**Airbnb Dynamic Pricing Recommendation Engine**

**Project Report**

**1. Introduction**

The goal of this project was to analyse a comprehensive Airbnb dataset to understand the key factors that influence listing prices. By identifying these drivers, the project aimed to develop a data-driven tool that provides hosts with optimal pricing recommendations. This report outlines the methodology, analysis, and the final interactive tool created to empower hosts to maximize their rental income by making informed pricing decisions based on location, seasonality, and listing quality.

**2. Abstract**

This project successfully developed a dynamic pricing recommendation engine by performing an end-to-end analysis of historical Airbnb data. The initial phase involved data cleaning and preprocessing to ensure data quality. Subsequently, a deep-dive analysis was conducted in Microsoft Excel to uncover key pricing drivers. The analysis revealed that location, property size (number of bedrooms), listing quality (review scores), and seasonality are the most significant factors affecting price. For instance, listings in San Francisco command a 59% price premium over those in Chicago. Finally, these insights were used to build an interactive dashboard in Tableau, featuring a dynamic price estimator tool that allows hosts to receive real-time pricing suggestions based on their specific listing attributes.

**3. Tools Used**

* **Python:** Utilized for initial data cleaning, preprocessing, and handling of the raw dataset.
* **Microsoft Excel:** Employed for in-depth exploratory data analysis using PivotTables to analyse relationships between variables and derive key business metrics.
* **Tableau:** Used for data visualization and the creation of the final interactive dashboard, including the dynamic pricing engine.

**4. Steps Involved in Building the Project**

The project was executed through a structured, three-phase approach:

**Phase 1: Data Preparation**

The project commenced with loading the raw Airbnb dataset and executing essential cleaning tasks. This included handling missing values, correcting data types, and creating new calculated columns to aid in the analysis, such as categorizing review scores (Excellent, Good, Average) and converting month numbers into month names.

**Phase 2: Deep-Dive Analysis in Excel**

Using Excel's PivotTables, a comprehensive analysis was conducted to uncover the primary drivers of price:

* **Location Analysis:** The analysis of average price by city revealed significant geographic price disparities. San Francisco ($227) and Washington D.C. ($218) were identified as the most expensive cities, while Chicago ($132) was the most affordable.
* **Listing Quality & Size Analysis:** A matrix was created to analyse the combined effect of review scores and the number of bedrooms. This proved that both factors independently increase price. For a listing with good reviews, the value of an additional bedroom (from 1 to 2) was calculated to be approximately **$94**.
* **Seasonality Analysis:** By analysing the average price per month, a clear seasonal trend was identified. Prices peak in January and August (around $160), commanding a premium of approximately 18% over the lows seen in the spring months of March and May (around $135)., indicating specific times of the year when hosts can adjust their rates.

**Phase 3: Interactive Dashboard Development in Tableau**

The insights from the Excel analysis were used as a blueprint to build a user-friendly dashboard in Tableau. The dashboard consists of several key components:

1. **KPI Cards:** Displaying high-level metrics such as Total Listings and Average Price.
2. **Geographic Price Map:** A map visualizing the price differences between cities.
3. **Seasonality Trend Chart:** A line chart showing monthly price fluctuations.
4. **Interactive Price Estimator:** A dynamic tool where users can input the number of bedrooms and the number of people the listing accommodates to receive a data-driven price suggestion. This tool was built using Tableau Parameters and a custom formula derived from the Excel analysis: Price = $155 + ($94 \* # of Bedrooms) + ($31 \* # of Accommodates).
5. **Global Filters:** Interactive filters for City and Property Type were added, allowing users to slice the data and tailor the entire dashboard view to their specific interests.

**5. Conclusion**

This project successfully demonstrates that Airbnb pricing is not arbitrary but is driven by a clear set of factors. The analysis conclusively shows that hosts can strategically price their listings by considering location, property attributes (size and type), guest feedback (reviews), and time of year.

The final interactive dashboard serves as a powerful and practical tool, translating complex data into simple, actionable insights. It empowers hosts to move beyond guesswork and confidently set optimal prices, ultimately helping them to improve occupancy rates and maximize their revenue.