Big Mountain Resort in Montana, renowned for its skiing facilities, recognizes the need for a revised pricing strategy and improved utilization of its amenities. Catering to a diverse range of ages and skiing abilities, the resort aims to optimize its resources and develop a more competitive pricing model. This initiative is supported by data analysis, which identifies key areas for cost reduction and resource maximization.

During data cleaning, several adjustments were made: correcting a mislabeled '2019' year in the 'years open' feature, rectifying an erroneous figure for Silverton Mountain Resort's skiable area from 26,819 to 1,819, and removing null values in weekend prices. The 'fastEight' column, deemed irrelevant, was also removed. A statewide analysis highlighted metrics such as state square mileage and population, revealing that facilities at other resorts often fell short compared to Big Mountain's offerings. This was evident in the limited availability of amenities like snow-making machines, night skiing areas, and fast quad lifts at other resorts, suggesting a smaller scale and fewer facilities(as seen in Figure 1). Compared to Big Mountain's 3,000 miles of skiable terrain, other resorts had less to offer in terms of runs, terrain parks, and lift facilities.

The exploratory analysis focused on Montana, noted for its vast area and low population density, ranking it among the top five states for skiable terrain. Principal Component Analysis (PCA) was employed to simplify the dataset, with the first two components capturing about 77% of the variance, pointing to common characteristics across states. A positive correlation was observed between summit elevation, vertical drops, and ticket prices, as resorts with higher elevations and larger drops typically charge more. Montana's impressive vertical drop of 2,353 feet was a standout feature. Likewise, larger skiable areas and efficient snowmaking capabilities were linked to higher ticket prices. Yearly snowfall also played a crucial role in attracting customers.

In the preprocessing phase, machine learning techniques were applied, with a 70/30 train/test split. Metrics like Mean Square Error (MSE), Mean Absolute Error (MAE), and R-squared were used to evaluate model performance. Linear regression identified about eight significant features(as seen in Figure 2). However, the model showed signs of overfitting, from the use of imputation methods, such as mean and median. The final model selection, a random forest algorithm, demonstrated lower error rates and higher precision compared to linear regression. This model identified key factors like vertical drop, snowmaking capabilities, total chairs, fast quads, and runs as crucial for resolving the resort's pricing strategy. This stage also showed how were used the best amount of data as seen in Figure 4.

The random forest model showed some valuable features(seen in Figure 3). After extensive data modeling and analysis, suggested a ticket price increase to $93.75 could be charged from the current $81.00, highlighting potential underpricing. With an increase of only 5 dollars, the resort could gain a profit of $1,750,000 . This increase, along with a recommendation to cut operational costs without losing profit by closing 3 runs can be seen in Figure 5. It also shows that the resort should leverage the resort's strengths while maintaining its competitive edge. Future strategies should continue to employ data-driven methods to stay attuned to customer preferences and market trends, ensuring that pricing and operational decisions remain relevant and advantageous.