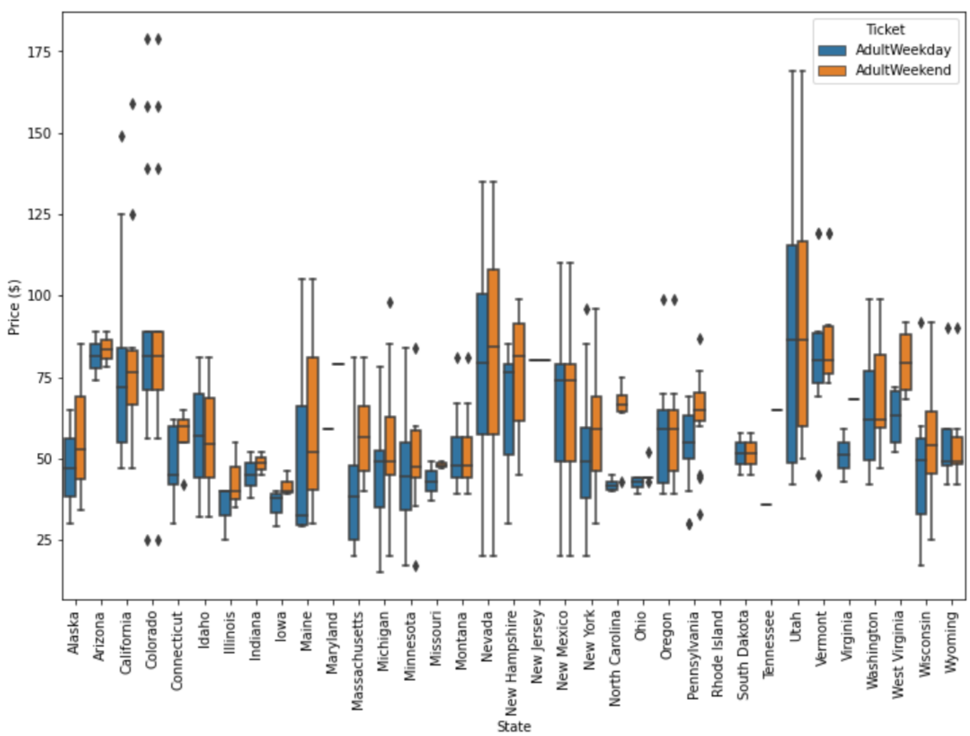
Problem statement

Big Mountain Resort, a ski resort located in Montana, offers spectacular views of Glacier National Park and Flathead National Forest, with access to 105 trails. Every year about 350,000 people ski or snowboard at Big Mountain. This mountain can accommodate skiers and riders of all levels and abilities. Big Mountain Resort has recently installed an additional chair lift to help increase the distribution of visitors across the mountain. This additional chair increases their operating costs by $1,540,000 this season. The resort needs guidance on pricing strategy in order to offset their operating costs by $1,540,000 this season.

Data Wrangling

We were provided with the list of resorts by states with categorical and numerical features. Our initial analysis led us to the discovery of Big Mountain Resort at index 151. We then proceeded to clean the data by removing rows with missing price values and one row for a resort that may not have opened yet. We also eliminated the "fastEight" column, as half of its values were missing and all non-missing values were zero.

Looking at distribution of ticket prices (weekday and weekend) by state we can notice that aside from some relatively expensive ticket prices in California, Colorado, and Utah, most prices appear to lie in a broad band from around 25 to over 100 dollars. Some States show more variability than others. Montana and South Dakota, for example, both show fairly small variability as well as matching weekend and weekday ticket prices. Nevada and Utah, on the other hand, show the most range in prices. Some States, notably North Carolina and Virginia, have weekend prices far higher than weekday prices

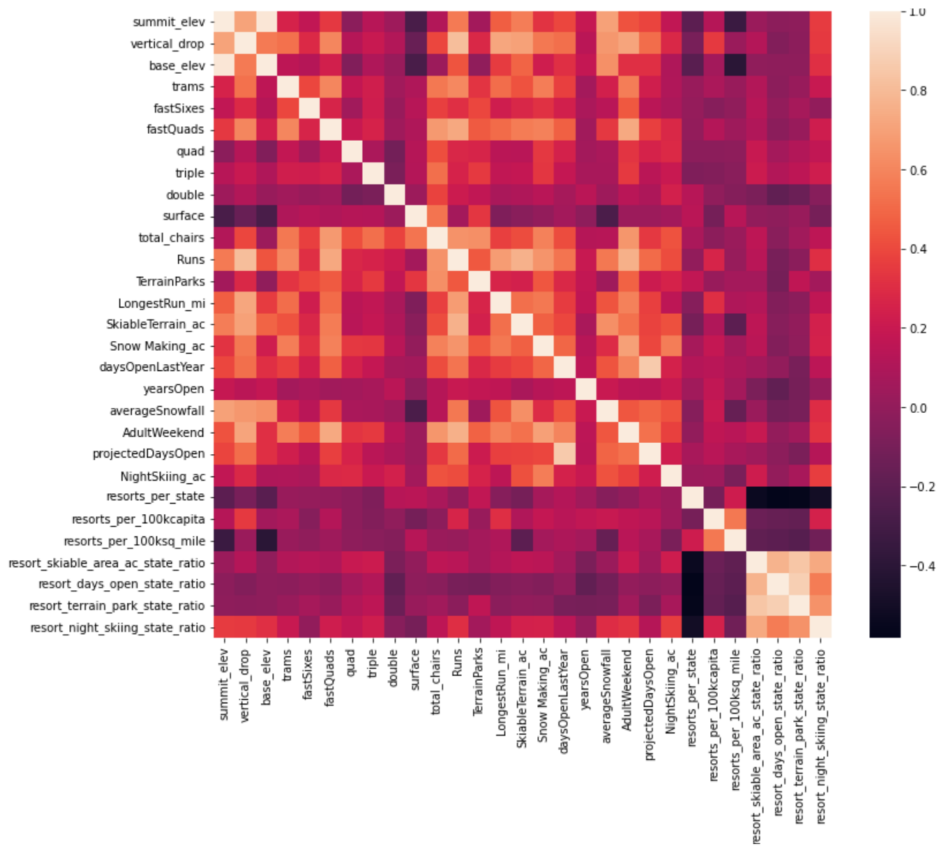


Based on the data provided we can conclude that resort prices fluctuate based on the day of the week, location, and region. One of the observed pricing strategies is the implementation of dynamic pricing, whereby ticket prices are increased during weekends when there is typically a higher influx of visitors, and reduced during weekdays when visitor numbers are lower, in order to entice more guests.

Exploratory data Analysis

In this chapter we analyzed relationships amongst the features and numeric features against the ticket price.

Heatmap below is a great way to gain a high level view of relationships amongst the features.



We came to a conclusion that there is no any correlation between states and ticket price. However there is relationship between ski resort features and ticket price. For example such features as Runs, total chairs and vertical_drop drive the prices up. fastQuads seems useful as well, same as Snow Making_ac, and of the new features, resort_night_skiing_state_ratio can be a selling point too. We can also see that total_chairs_runs_ratio and total_chairs_skiable_ratio can negativy affect ticket prices, so does absence of the fast quads.

Model Preprocessing with feature engineering

We started building our model by using the mean value as a predictor, which allowed us to establish a baseline performance model with estimated value of $19 per ticket using the average price.

Next, we developed a linear model where we used the median and mean to fill in missing values and then trained the regression model. Using this approach, we can estimate a ticket price within $9 which is significant improvement from just guessing using the average.

Finally, we explored the random forest model. Instead of repeatedly checking performance on the test split, we defined the pipeline upfront and assessed performance using cross-validation. This model helped us identify four positive features (fastQuads, Runs, Snow Making_ac, vertical_drop) that are also present in the linear model.

Winning model and scenario modelling

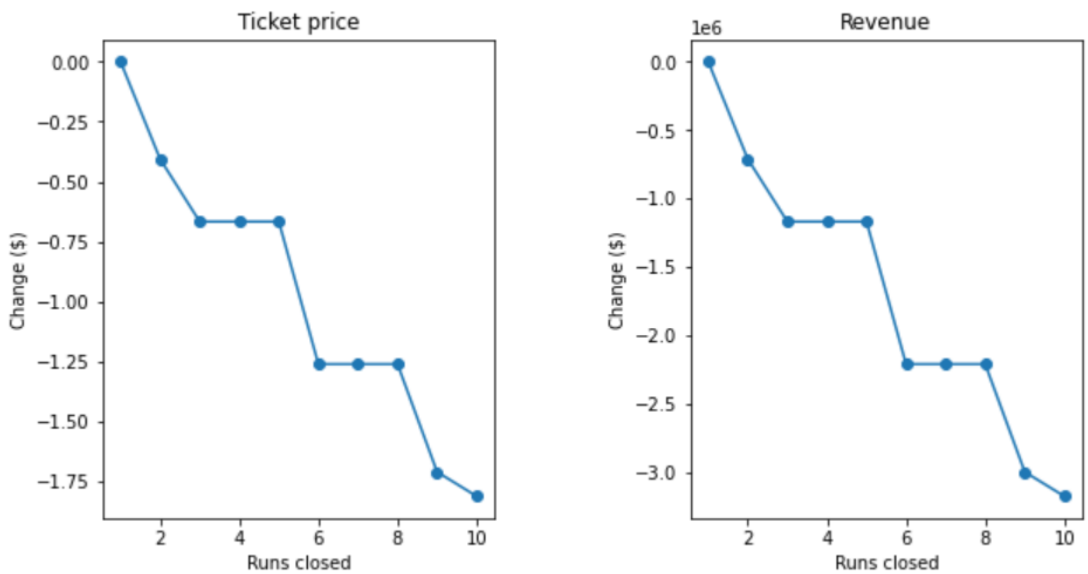
After comparing the performance of the linear model and the random forest model, we decided to proceed with the random forest model as it shows a lower cross-validation mean absolute error by almost $1 and exhibits less variability.

Pricing recommendation

The current price being charged by Big Mountain is $81.00.

Our modeling suggests that Big Mountain Resort could charge a price of $95.87 for its tickets.

In order to achieve an offset of their recent additional operating cost of $1,540,000 (due to the new chair lift) without reducing ticket prices or by increasing them, we recommend reducing operating costs by closing some of the runs at Big Mountain Resort. Our modeling suggests that closing one run would have no impact on ticket prices or revenue, and therefore, could be a good option. However, we do not have visibility into the operating cost per run. Based on our model, closing two runs would reduce support for ticket prices and revenue, but would still allow for a reduction in operating costs. Closing three runs may result in no further loss in ticket prices, which could translate into a reduction in operating costs. I would recommend a gradual reduction in the number of runs to minimize any potential negative impact on ticket prices and revenue.



Conclusion

We have reviewed potential scenarios for Big Mountain Resort for either cutting costs or increasing revenue (from ticket prices). Ticket price is not determined by any set of parameters; the resort is free to set whatever price it likes. However, the resort operates within a market where people pay more for certain facilities, and less for others. Being able to sense how facilities support a given ticket price is valuable business intelligence. This is where the utility of our model comes in. We have determined that closing some of the used runs can help with reducing operating costs. Other options that can also be considered are:

1. 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.
2. Same as number 1, but adding 2 acres of snow making cover.

3. Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres.

Future scope of work

We need to obtain visibility into the weekday ticket prices to determine whether adjustments are needed to attract more visitors during off-peak times. Additionally, we lack data on the operating costs of runs and snow makers, which would be valuable in assessing whether closing runs or adding more snow makers would be beneficial in terms of cost savings or revenue generation.

It's also worth investigating why Big Mountain Resort is currently charging a much lower price than our predicted model. It's possible that the market in Montana cannot support a higher ticket price or that the current customer base values affordability over superior facilities. However, since the resort's leadership has expressed interest in adjusting the price, the model may not be surprising to them.

This model could be shared with business analysts of the company to enable them to test the model for different combinations of parameters. This type of iterative testing could help the resort to make more informed decisions about pricing and operations, as well as identify opportunities for cost savings or revenue generation.