

# **Pilot-Study Proposal**

I am delighted with the opportunity to provide scientific advisory and consulting services to your company. I believe my proposal provides the most comprehensive approach for determining the profitability of the new hotel.

Machine learning and data analytics are two crucial processes of data science used together to transform data into valuable insights. Data analytics plays a role in analysing historical data, whereas machine learning algorithms play a vital role in finding patterns. Both combined helps companies make the right changes in their business model, beat competitors and grow strategically.

## Data Features

The implication of machine learning with business analytics can rightfully investigate the cost-effectiveness of the hotel opened in the given location. It is necessary to study the characteristics that can affect the hotel business because the profitability of a hotel depends on more than its characteristics. Thus, it is critical to assess the key factors that add to a hotel's profit. The relevant geographical and socio-economical data that could be a significant factor are as follows:-

- Location characteristics (urban or rural): The location or position of the hotel determines the room revenues, venue charges, etc.
- Accessibility (Distance from the nearest transport hub, tourist place, markets): Access to market places, transport hubs regulate the occupancy rate, customer ratings, etc.
- Real estate cost: After labour cost, real estate cost adds to the most considerable expense of the hotel.
- Economic factors: The strength and weakness of the currency and economic cycling of a place can significantly impact the success of a hotel.
- The average distance from 3 nearest hotels: The distance from market competitors affects a hotel's sustainability.
- Other expenses: Contractors, Supplies, Advertising, Regulation and tax etc.

## Predictive Task

Focusing on the variables mentioned above, we can use various machine learning classification algorithms to build the predictive model in determining whether the new hotel opened in the given location will be profitable or not. Machine learning algorithms use computational methods to learn information directly from the data provided and increase the effectiveness of the business models and analytics.

## Procedures

To work out the given problem, a predictive model needs to be built that will accurately predict the profitableness of a hotel based on historical data of successful and unsuccessful hotels opened under the chain's brand. We take a supervised machine learning approach and make sense of the data within the context of the problem at hand. The various learning procedures that we can opt for are as follows:-

- I. **Logistic Regression:-** It is evident that the problem at hand is a binary classification problem where we have to predict the absolute value if the hotel will make a profit or loss, regardless of the amount.
- II. **Decision Tree:-** In the case of a non-linear relationship between the variables, tree-based models can be used to solve classification problems that result from a series of feature-based splits on the given data.
- III. **SVM:-** Support Vector Machines are effective in high dimensional spaces and are capable of performing binary classification on datasets.

## Evaluation Methods

After building the various machine learning models, we deploy the *train-test split* technique to evaluate the performance of the algorithms. With sufficient data at our disposal, we can split the dataset into a train (75%) and test (25%) datasets. This is important such that there is enough data in the train and test datasets for the model to learn an effective mapping of independent variables to the dependent variable and to evaluate the model performance respectively effectively. Henceforth, we can find the evaluation metric of *accuracy* in percentage with well-balanced data. Furthermore, a *confusion matrix* can be plotted to get an in-depth breakdown of each class's correct and incorrect classifications.