

## *Airbnb Dynamic Pricing Recommendation Engine*

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### ◆ Introduction

This project focuses on creating a dynamic pricing recommendation engine tailored for Airbnb listings. With the growth of short-term rental platforms, hosts are constantly seeking ways to optimize their pricing to attract bookings while maximizing revenue. However, setting a fixed price fails to consider real-time factors like seasonality, location-specific demand, listing quality, and user feedback. The goal of this project is to analyze historical Airbnb data to identify pricing trends, uncover influential listing features, and build a predictive model. This system is designed to help hosts make data-informed decisions to stay competitive and increase their occupancy rates.

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### ◆ Abstract

The Airbnb pricing engine was developed using a dataset of over 74,000 listings. The process included data cleaning, transformation, predictive modeling, and dashboard visualization. The key variables analyzed were city, property type, room type, accommodations, and review scores. A linear regression model was trained to predict prices based on these features. Data visualization was carried out using Tableau, allowing users to filter results by city, room type, and price range. The goal was to understand how different listing attributes influence pricing, and to build a model that can recommend optimal prices to improve host revenue strategies.

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### ◆ Tools Used

- Python (Pandas, Sklearn)
  - Tableau (Visual Analytics)
  - Excel (Initial Review)
  - FPDF (Reporting Library)
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### ◆ Steps Involved in Building the Project

1. Data Cleaning: Removed columns like IDs, images, and free-text descriptions that didn't aid analysis. Rows with missing key values (like review scores and bedrooms) were dropped.
2. Transformation: Converted log-transformed price values into actual prices using exponential functions.

3. Exploratory Analysis: Analyzed how price varies by city, property type, room type, and customer reviews.
  4. Modeling: One-hot encoding was applied to categorical features, and a linear regression model was trained to predict price.
  5. Visualization: Created Tableau dashboards with bar charts, box plots, histograms, and scatter plots for deeper insight.
  6. Reporting: Insights were compiled into a concise report with pricing strategies and suggestions.
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### ◆ Conclusion

This project successfully developed a complete dynamic pricing system for Airbnb listings, leveraging both machine learning and visual analytics. The regression model provides pricing suggestions based on city, listing quality, and room characteristics, while the Tableau dashboard enables hosts to explore price trends interactively. These tools equip hosts with data-driven insights to adjust their pricing, stay competitive in different markets, and ultimately increase their profitability. With scalability in mind, this system can be expanded for real-time integration or adapted for other rental platforms. Overall, it offers a valuable decision-support framework for modern short-term rental businesses.

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### ◆ Python Pricing Engine Script Suggestion

We built a Python script that:

- Loads cleaned Airbnb data
  - Uses city, room\_type, bedrooms, accommodates, and review\_scores\_rating as features
  - Trains a **Linear Regression model**
  - Takes new listing input as a dictionary or DataFrame
  - Outputs a **predicted price**
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