In Montana, Big Mountain Resort is a top ski destination. We've been assigned to help Big Mountain to improve its pricing and facility utilization. The company recognizes the need for improvement in certain areas of its operations. The goal is to use data analysis to determine a competitive price and assess the market value of their facility, all while reducing operating expenses.

When data wrangling, the errors corrected included an unrealistic 2019 value for years' open feature. We also found an outlier in skiable terrain for Silverton Mountain Resort in Colorado (corrected from 26819.0 to 1819). Errors such as null or NAN values at weekend prices for accuracy. We deleted the irrelevant fast-eight columns for clarity. We created a statewide summary with data extracted from Wikipedia. This showed metrics like state square mileage and population. During the data wrangling process, we noticed a recurring trend that demonstrates the comparatively limited facilities in other resorts when compared to Big Mountain. As shown in Figure 1. Where most resorts had limited availability of snow-making machines and night skiing areas. They had fewer fast quad lifts, suggesting smaller scale or cost considerations. I observed a shortage of other factors in several areas, such as quads, triples, double chairs, and surface lifts, showing resorts overall have fewer facility benefits than Big Mountain has. Other resorts also had fewer runs and terrain parks. The skiable terrain in which Big Mountain boasts an incredible 3000 square feet. Figure x clearly illustrates that Big Mountain surpasses other resorts in terms of skiable terrain.

During the exploratory phase of this project, we examined Montana, with its expansive area and lower population density. This state offers a more generous allocation of skiable terrain, placing it in the top five for skiable areas. We used Principal Component Analysis (PCA) to reduce dataset complexity. The first two principal components captured about 77% of the variance, showing common characteristics among states. Summit elevation and vertical drops show a positive correlation with ticket prices, as resorts with higher elevations and larger drops can charge more. Montana has an impressive vertical drop of 2353 feet high, beating out most of the competition (figure A). A positive correlation between skiable terrain area and snowmaking capability with ticket prices. Higher prices are justified by the larger terrain and reliable snow conditions. Yearly snowfall affects customer decisions to visit resorts (Figure A). The analysis suggests that snow prevalence and resort infrastructure are key features that give resorts a competitive edge.

For the preprocessing phase, we first used some basic metrics to create a baseline for performance evaluation using metrics like Mean Square Error (MSE), Mean Absolute Error (MAE), and R-squared. For the train/test scenario, we used a 70/30 split. We also tried a Linear regression model which showed about 8 factors were relevant, as seen in Figure 2. This model served as a reference point, though it showed signs of over-fitting. I used imputation of data using mean or median values as a base metric for our continuing search for an accurate model of the data. We scaled the data before applying it to the models. Our initial focus was on finding an excellent model to use that encompasses identifying key features influencing ticket prices using linear regression. All models tested for deployment used cross-validation, which showed us an accuracy metric to go by when we concluded our pick of the random forest. As we delved

further into our models, the linear regression explained the significant features to about 8. The graph for the performance plateau observed in the analysis (shown in Figure 2). We then used random forest showed a lower mean absolute error compared to the linear regression model, showing more precision and consistency. The result showed us the key features to determine how to resolve our business issue. The salient features shown to have a strong correlation were vertical drop, snowmaking, total chairs, fast quads, and runs.

The modeling process involved establishing a baseline, preprocessing data, and using linear regression and random forest models to predict ticket prices. In the preprocessing stage, it is a detriment that we had enough information to make an accurate decision on the feature as seen in Figure 4. We ultimately selected the random forest model for its superior performance in terms of accuracy, generalizability, and consistency. The Resort's current ticket price is $81.00, but the model recommends a price of $93.75. This discrepancy shows potential underpricing given the resort's amenities. We excluded Big Mountain's data from the training set to ensure an unbiased model. Price Increase justification: The model suggested a workable price increase of around $10, offering flexibility for adjustments. Coming back to our main thesis, the ML model shows Big Mountain is lush in amenities that beat the competitor. We use the last features to come out of our ultimate model in Figure 5. Big Mountain possesses an impressive vertical drop, ranking prominently in this category, with only a few resorts surpassing it (Figure X). The resort is among the top in the industry for snow-making with 600 square feet of snow-making ability that far exceeds most resorts, which is shown in Figure A. Big Mountain has a significant number of total chairs and fast quads, enhancing its appeal. It also boasts more runs and longest runs. Big Mountain's Skiable Terrain excels in the amount of skiable terrain available. Given its market position and features, Big Mountain Resort appears underpriced. The resort has the option to close at least 3 ski runs without affecting profits, which would lower operating expenses (refer to Figure 5). An increase in ticket price is justifiable and viable given everything we have seen during this analysis. The advice is to increase the by $5, which would generate an added $1,750,000 extra revenue. Also, the advice is to eliminate 3 runs, as shown in Figure 5, which barely puts a dent in revenue. Throughout this project, the same issue came to mind. Big Mountain resorts have premium features that set them apart from the pack. These features offered by the Big Mountain Resort are highly valuable to customers. With the use of this marketable knowledge, they can charge more for the accommodations and amenities they provide. Future focus: I think you could continue to use data-driven approaches to understand customer preferences and market trends. Also, the future focus could be on refining predictive models regularly to ensure pricing and operational strategies remain competitive and relevant.