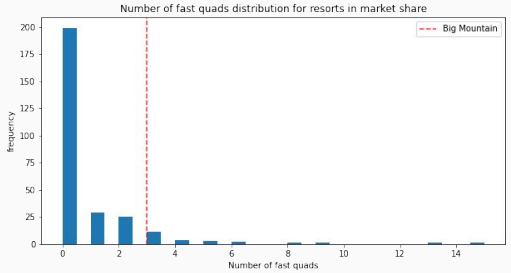
Exploring the data

Big Mountain Resort tends to be in the > 90th percentile for the largest determinants of ticket price with respect to other U.S. resorts. However they are only in the 81st percentile in ticket price.

- 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
- 94th percentile in the number of fast four-person chairs based on a dataset of U.S. resorts.







Full data in Appendix A

Modeling ticket price

- **Predictive task**: Can we predict the ticket price based on geographic, demographic, and service-based attributes?
- Trained linear and random forest regression models and evaluated them using 5-fold cross-validation. Random forest yielded higher accuracy and lower variability in our evaluation.

Model	Mean absolute error (on validation sets)	Standard deviation (on validation sets)	Mean absolute error (on test set)
Linear Regression	10.499	1.622	11.793
Random Forest Regression	9.645	1.353	9.538

Table 1. Mean absolute error and standard deviation based on validation set performance and mean absolute error on the test set for each model. Values are rounded the the thousandths place.

Modelling ticket price

- Our random forest model suggests that the ticket price should be increased to $95.37 ($14.37 increase per ticket).
- Given that there are 350, 000 expected visitors per season who purchase 5 tickets, raising ticket prices by $0.88 compensates for the $1, 540, 000 increase in operating costs and is well within this estimated price range.
- The most important features in predicting ticket price 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.

Bar graph of the most important features in determining ticket price using a random forest regressor

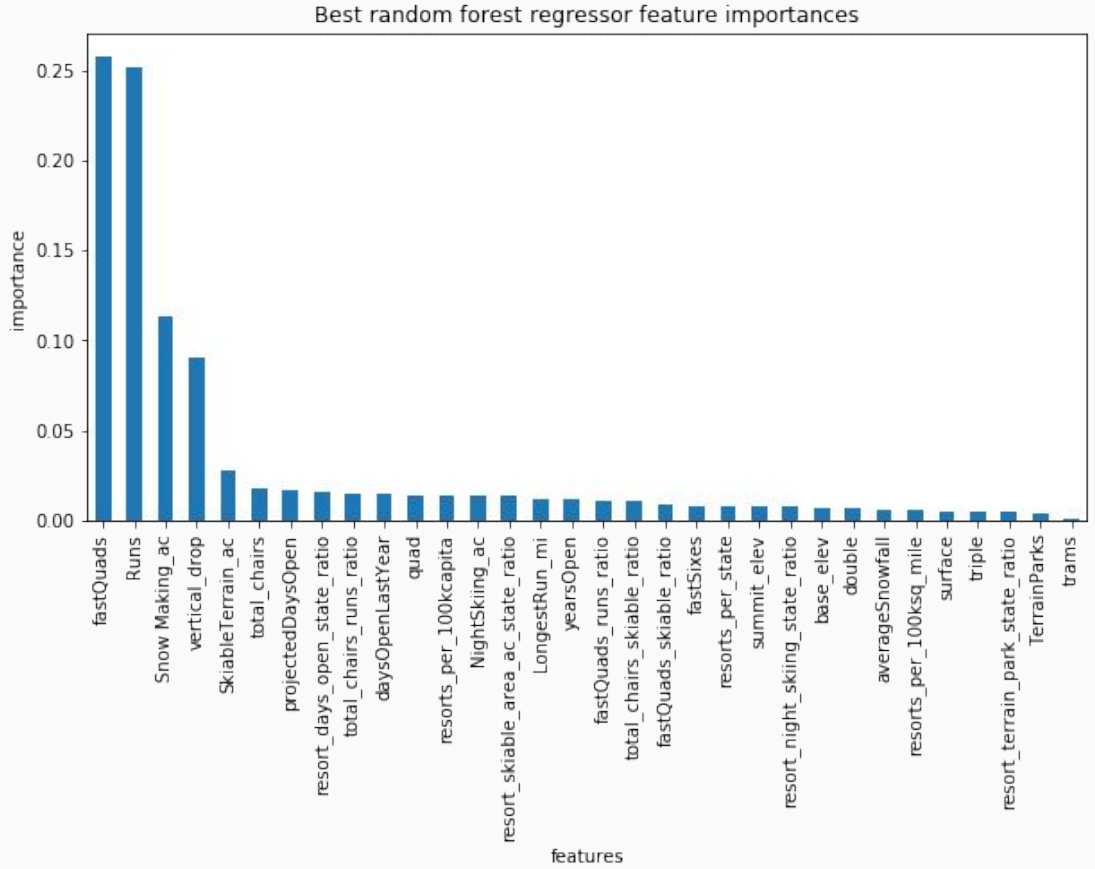


Table of the list of potential solutions proposed by management and their estimated revenue change

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

Table 2. Big Mountain Resort management had proposed a list of potential revenue-increasing strategies. The second solution appears to yield the most revenue while also being the most economical.

Key considerations

- Our chosen model contains some uncertainty in its predictions, illustrated by its mean absolute error of about 9.64 in our testing. This means that we expect its predicted prices to be off-target by about $9.64 on average.
- 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. 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.
- 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.

Summary & Conclusion

- Because ticket prices at Big Mountain resort are likely underpriced, we recommend raising the ticket price by at least $0.88 to $81.88 in order to fully compensate for the increase in operating costs due to the additional chair lift
- Our model predicts that the ticket price should increase by $14.37 from $81 to $95.37. However, because we expect it to be off-target by $9.64 in its prediction, on average, and that our data is limited, operating costs and competitive market analysis should be considered before making large price adjustments
- Investment strategies like increasing the vertical drop by 150 feet should also be considered as a way to justify a higher ticket price and increase long-term revenue
- To continue using this model for ticket price estimation, this dataset should be updated to account for new prices, amenities, and geographic and demographic statistics

Appendix A: Big Mountain Percentiles in Various Feature Distributions