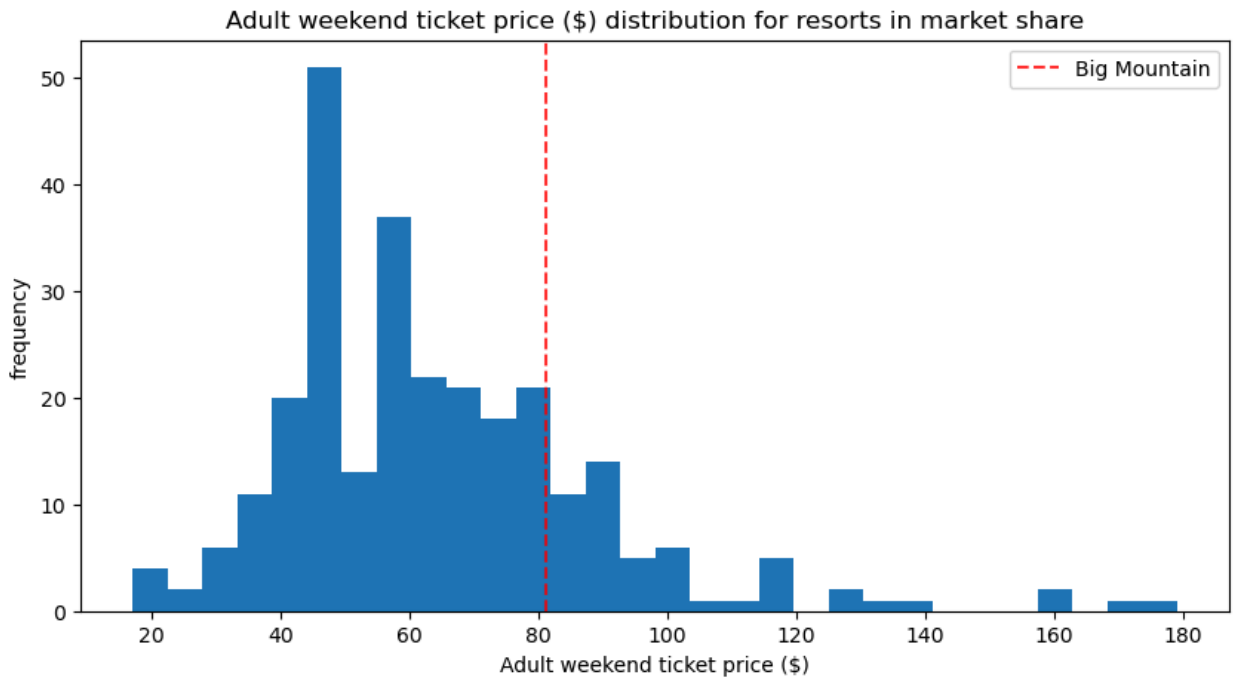
Big Mountain Resort Project Report

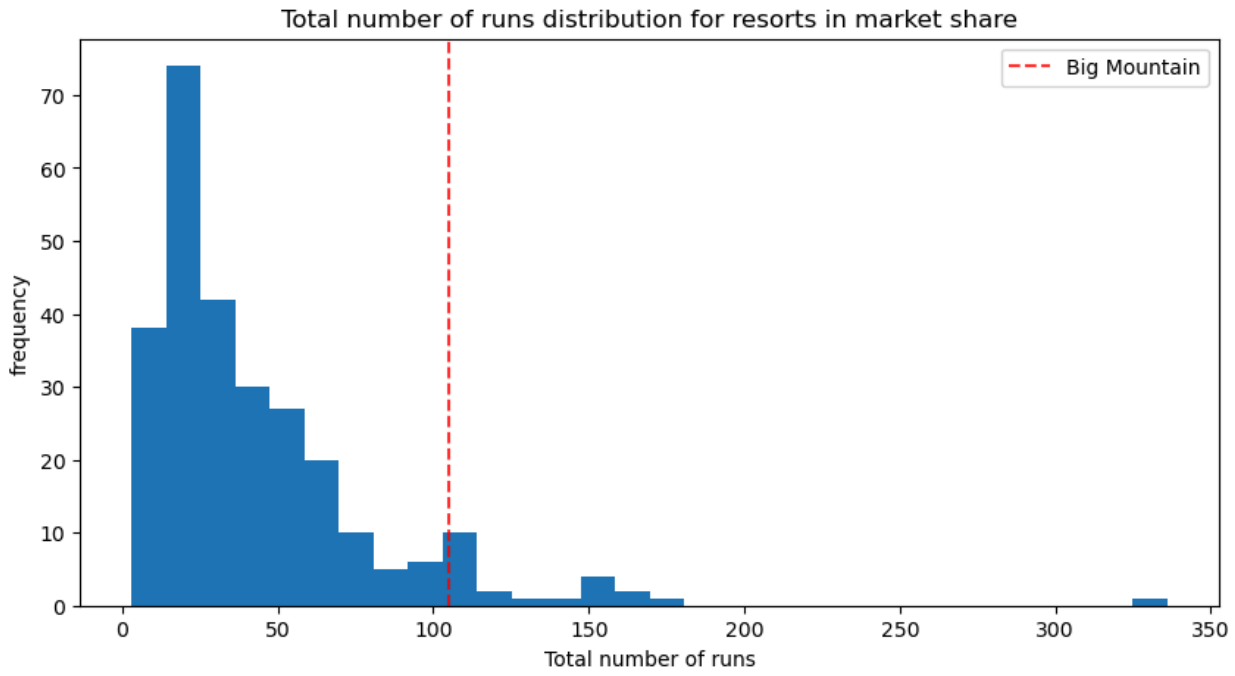
This project was quicked off with the question, “How can Big Mountain Resort reduce its operating costs without undermining ticket price or capitalize on its current facilities to support an even higher ticket price by next season.” We understood that the focus would be on the operating costs and looking in to how we can further capitalize current facilities at the Big Mountain Resort in Montana. To begin we took a look at the Metadata provided by the database manager. This included data from 330 comparable resorts that are apart of the same market share including Big Mountain Resort data as well. Specifically we looked at columns; name, region, state, all tram data, all counts of chairlifts, runs, terrainparlks, total skiable area, days & years open, cost of adult tickets both weekend and weekday, projected days open, and night skiing.

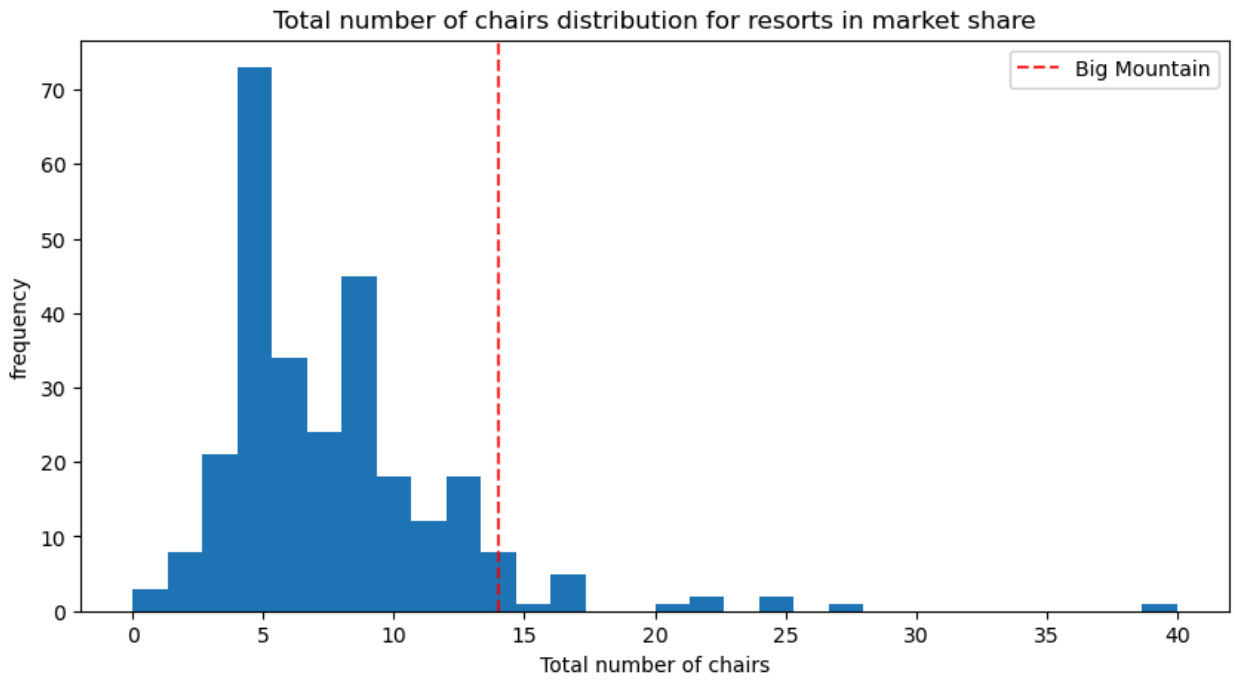
In exploring the data we found the data contained 330 rows, our own resort was present although there was quite a bit of data that was missing. Specially columns fastEight, NightSkiing_ac, AdultWeekday & AdultWeekend. Prior to dropping any rows we first took a look at how many missing values we had by columns, checking to be sure we had appropriate data types assigned to each column, checking for duplicates, and understanding the relationship between the region and state columns. We then created a state-wide summary to understand our particular market segment. The focus here was on TerrainParks, SkiableTerrain_ac, daysOpenLastYear, and NightSkiing_ac. After aggregating we were able to see how many resorts there were per state, along with the totals for nightskiing, terrain parks, totaldaysopen and totalskiablearea. We found that about 14% of the rows had no price data which is when we decided to drop those values addressing through imputation. The distributions show us that the median years open by resort is between 50-70 years with very few resorts staying open past 100 years. The large majority of skiable terrain is sub 1000 acres, terrain parks resemble a non-normal distribution with a long tail, days open last year have a normal distribution averaging around 75-150 days open, and lastly night skiing exhibits a non-normal distribution with the majority of values falling below 200. Our target feature tells us that there is an overall linear relationship between weekday and weekend prices in the market, although in the state of Montana, it appears that all resorts seem to charge the same ticket price on the weekend versus the weekday. I think it would be good to mention that when reviewing Montana resorts we did find that we were missing some resort data for weekday prices therefore we dropped those rows. By the end we were left with a total of 277 rows versus 330 where we started.

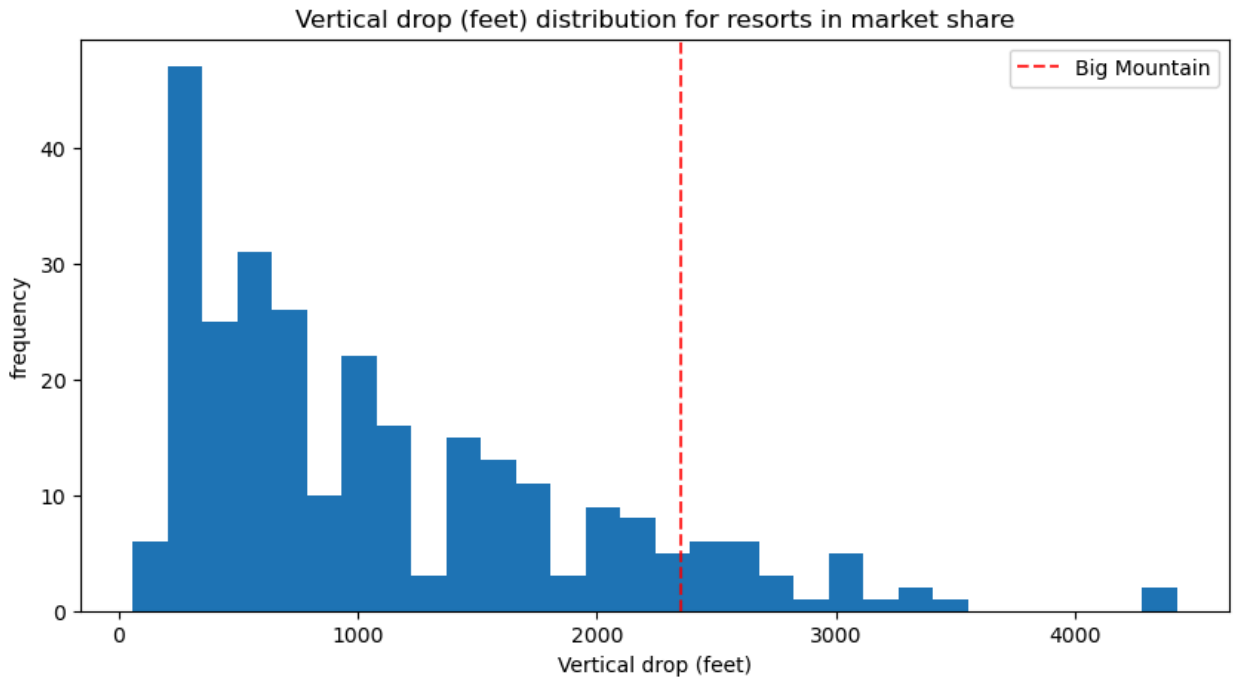
The data includes numerical features like vertical_drop, fastQuads, Runs, total_chairs, resorts_per_100kcapita, and Snow Making_ac. These features were analyzed to see how they relate to the AdultWeekend ticket price, our target variable.

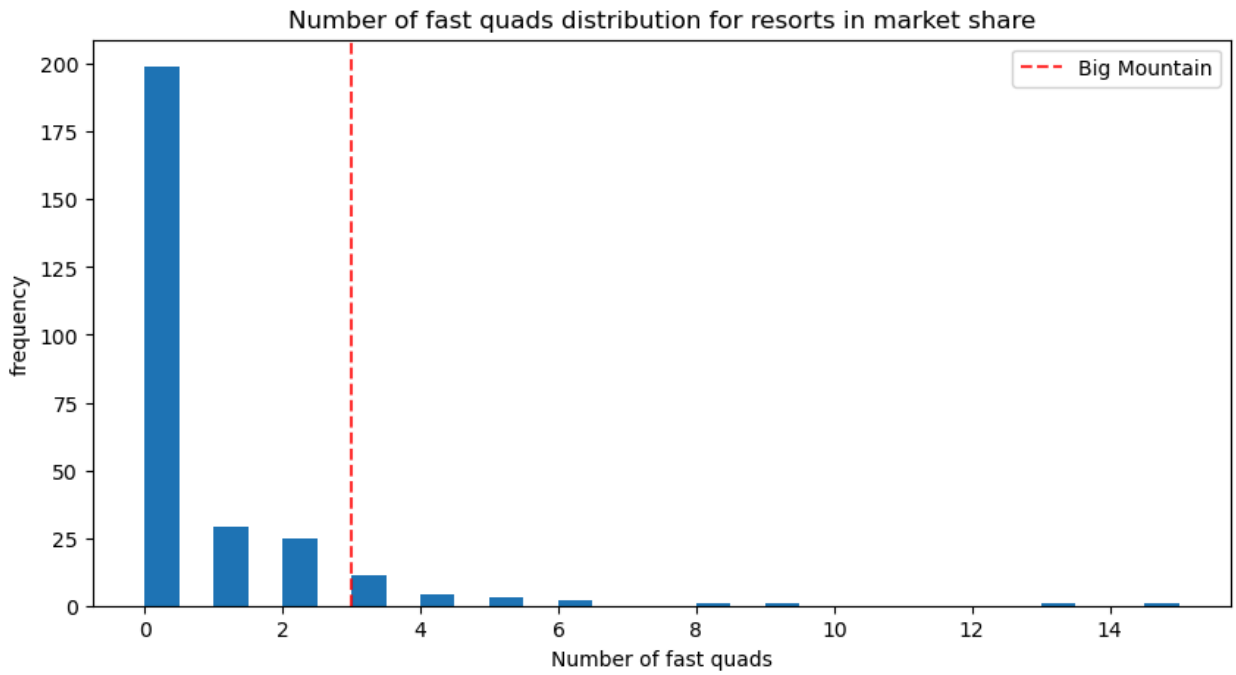


The relationships/patterns that were most notable were total runs & total chairs, vertical drop and fast quads all generally linked in that the more of these variables the higher the ticket price.




Total number of chairs distribution for resorts in market share
Big Mountain
frequency
0
10
20
30
40
50
60
70
0
5
10
15
20
25
30
35
40
Total number of chairs

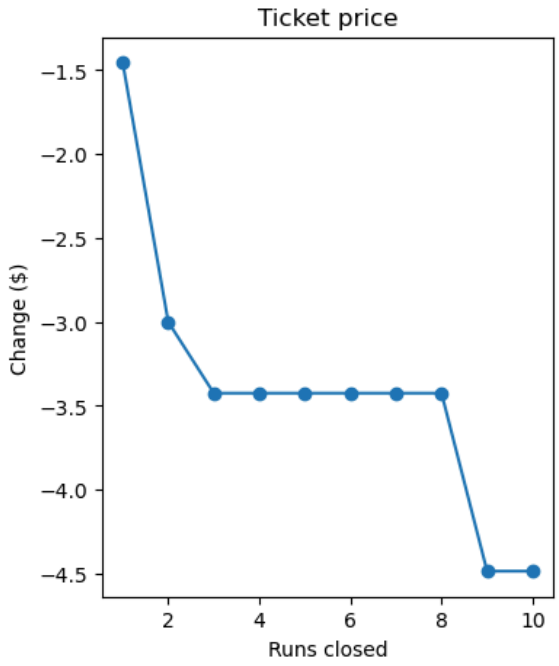

Vertical drop (feet) distribution for resorts in market share
Big Mountain
frequency
0
10
20
30
40
0
1000
2000
3000
4000
Vertical drop (feet)

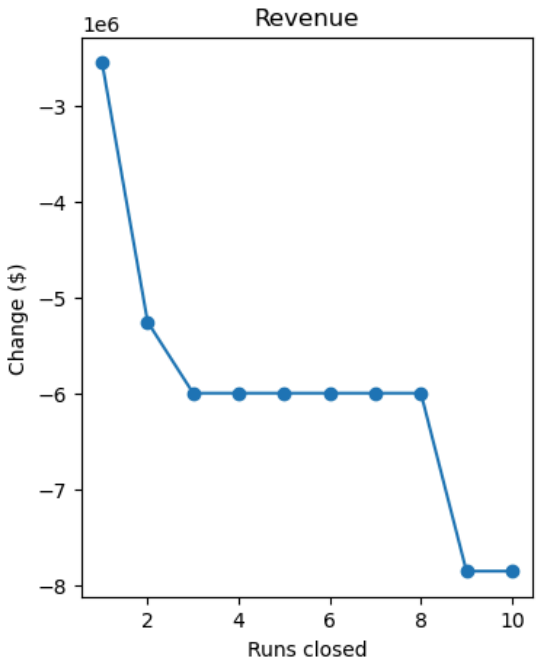


Now understanding the features that where our key focus we then begin to develop our model. We started by using the average ticket price as a simple model to set the benchmark. We then developed a linear regression model identifying that fastquads, runs, snow_making_ac and vertical_drop had the most significant predictors of the ticket price. The model performed consistently well across both cross-validation and test data. We then moved on to random forest regressor where we used median imputation for missing values and standardization. The model outperformed linear regression by having a lower mean absolute error and more stable results. Its consistent performance across different data makes it a stronger choice for business modeling. Based on these results random forest regressor would be a better suit used for pricing strategies since it handles complex, non-linear relationships and has shown reliability in our tests.

We found that Big Moutain Resort is currently charging $81 for an AdultWeekend ticket which places them in the lower 50% of the market share. The model explored several scenarios to understand the impact of various features:

- Scenario 1: Permanently closing down up to 10 of the least used runs. This doesn't impact any other resort statistics.





The model says closing one run makes no difference. Closing 2 and 3 successively reduces support for ticket price and so revenue. If Big Mountain closes down 3 runs, it seems they may as well close down 4 or 5 as there's no further loss in ticket price. Increasing the closures down to 6 or more leads to a large drop.

- Scenario 2: 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 snow making coverage
  -This scenario increases support for ticket price by $8.42

- Scenario 3: Same as number 2, but adding 2 acres of snow making cover
  -This scenario increases support for ticket price by $9.33
  Investing in infrastructure such as trams or expanding the skiable terrain may not substantially impact pricing, suggesting a need for careful consideration before committing to such investments.

- Scenario 4: Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres
  - This scenario results in a 0.0 revenue change so this would not have a meaningful impact.

Given that the features we are aware that carry value, Big Mountain Resort should consider revising its ticket prices to better align with the value provided by its key features. The current pricing structure may not fully capture the potential revenue the resort could generate. Ongoing monitoring

of market trends and customer preferences is recommended to ensure that the pricing strategy remains competitive. Future analyses could incorporate more detailed scenario modeling or integrate customer feedback data to refine pricing further.

The model's effectiveness was measured using metrics such as R-squared, Mean Absolute Error (MAE), and Mean Squared Error (MSE). These metrics confirm the model's strong fit and its ability to predict ticket prices accurately, reinforcing confidence in the recommendations provided. Future work could include customer segmentation to tailor pricing strategies for different market segments, as well as expanding the feature set to include customer satisfaction metrics. These additional insights would further enhance the resort's ability to optimize its pricing and service offerings.