Big Mountain Resort ski resort in Montana wants to select better value for their ticket price, based on the premise that Big Mountain can capitalize on knowledge of the comparative importance of their facilities to adjust ticket prices. This contrasts with the current strategy of charging a premium above the average price of resorts in the same market segment. Big Mountain Resort has been reviewing potential scenarios for either cutting costs or increasing revenue (from ticket prices)

To implement changes that Increase revenue and support higher ticket prices or ticket sales, one target was to acquire a new chair lift. To successfully hit this target, Big Mountain would have to earn enough revenue this season to offset the $1,540,000 cost of the newly acquired chair lift.

Such a move was too risky to try in real life without further analysis. To test the feasibility of our strategies, we created a predictive model that was trained by incorporating data from all ski resorts in the United States.

Big Mountain 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.

We compared the performance of the best linear regression model to that of the best Random Forest model using mean absolute error.

Linear regression means absolute error for the training data mean and std deviation was 10.5 and 1.62 respectively. Mean absolute error for the test data was 11.8.

Random Forest mean absolute error for the training data mean and std deviation was 9.72 and 1.36 respectively. The mean absolute error for the test data was 9.41.

The Random Forest model has a lower cross-validation mean absolute error by almost $1. It also exhibited less variability. Therefore, the Random Forest modeling method was the choice we went with. However, when we compared both models, the features that showed the most importance for ticket price in the market context were:

* vertical drop distance
* Snow Making acreage
* total chairs
* number of fast Quads
* number of runs
* length of the longest run
* number of trams
* skiable terrain acreage

Current ticket prices for Big Mountain were not the highest in the nationwide market (figure 1). However, Big Mountain ticket prices were the highest in its home state of Montana (figure 2).

A graph of a number of blue bars

Description automatically generated with medium confidence

Figure 1. Frequency of ticket prices across ski resorts in the United States. The red vertical line shows the Big Mountain ticket price ($81)

A graph with blue lines

Description automatically generatedFigure 2. Frequency of ticket prices across ski resorts in the state of Montana . The red vertical line shows the Big Mountain ticket price ($81)

We refit our model to use all data except the data available for Big Mountain. i.e., we excluded Big Mountain data from the model to train it entirely on data from other resorts. The expected Big Mountain ticket price using the model was $97.96 This suggests that without any changes to the facilities a price increase to $97.96 will be on par with other resorts in the nationwide market if the information used in the model is complete enough to predict accurately.

Because Big Mountain prices were already the highest in Montana. Options for cutting costs were eliminated because they would not present viable scenarios for increasing revenue from ticket prices or sales.

The model was used to consider options for facility changes on the basis that each visitor averaged 5 ticket purchases per season. Options under consideration were as follows:

1. Permanently closing down up to 10 of the least used runs without changing anything else in the resort.

The result was that closing one run made the least difference in ticket price ( $0.50 ticket price reduction), and just over $1.5 million reduction in seasonal revenue. Closing 2 runs reduced ticket prices (by about $1.20) and revenue (by over $2 million per season). This was exacerbated if 3 runs were closed, but there was no difference in the effect of closing 3, 4 or 5 runs (close to $1.50 ticket price reduction and $2.5 million revenue reduction). Closing 6 runs further reduced ticket prices and revenue dramatically, but there was no difference in the effect of closing 6, 7 or 8 runs (about $2.20 ticket price reduction and $3.9 million revenue loss) . Closing 9 or 10 runs reduced ticket prices and revenue further than closing 8 runs, and to the same degree.

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.

The result was that this scenario increased support for ticket prices by $2.22 and projected a seasonal revenue of $3,888,889.

1. Same as number 2, but adding 2 acres of snow making cover. Scenario 3 increased support for ticket prices by $1.99 with projected seasonal revenue of $3,474,639
2. Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres. This scenario produced no expected changes in ticket prices or revenue.
3. Simply adding an additional chair lift. i.e., increasing the “total\_chairs” from 1 to 2. The result of this (scenario 5) was an increase in support for ticket prices by $1.00 and expected season revenue of $3,888,889.

Because Big Mountain prices were already the highest in Montana. Options for cutting costs were eliminated because they would not present viable scenarios for increasing revenue from ticket prices or sales. Options 2 and 3 validated the proposal to add an additional chair lift. Option 5 indicated that the chair lift alone was more important than changing vertical drop or snow cover acreage, and could increase both revenue and ticket prices. Revenue from an additional chair would offset the $1,540,000 cost of the newly acquired chair lift by $2,348,889 in a single season. The model justifies the addition of a chair lift.