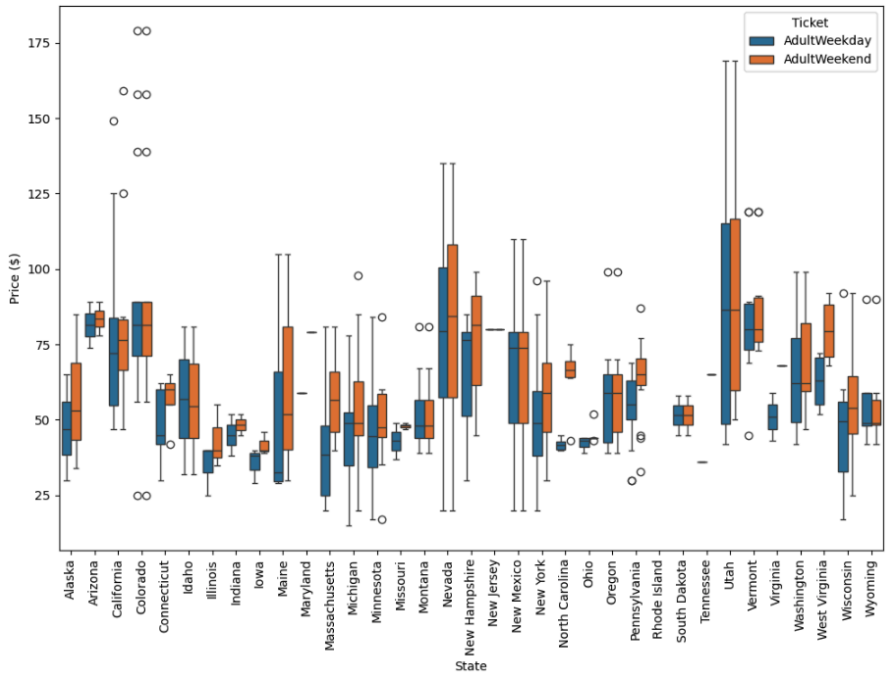
Big Mountain Resort is a ski resort located in Montana with views of Glacier National Park and Flathead National Forest. The resort has recently installed another chair lift which increased their operating costs by $1,540,000 this season. The resort's former pricing strategy involved charging more than the average ticket price for the market. Executives want to know if there is a better way to value their tickets and are looking to balance their profits by cutting costs or implementing new changes that will support an even higher ticket price.

This initiative will be deemed successful if the resort's net profits increase by at least $1,540,000 for the season. This will compensate for the increased cost of the new chair lift. Deprecating less valuable facilities will decrease spending, making the new profit goal more feasible.

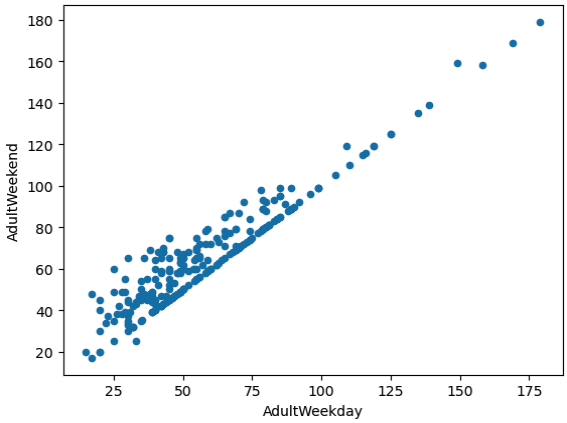
So, the question remains: How can Big Mountain Resort increase revenue this year by cutting operation costs or implementing new luxury accommodations to justify higher ticket prices?

Data Wrangling
The data frame began with 330 rows and 27 columns. I saw one potential duplicate entry, Crystal Mountain, but then found that there are two different resorts in different states. I found the top 5 regions with the most resorts were New York, Michigan, Colorado, Sierra Nevada, and Pennsylvania.

I wanted to see the distribution of weekday and weekend prices by state, shown here in this boxplot:



Some states have quite a lot of variability- Montana, our target state, does not.
There are several entries in the dataframe without data on AdultWeekday or AdultWeekend prices, so I decided to drop these as that is our target metric. Now I could compare weekday to weekend prices:



There is a clear positive correlation between weekday and weekend price. In fact, there seems to be a line where they are the same. We saw in the previous chart that resorts in Montana do have the same price for both. This chart suggests the same is true for many resorts. There is an established precedent for AdultWeekend ticket prices to be higher, so we should focus on changing that price.

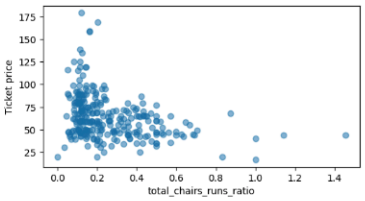
After wrangling the data, the dataframe now has 277 rows and 25 columns.

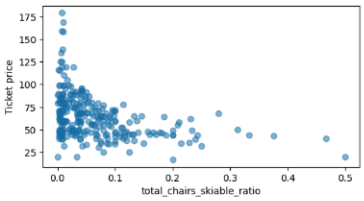
Exploratory Data Analysis

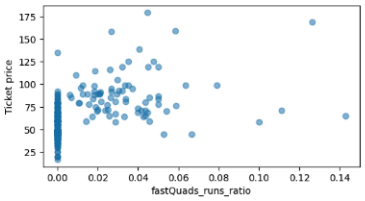
My exploratory data analysis (EDA) showed me that Montanna is in the top 5 states with most skiable areas, though it is not in the top for number of resorts or population. Colorado is in the top 5 for total skiable area and number of resorts. New York has the most total night skiing available.

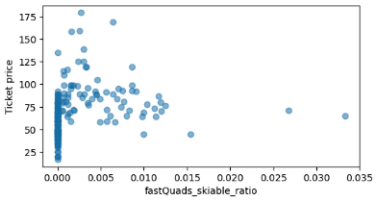
New England states have the highest ratios of resorts to population and resorts to state size. This is most likely because they are smaller states, and are further north than most other states in the USA, contributing to more snowfall and better skiing conditions.

The most useful features found when examining relationships to adult weekend prices were fastQuads, runs, vertical drop, and area covered by snow-making machines. We want to focus on these features in our modeling.





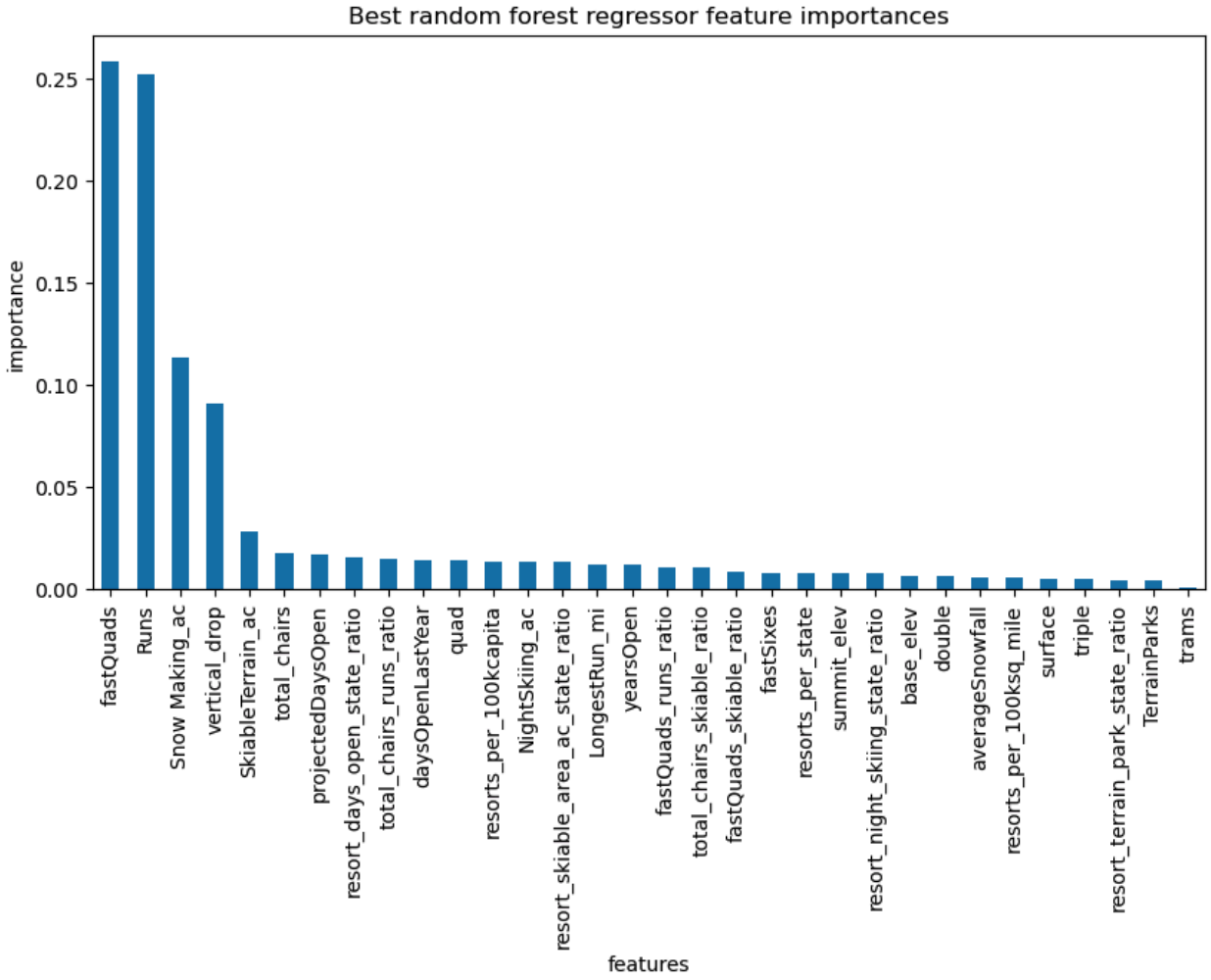




Model Preprocessing

I began modeling by splitting the existing data set into separate training and testing data sets. I then checked how well the average price, calculated from the original set, compared to the training models. They were spot on to the average price of ~$63.81, using a dummy regressor and R-Squared.

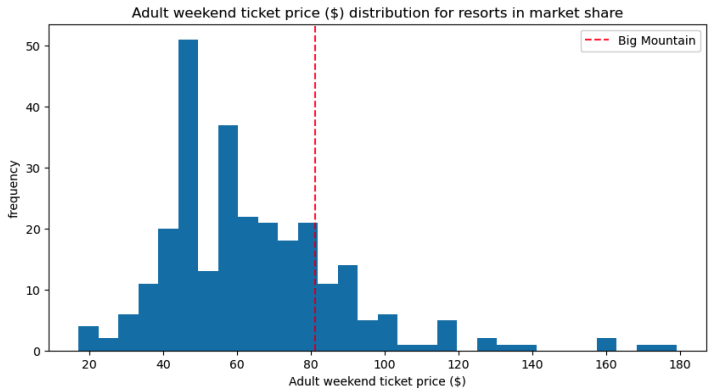
I tried building a linear model with median imputing the missing values. Rather than use all the features, I would use cross-validation with a value of k=8, which yielded the best results. I then tried a random forest model, which confirmed that our four most important features were fastQuads, Runs, SnowMaking_ac, and vertical_drop. The random forest model has a lower cross-validation mean-absolute-error than the linear model by about $1, so I chose to continue modeling with the random forest.



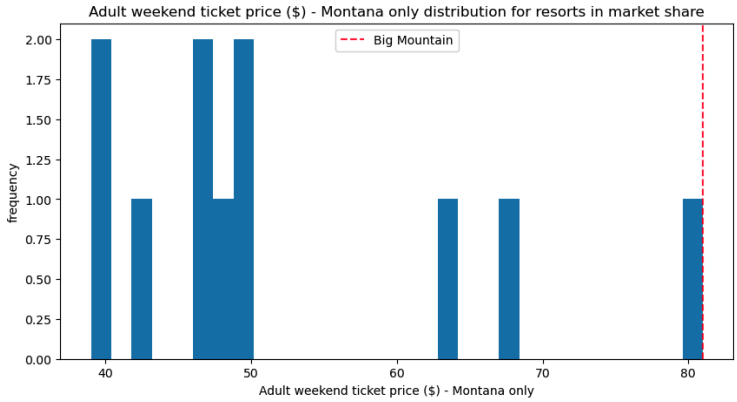
Modeling

I refit the model using all available data, Big Mountain excluded. This would allow me to calculate the expected Big Mountain AdultWeekend ticket price. The modeled price was $95.87- the current price is $81.00. Even with the expected mean absolute error of $10.39, an increased price is justified.

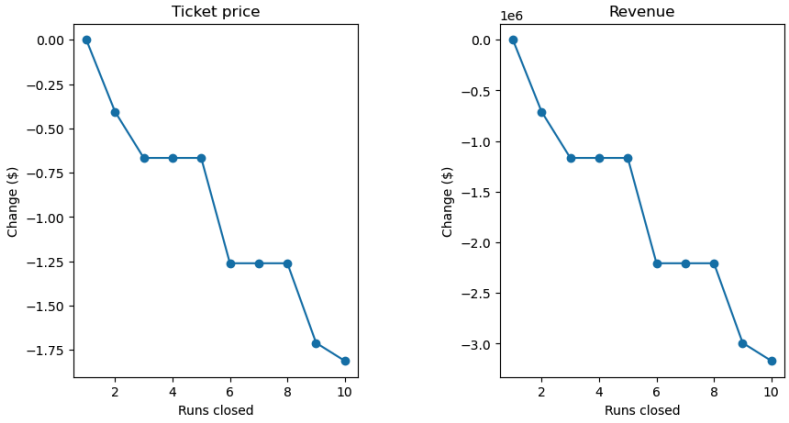
Compared to other states, Big Mountain's AdultWeekend price sits near the middle of the distribution:



Compared to just Montana, however, it is at the top of the range:



Of the shortlisted options for changes to the resort, the data model predicts that closing up to 5 runs would be a safe enough decision to not necessitate a significant drop in revenue:



If Big Mountain were to add a run, increasing the vertical drop by 150 feet, and adding a new chair lift, the model predicts support for an increase in ticket price by $1.99, translating to $3,474,638 more in profit for the season. Adding 2 additional acres of snow making on top of these changes does not support a different price, and therefore adding the additional snow-making is not recommended. Increasing the longest run by 0.2 miles predicts no change at all, so this is also not recommended.

Conclusion

The model definitely supports an increase in ticket price for AdultWeekend tickets. Big Mountain should be able to justify the increase by adding a new run to increase the total vertical drop, even with purchasing a new chair lift. We could also save money by closing down a few chairlifts- I recommend starting with one (least amount of changed revenue) and if that goes well, close up to 4 more.

The modeled price is much higher than the actual price, even though Big Mountain is already at the top of the range for the state, because other states tend to have higher weekend prices than weekday prices. These prices are justified and absolutely should be considered.

Non-technical operations should also be considered for increasing profits, such as lodging amenities, employee salaries, and rentals.