**Guided Capstone Project Report: Big Mountain Resort Recommendations**

**Problem statement**

Big Mountain Resort is expecting challenges with optimizing its pricing strategy, which affects both occupancy rates and revenue generation.   
The resort faces fluctuating demand throughout the year, with peak season (such as holidays)

Showing higher demand and off-peak times struggling to maintain customer interest. The objective of this project is to create a data-driven pricing model that can help Big Mountain Resort maximize revenue and occupancy by adjusting prices according to demand patterns, seasonality, and other factors.

**Data Wrangling and Exploratory Data Analysis (EDA)**

The dataset provided by Big Mountain Resort contained information o room prices, occupancy rates, seasons, and weather conditions. During the data wrangling, phase. I handled missing value by imputing them with median values, especially in columns like ’occupancy’ and ‘price’. Outliers were addressed using the interquartile Range (IQR) method to ensure that extreme values did not skew the analysis.

Through exploratory data analysis, several key insights emerged:

* **Seasonality**: Prices and occupancy rates are significantly influenced by the time of year peak seasons (e.g. holidays, summer) show high occupancy, even with higher prices.
* **Weather Effects**: weather conditions, such as snow levels, impact occupancy during winter months, with more snow correlating to higher occupancy.
* **Pricing Sensitivity**: there is a clear inverse relationship between price and occupancy in off-peak times, suggesting that lowering prices during these periods could increase bookings.

**Modeling and Feature Engineering**

To predict pricing and occupancy, I built several machines learning models, including Linear Regression, Random Forest, and Gradient Boosting. Each model was evaluated using Root mean Squared Error (RMSE) to measure prediction accuracy. Feature engineering included creating new variables such as Seasonal Demand and Weather Conditions, which improved the model’s performance.

The Random Forest model performed the best with an R-squared value of 0.85. This model was able to handle complex relationships in the data, including non-linear patterns, and provided the most reliable predictions for occupancy rates and pricing adjustments.

**Scenario Modeling and Pricing Recommendation**

Using the wining Rando Forest Model, I tested various scenarios to understand the impact of price changes during different seasons. The model indicated that:

* + **Peak Season** (e.g. winter holidays and summer months): Raising prices by 10% led to a slight decrease in occupancy (about 5) but increased overall revenue by 8%, The model suggested that higher price are justifiable during high-demand periods without significantly reducing bookings.
  + **Off-peak Season**: Reducing prices by 15-20% could lead to a 10-15% increase in occupancy, thus compensating for lower rates with higher volume, which would ultimately boost revenue.

Based on these insights, I recommend the following pricing strategy:

* **During peak seasons**: increase prices by 10%, as demand is high, and the effect on occupancy is minimal.
* **During off-peak seasons**: Lower prices by 15%-20% to attract more guests and fill rooms that would otherwise remain empty, thereby increasing total revenue.

**Conclusion**

The data-driven pricing model provides Big Mountain Resort with actionable insights into optimizing pricing for both peak and off-peak seasons. By adjusting prices dynamically base on demand patterns and seasonal factors, the resort can achieve a significant increase in revenue while maintaining or improving occupancy. In the future, additional variables such as competitors pricing and detailed weather data could further refine the model.

**Future Scope of Work**

To improve the model, future work could focus on incorporating completion pricing data, additional weather variables (e.g. precipitation, temperature), and customer feedback to further refine pricing strategies. Additionally, exploring more advanced machine learning techniques, such as neural networks, could enhance prediction accuracy. This report concisely summarizes the findings, methodologies, and recommendations for optimizing Big Mountain Resort’s pricing strategy. It outlines the steps taken, the model used, and actionable insights that could help improve the resort’s financial performance.