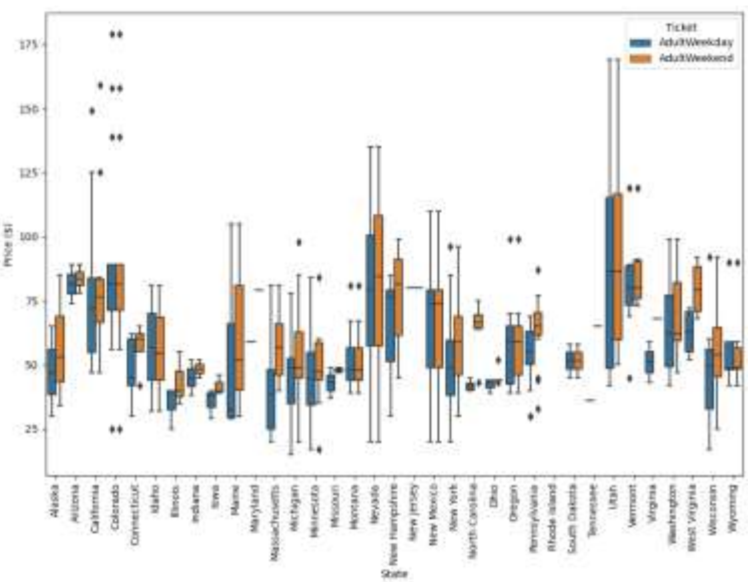
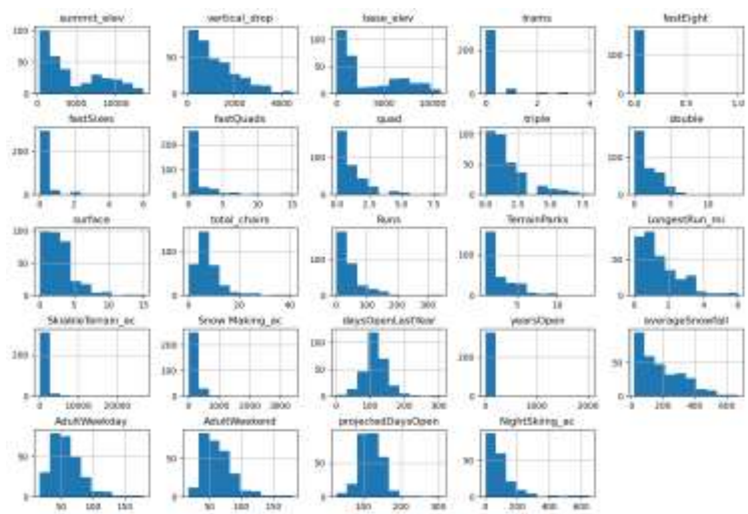
Guided Capstone – Big Mountain Ski Resort Case Study

Rishi Kamdar

Big Mountain Resort is a major ski resort in Montana and boasts incredible mountain views while enjoying an thrilling snow sports experience. The resort has added a new chair lift to increase the distribution of visitors across the mountain and this will increase their operating costs by $1.54m. The analysis we conducted will help determine Big Mountain's ticket pricing strategy for the upcoming season to maximize returns. We will be comparing several features pertaining to ski resorts and comparing those features to other ski resorts across the United States. By running regression and random forest models, we can use those features to statistically determine how much ticket prices could be increased and determine what features have a direct impact on the ticket prices.

We start by cleaning our dataset. We check and manage any null and missing values, particularly for the ticket price columns as that is the variable we are modeling for. Once that is done, we want to do some high-level analysis to determine any outliers that should be removed from the data. The average ticket price, range of ticket prices by state, and distribution of individual features across ski resorts are checked to get a general story about the data.





These visualizations can tell us a few things. First, Montana's average ticket pricing range is not has high as several other states. Additionally, several states have a significant difference between their weekday and weekend pricing. We chose to use the weekend pricing as there were less missing values and because there is no difference between Montana's weekend and weekday pricing. The second graphic shows us which features may be abnormally distributed so that further research and adjustments can be made before analysis. Once the data is cleaned, we merge it with state summary data we found online which includes population and state size information.

Now that the data is ready for analysis, we can explore some of the features of the data in more detail and prepare the data for modeling. The goal of this analysis is to determine which features have a correlation with the price of a weekend ticket. First, we scale the data to normalize the values to their means and their standard deviations. This makes all the features comparable. After checking for variance, we can create some visualizations to look at correlation.

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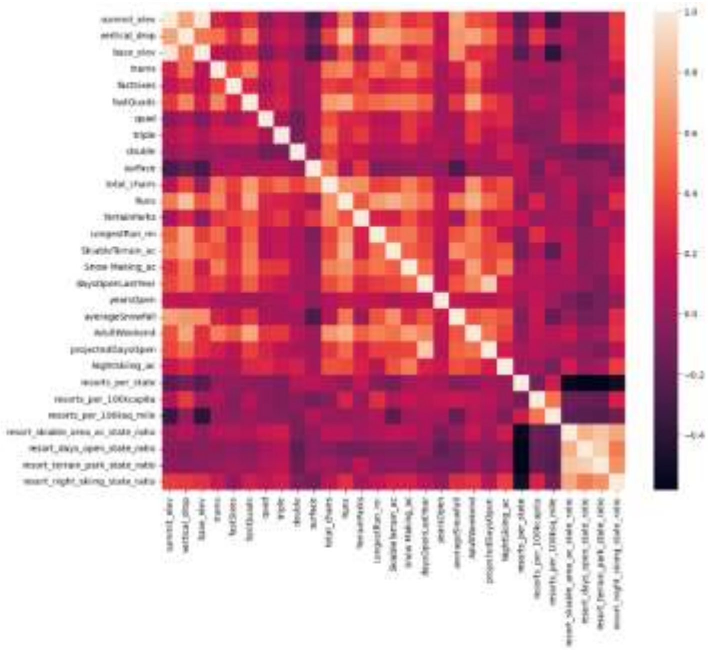
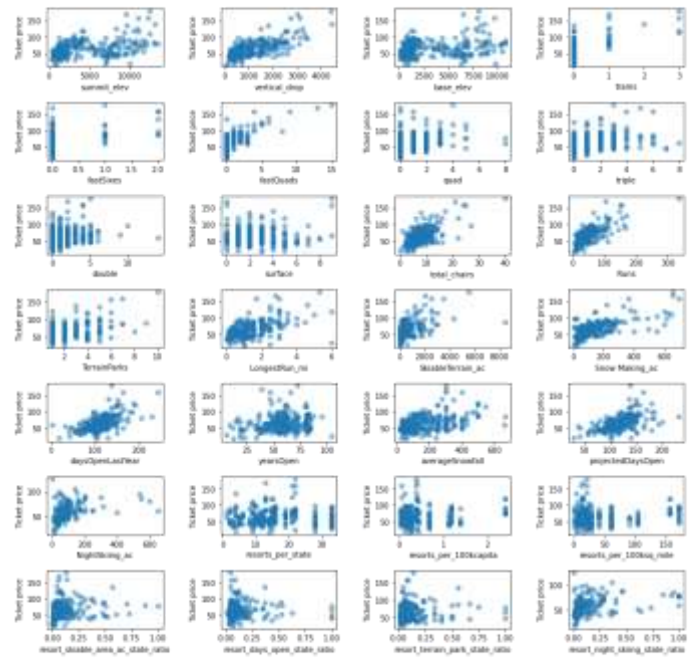


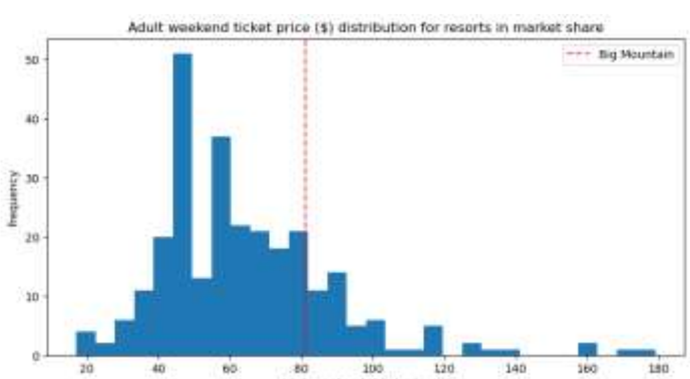


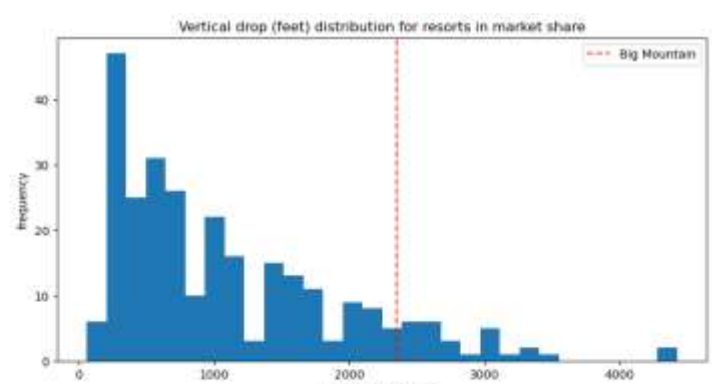
The correlation heatmap and scatter plots can tell us which features are of interest to us. We can see that there is a strong positive correlation with summit, elevation, vertical_drop, fast_Quads, Runs, total_chairs, and snow_making_ac. These are the features that we will be testing in our model.

We now begin to train our data and test it to fit our machine learning models. We do a 70/30 split to get an assessment of how the model will work for future analysis and to make sure that the model we choose does not overfit our current data.

We test the linear regression and random forest models using sklearn and creating pipelines. After running both models, the top 4 features in both models were fastQuads, Runs, snow_making_ac, and vertical_drop. The random forest model had a lower cross validation mean by almost $1 and showed less variability so for that reason, we will be using the random forest model to test our feature based scenarios.

We refit the model after excluding Big Mountain Resort from the dataset to test out the different business scenarios that could affect the pricing strategy. First we look at the distribution the features of interest in comparison to Big Mountain Resort.





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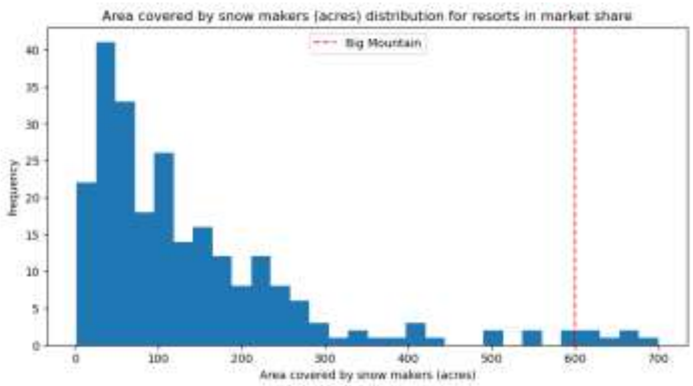

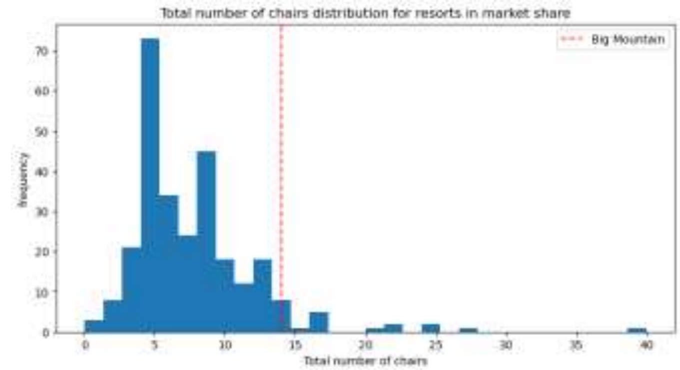

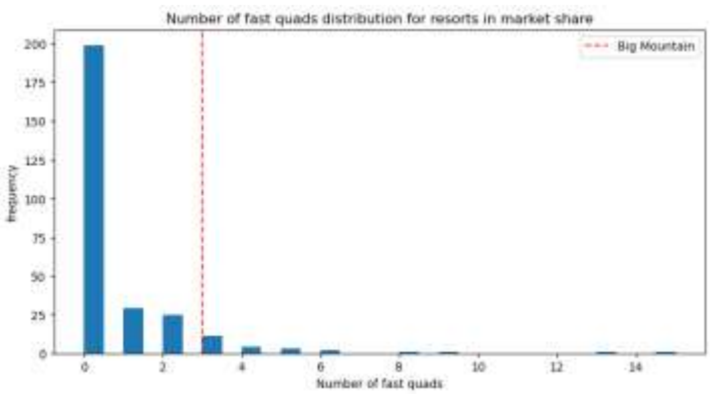

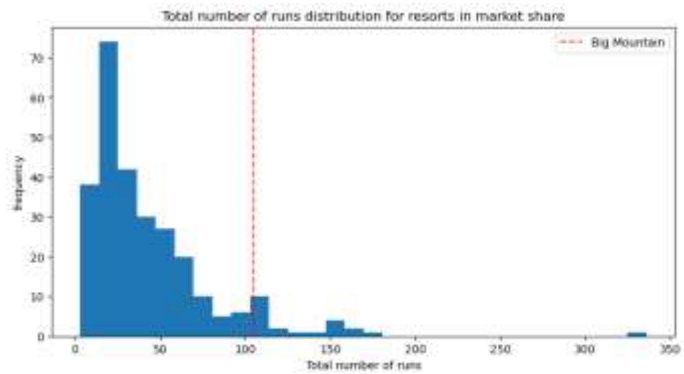

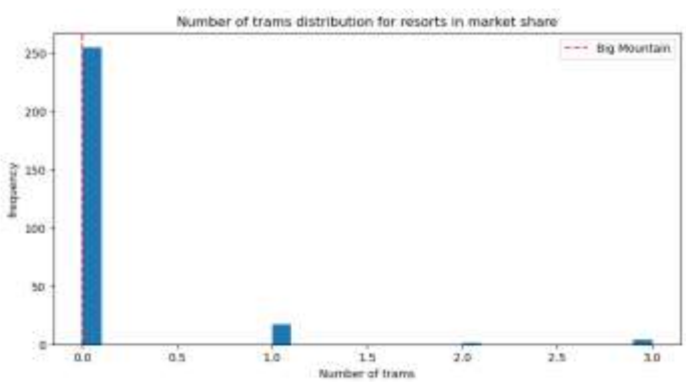

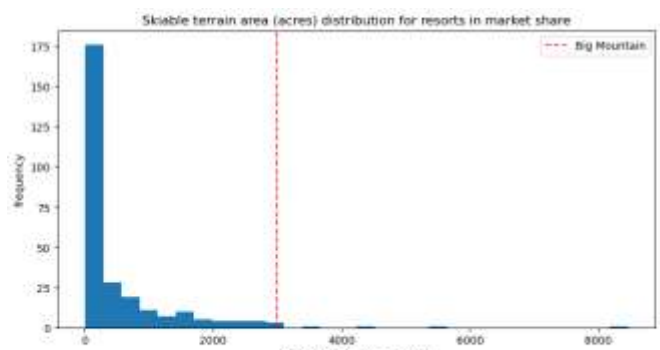

Based on these distributions, we can see that Big Mountain Resort is on the higer side of most of these features and likely can justify an increase in ticket pricing. The question becomes which strategy does Big Mountain Resort want to employ to justify the increased pricing while also maintaining/increasing the expexted visitors per year. The scenarios are listed below.

1. Permanently closing down up to 10 of the least used runs. This doesn't impact any other resort statistics.
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
3. Same as number 2, but adding 2 acres of snow making cover
4. Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres

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Each scenario is put through the prediction model and the outcomes are as follows. The outcome of the first scenario is that the resort can close up-to 4-5 runs before ticket pricing would be significantly affected. The second scenario outcome shows that by increasing the vertical drop and adding a new lift, the resort could increase ticket prices by $1.99 which would generate an additional $3.47m in revenue. For the third scenario, additional snow making showed no impact on the price and same with the last scenario of increasing the longest run by 0.2 miles. In conclusion, increasing the vertical drop and adding a new lift seems to be the best strategy for increasing ticket prices.