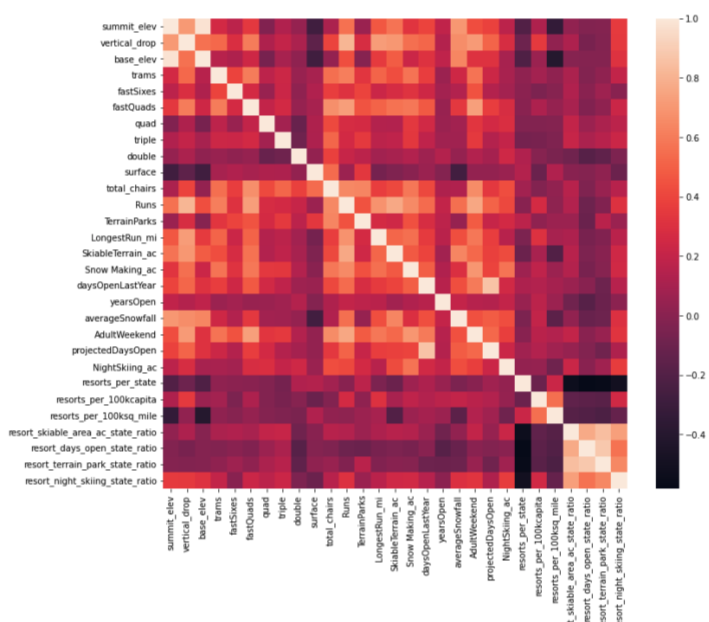
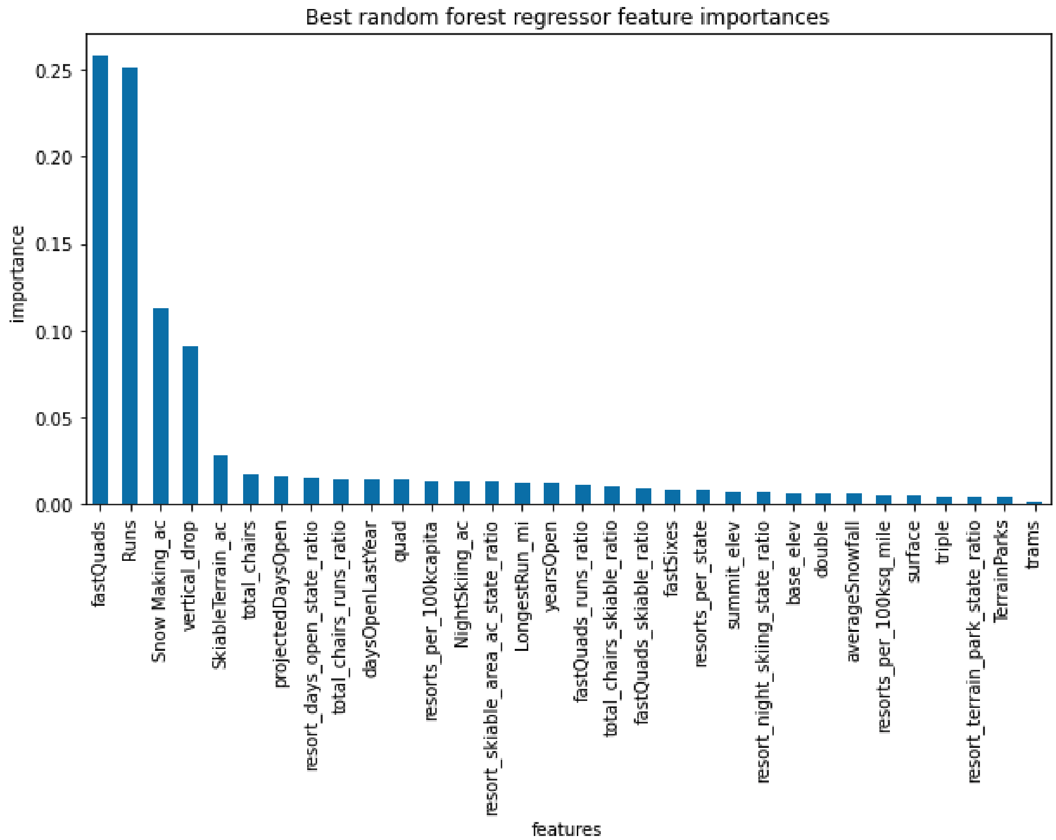
1. Introduction:
   Big Mountain Resort, a ski resort located in Montana, has recently installed an additional chair lift to increase the distribution of visitors across the mountain. This chair increases the operating costs by $1,540,000 this season. There is a suspicion that Big Mountain is not capitalizing on its facilities as much as it could. The business wants the guidance from data science team on how to select a better value for their ticket price and how to reduce the cost without affecting the revenue.
2. Methodology:
   The method we use is to build a model to predict the ticket price from key features of a skiing resort, such as total skiable areas, the number of trams, total chairlifts at the resort etc. The data for training is from the resorts in the same market segment with Big Mountain Resort in US. Both linear regression and random forest regression model are considered which give us insights on which features having the biggest effects on the ticket price. The model also indicates which changes are possible to reduce the cost and increase revenue.
3. Results:
   The heat map indicates the 4 features that impact most significantly on the ticket price are fastQuads (the number of fast four person chairlifts), Runs (number of runs on the resort), Snow Making_ac (total area covered by snow making machines in acres) and the resort_night_skiing_state_ratio (the ratio of the area that is covered in lights for night skiing over the total resort area).



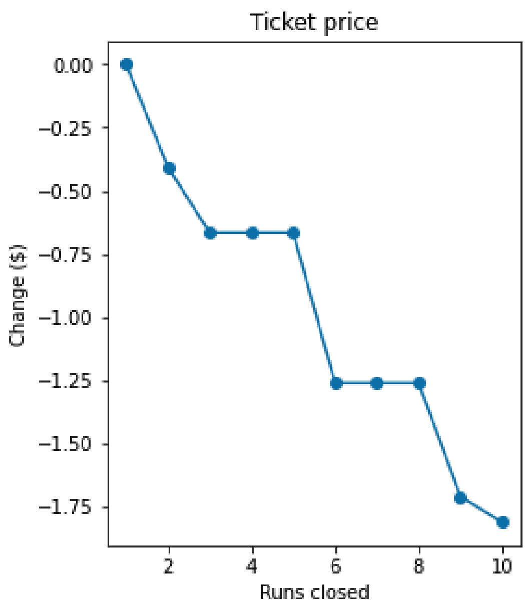
This fact is confirmed by the random forest model we built, which indicates that the top four features that affect the ticket price are fastQuads, runs, Snow Making_ac and vertical_drop. The importance of these features are shown as following:

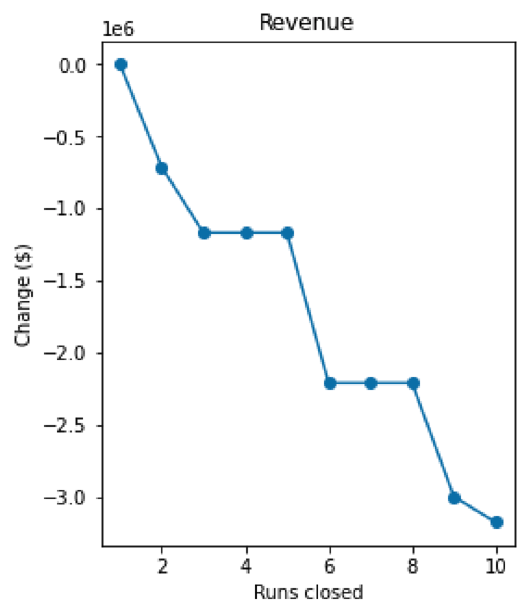


After considering linear and random forest regression models, we decide to use the latter one because it exhibits less variability and lower cross-validation mean absolute error.

4. Recommendations:
   We consider 4 scenarios, which result as following:

   The first scenario is permanently closing down up to 10 of the least used runs. The model says closing one run makes no difference. Closing 2 and 3 successively reduces support for ticket price and so revenue (about 0.67 for each visitor if we close 3 runs). 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 (decrease 1.26 for each visitor for closing 6 runs, which corresponds to $2.2 million dollars lost in revenue).





The second scenario is to 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 8.61. Over the season, this could be expected to amount to15065471 increase in revenue. However, the additional chair installation will cost $1,540,000 for operation fee.

The third scenario is the same as number 2, but adding 2 acres of snow making cover. This scenario increases support for ticket price by 9.90. Over the season, this could be expected to amount to 17322717 increase in revenue. We can see that adding 2 acres of snow making cover makes no big difference.

The last scenario is to increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres. The model indicates no difference here whatsoever. Although the longest run feature was used in the linear model, the random forest model (the one we chose because of its better performance) only has longest run way down in the feature importance list.

5. Conclusion:
   We would suggest to follow the second scenario since it has the highest pay-off. The revenue we can get is around 15millionwhilethecostisjust1.5 million. Even if we raise price to cover this operation cost of the new chair lift, the ticket price is only 0.88 higher. This increase is very small compared to the current ticket price at 81 so the customers will not be unhappy. Closing the least used run can be tried as well. Since closing one run has no effect on the price, we can try closing one run first. Then we can try closing 5 runs, then 8 runs etc. to see if it benefits our business. However, since we don't know the cost of keeping runs open, we cannot measure exactly how much we can save if we close one run. If we have this data ,and also the data on the cost of adding a run, snow making cover facilities etc., we can calculate the return of each proposals to find the best option with more confidence.