**Guided Capstone Project Report – Big Mountain Resort**

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. These are serviced by 11 lifts, 2 T-bars, and 1 magic carpet for novice skiers. The longest run is named Hellfire and is 3.3 miles in length. The base elevation is 4,464 ft, and the summit is 6,817 ft with a vertical drop of 2,353 ft. 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's pricing strategy has been to charge a premium above the average price of resorts in its market segment. They know there are limitations to this approach. There's a suspicion that Big Mountain is not capitalizing on its facilities as much as it could. Basing their pricing on just the market average does not provide the business with a good sense of how important some facilities are compared to others. This hampers investment strategy. The business wants to select a better value for their ticket price. They are also considering several changes that they hope will either cut costs without undermining the ticket price or will support an even higher ticket price.

The average ticket price for a ski resort in US is 19$.This depends on multiple features like state population, facilities available, vertical elevations etc. Trying to fit a model to predict the market ticket price resulting in the below observation -

1. Initial model showed ticket price to be around 9$ by just taking the average into consideration, which is much better than $19. However, this needs to be analyzed further for accuracy. Also, it feels like the features are being overfitted
2. A better Linear model was trained on the data set with different permutation of K folds and the ticket prices showed an value close to $10.50. Below are the features that shows significance to the ticket price.

* vertical\_drop
* Snow Making\_ac
* total\_chairs
* fastQuads
* Runs
* LongestRun\_mi
* trams
* SkiableTerrain\_ac

SkiableTerrain\_ac and Trams showed negative association with the ticket price, and it didn’t make sense. So, a better Random Forest Model was adapted.

1. Random Forest Model was adapted on the training data set with K fold, and it showed a promising ticket price around $9.50. This is even better than Linear Regression model. The key features that showed significant association are below

* fastQuads
* Runs
* Snow Making\_ac
* vertical\_drop

The random forest model has ticket price lower than $1 compared to the previous mode. It also exhibits less variability. Verifying performance on the test set produces performance consistent with the cross-validation results.

## Now coming to the Big Mountain Resort In Market Context -

### **Vertical drop** -Big Mountain is doing well for vertical drop, but there are still quite a few resorts with a greater drop.

* **Snow making area**- Big Mountain is very high up the league table of snow making area.

### **Total number of chairs** -Big Mountain has amongst the highest number of total chairs, resorts with more appear to be outliers.

### **Fast quads**-Most resorts have no fast quads. Big Mountain has 3, which puts it high up that league table. There are some values much higher, but they are rare.

* **Runs**-Big Mountain compares well for the number of runs. There are some resorts with more, but not many.
* **Longest run** - Big Mountain has one of the longest runs. Although it is just over half the length of the longest, the longer ones are rare.
* **Trams** – Most of the resorts, such as Big Mountain, has no trams.

### **Skiable terrain area** - Big Mountain is amongst the resorts with the largest amount of skiable terrain.

The business has shortlisted some options:

1. Permanently closing to 10 of the least used runs. This doesn't impact any other resort statistics.
2. 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
3. Same as number 2, but in addition to that, adding 2 acres of snow making cover
4. Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres

* Big mountain currently charge $81 for a ticket. The Random Forest Model that worked on Market level was implemented on the Big mountain.
* The model predicts the price to be close to $95

By taking the predicted ticket price of $95, the scenarios for the business options was analyzed further

Scenario 1 - Permanently closing 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. If Big Mountain closes 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.

Scenario 2 – Increase vertical drop and installation additional chair lift

This scenario increases support for ticket price by $8.61

Over the season, this could be expected to amount to $15065471

Scenario 3 - Increase vertical drop, installation additional chair lift and adding snow cover area

This scenario increases support for ticket price by $9.90

Over the season, this could be expected to amount to $17322717

Such a small increase in the snow making area makes no difference!

Scenario 4 – Increase the longest run and adding snow cover area

No difference 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.

**Conclusion**

The recommendation to the business is to adapt scenario 2 of increasing vertical drop and installing additional chair lift. Taking consideration for the cost of the additional chair lift, the additional revenue would compensate the installation price. Further recommendation is to close the runs. Closing 2 and 3 successively reduces support for ticket price and so revenue. If Big Mountain closes 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.