A cover of a book

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# 📘 Airbnb Dynamic Pricing Recommendation Engine

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## 1. Introduction

This project aims to build a dynamic pricing recommendation system for Airbnb listings based on factors such as **location**, **room type**, **availability**, and **reviews**. The main goal is to help hosts optimize their listing prices to stay competitive and increase revenue.

We used the following tools:

* **Python (Google Colab)** – for data cleaning and predictive modeling
* **Tableau** – for data visualization and dashboard creation
* **Excel** – for optional data exploration

The dataset includes over **100,000 Airbnb listings**, covering key attributes like price, room type, number of reviews, availability, and location details.

## 2. Dataset Overview

The dataset contains **26 columns** and **over 100,000 rows**. Key features used in the analysis:

* room\_type
* neighbourhood\_group
* number\_of\_reviews
* availability\_365
* price
* reviews\_per\_month

We removed unnecessary columns and handled missing values to prepare the data for analysis and visualization.

## 3. Data Cleaning and Preparation (Python)

Using **Google Colab**, we performed the following cleaning steps:

* Removed columns with too many missing values (like license, house\_rules)
* Dropped rows with missing or null values in critical columns
* Converted price and service fee from strings to numeric values
* Exported the cleaned dataset as cleaned\_airbnb\_data.csv

Here’s a snippet of the cleaning logic:

df['price'] = df['price'].replace('[\$,]', '', regex=True).astype(float)

df\_cleaned = df.dropna(subset=['price', 'room\_type', 'neighbourhood\_group'])

df\_cleaned.to\_csv('cleaned\_airbnb\_data.csv', index=False)

## 4. Exploratory Analysis & Dashboard (Tableau)

### 💡 Key Insights:

### a. Average Price by Room Type

* Hotel rooms have the **highest average price**
* Shared rooms have the **lowest average**

### b. Average Price by Neighbourhood Group

* **Manhattan** leads in average price, followed by **Brooklyn**
* **Queens** and **Bronx** offer more affordable options

### c. Number of Reviews vs Price

* Listings with **moderate pricing and high reviews** are more likely to be booked
* Outliers exist where low-reviewed listings have high prices

### d. Availability vs Price

* Listings with **high availability** (> 200 days/year) tend to be priced moderately

### e. Price Distribution

* Most listings are priced **between $50 and $800**

### f. Dashboard Filters Used

* neighbourhood\_group, room\_type, number\_of\_reviews, availability\_36

## 5. Recommendations

Based on the analysis:

* **Manhattan** listings can maintain higher prices but should stay competitive in peak seasons.
* **Queens** and **Bronx** listings should consider **price adjustments** to attract more bookings.
* **Entire homes** with high reviews and availability can justify premium pricing.
* **Private rooms** in high-demand areas should experiment with dynamic pricing based on season and reviews.

## 6. Limitations

* The data does not include **seasonality** (exact booking dates), which limits time-based pricing.
* **External market trends** (events, regulations) are not reflected.
* Data may be **outdated or region-specific** and may not generalize to all Airbnb markets.

## 7. Conclusion

This project successfully:

* Cleaned and analyzed a large Airbnb dataset
* Built a regression-based pricing model
* Created an interactive **Tableau dashboard** for insights
* Provided actionable **pricing recommendations** to Airbnb hosts

The dashboard helps hosts make data-driven pricing decisions by filtering and comparing room types, locations, and reviews.

## 8. Appendix

### 🔍 Tableau Dashboard Screenshot:

A screenshot of a graph

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### 🔧 Sample Python Code:

# Predictive Model

from sklearn.linear\_model import LinearRegression

model = LinearRegression()

model.fit(X\_train, y\_train)

predictions = model.predict(X\_test)