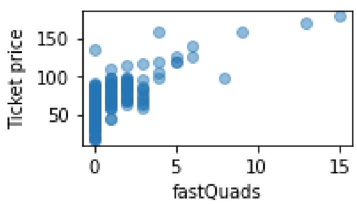
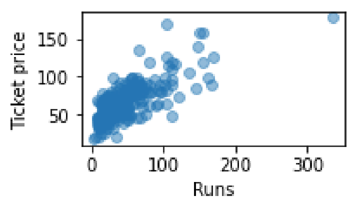
Big Mountain Resort - Report on Increasing Ticket Price Based on Available Features at the Resort

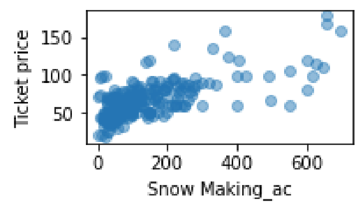
With the addition of a new chair lift, the costs of operation Big Mountain Resort in Montana have increased by more than $1 million. To account for these increased costs, I looked at data comparing 330 ski resorts in the same market as Big Mountain to answer the following question; how Big Mountain Resort can adjust their ticket pricing before next season, by correlating prices to the number of lifts and trams, so that the projected revenue is increased by $1.75 million for this year?

I began by cleaning the dataset of missing values in the AdultWeekend column. The entire fastEights column was dropped due to its skewed distribution among the resorts, as well as having many missing values. The AdultWeekday column was also dropped because it was almost always equal to the AdultWeekend columns, however it had more missing values. I made one correction to the SkiableTerrain_ac columns by using data obtained from the Wikipedia article on the resort in question. At this point, I was satisfied with the dataset, so I began the analysis phase.

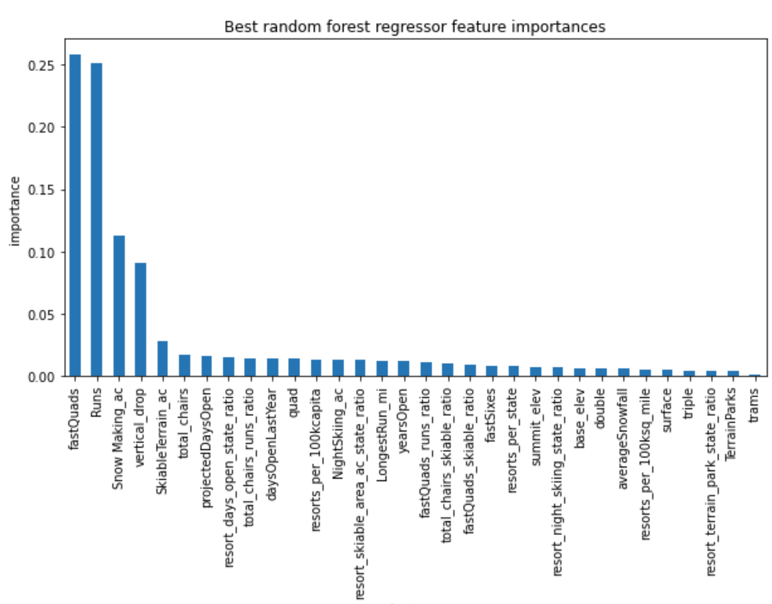
I investigated the relationship between ticket prices and the different features provided by the data. The state that the resort was located in had little effect on the price, as did any other state specific features like resort density. Fast quads, snow making area covered, and runs all have a linear relationship with ticket price. For the modeling, I decided to focus on snow making area and fast quads.





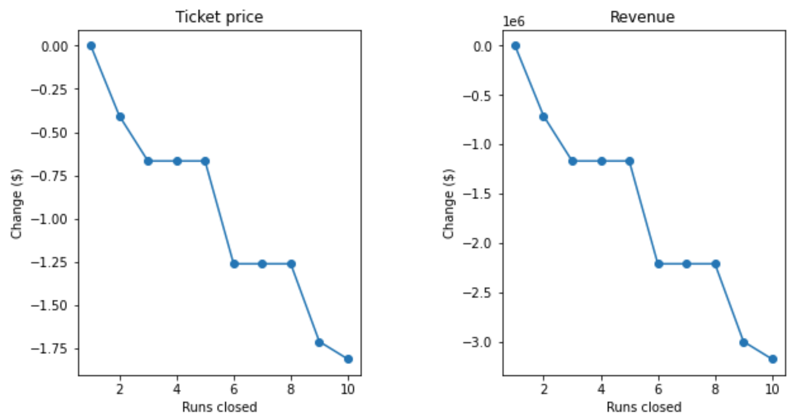


I began the modeling by moving the Big Mountain Resort data into a separate table. I would use the model on it after I had trained the model with the remaining data. The remaining data was then split into train/test data, with a 70/30 split. I then used to mean ticket price to get a baseline of how our model should perform. Using the linear regression model, which produced a mean absolute error of $9.41 for the test data. Results did not change much when the mean was used to impute missing values, instead of the median. I then moved to testing a random forest model, instead. The parameters that were found to best estimate the ticket price were 69 estimators, a median imputer strategy, and no standard scalar. The random forest model agreed with the linear model concerning which features were most important, however it applied more weight to runs and fast quads.



The random forest model, with the aforementioned parameters, predicted that Big Mountain's ticket price would be $95.87, an increase of close to %18. The mean absolute error for this prediction is $10.39, however, fully accounting for this error would still indicate that Big Mountain could raise their ticket price from $81.00 to $85.48, an increase of %5.5. Taking the yearly visitors estimate of 350,000 and the average stay per visitor of 5 days, this would be an increase of revenue of nearly $7.9 million. This is quite a large increase in revenue and may not be the best solution for Big Mountain, as it could leave returning customers with quite the shock.

Big Mountain has made suggestions on paths forward: closing down the ten least used runs, increasing vertical drop, total chairs, and with/without additional snow making area, and increasing the longest run by 0.2 miles. The last option of increasing the longest run showed little promise, as the model predicted that it would have no change on ticket price at all. The first option of decreasing the number of runs produced interesting results. Getting rid of one run had no effect on ticket price/revenue. However, as more runs were removed, the ticket price/revenue began to drop sharply, as shown in the figure above. It should be noted that the runs removed here



were not necessarily the ten least used, as that data was not part of the dataset. The second option of increasing the vertical drop and number of chairs was also promising. The model predicted that this would increase the price of tickets by $1.99, an increase of %2.5, which would increase revenue by almost $3.5 million. Adding the additional snow making coverage to cover the new development would not affect this increase either positively or negatively. Therefore, my recommendation to Big Mountain Resort would be to shut down operation of the least used run and move forward on the plan to increase the vertical drop without the additional snow making area, while increasing the ticket price by %2.5. Big Mountain has recently added a new chair lift that increased operation costs by close to $1.5 million. Assuming the additional chair lift required by my suggestion will increase costs by a similar amount, the remaining profit would be $500,000, without accounting for the decreased operation costs from shutting down one of the runs. Big Mountain ranked high on many important features, thus the increase in ticket price is very reasonable.

Future models would be better trained with more data. For instance, data on the traffic of each run, cost of each run, and any other amenities at the resort, i.e. a spa, a pool, a lounge, etc., would be useful in identifying any non-economical factors that may be contributing to decreased profits.