Prepared by: *Umashankar Prajapati*

B.Tech Chemical Engineering, Minor in Management

Indian Institute of Technology Jodhpur

New York City Airbnb Data Analysis Case Study

This case study analyzes Airbnb listing data from New York City (2019) to understand pricing trends, availability patterns, and geographic distribution of rentals. The dataset includes 38,821 listings with attributes such as price, neighborhood, room type, reviews, and availability. Below are the key findings and insights derived from the analysis.

Objective:

- Optimize pricing for hosts using dynamic models.

- Improve user experience through layout/A-B testing.

- Expand the market based on guest preferences (e.g., long-term stays, experiences).

---

1. Data Overview

- **Dataset size**: 38,821 entries, 16 features.

- **Key variables**:

    - **Price**: Ranges from $0 to $10,000 (mean: $142.33, median: $101).

    - **Minimum nights**: Average 5.87 nights (max: 1,250 nights).

    - **Room types**: 52% "Entire home/apt," 46% "Private room," 2% "Shared room."

   - **Availability**: Mean 114.89 days/year (median: 55 days).

2. Key Insights

2.1 Price Distribution

- The majority of listings (75%) are priced below $169/night.

- **Manhattan** has the highest average price ($168.87/night), while the **Bronx** is the cheapest ($79.64/night).

- Outliers exist, with some listings priced up to $10,000/night (likely luxury properties or data entry errors).

Price Distribution (Absolute Scale)
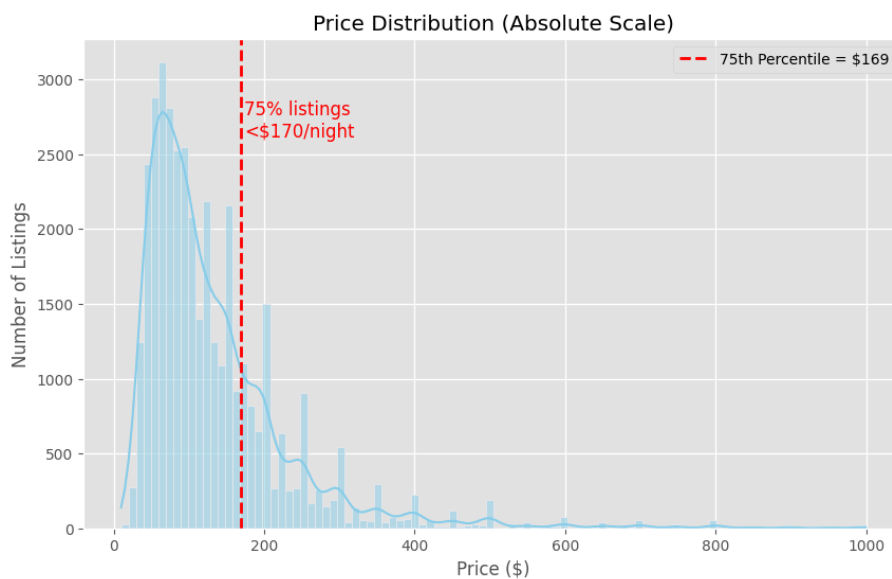
Average Prices by Area and Room Type
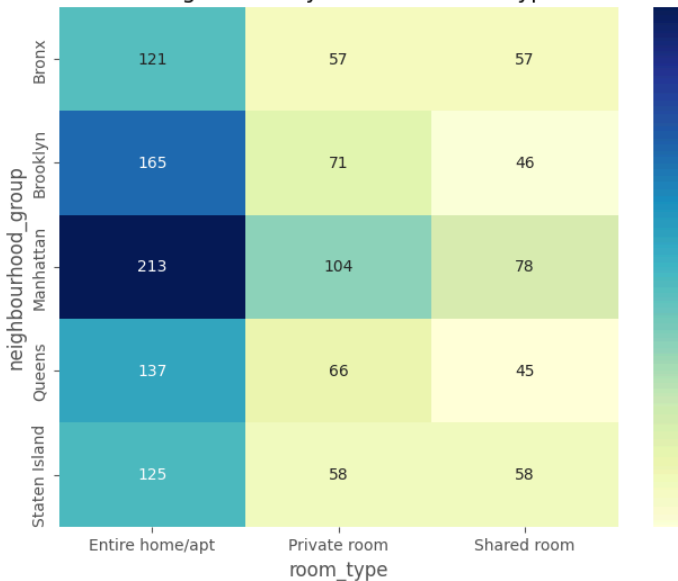
Total Revenue by Neighbourhood Group
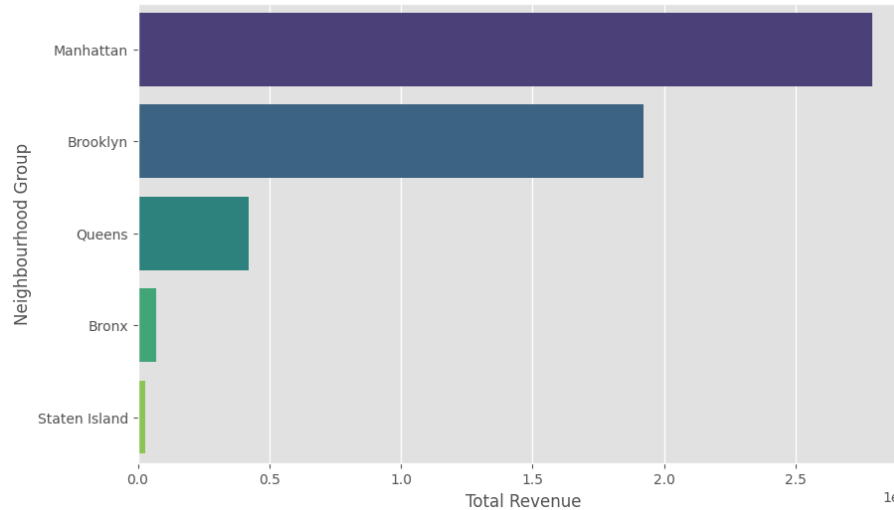
2.2 Geographic Trends

- **Most listings** are concentrated in **Manhattan** and **Brooklyn**.

- **Expensive neighborhoods**: Tribeca ($302.31/night) and Midtown ($248.46/night).

- **Affordable neighborhoods**: Borough Park ($64.40/night) and Elmhurst ($80.14/night).

### Top 3 Neighbourhoods by Average Price (listings > 100)

Neighbourhood	Total Listings	Average Price ($)
Tribeca	101	302.31
Midtown	973	248.46
SoHo	280	244.95

Bottom 3 Neighbourhoods by Average Price (listings > 100)

| Neighbourhood	Total Listings	Average Price ($)
Borough Park	110	64.40
Elmhurst	194	80.14
Jackson Heights	160	80.31

2.3 Room Type Analysis

- **Entire homes/apartments** dominate high-demand areas like Manhattan, despite local regulations restricting short-term rentals of entire properties.

- **Private rooms** are more common in Brooklyn and Queens.

Number of Listings by Area and Room Type
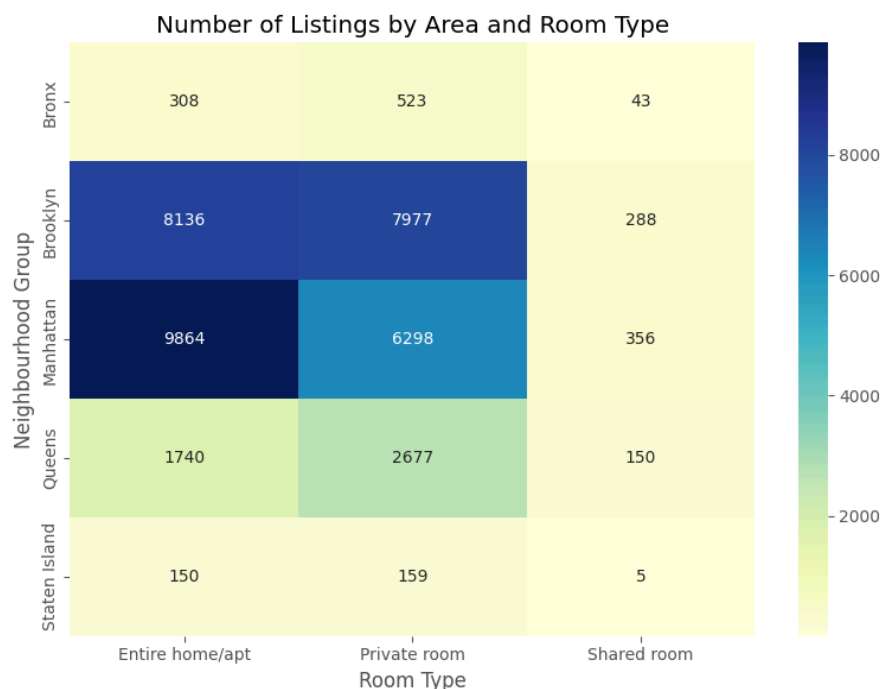
2.4 Availability and Demand

- 44% of listings require a **minimum stay of 30 days**, aligning with NYC's short-term rental regulations.

- Listings with **lower prices** (under $100/night) receive more reviews, indicating higher occupancy rates.

- Weak correlation (-0.19) between price and availability, suggesting pricing strategies prioritize profitability over frequent bookings.

Correlation Heatmap
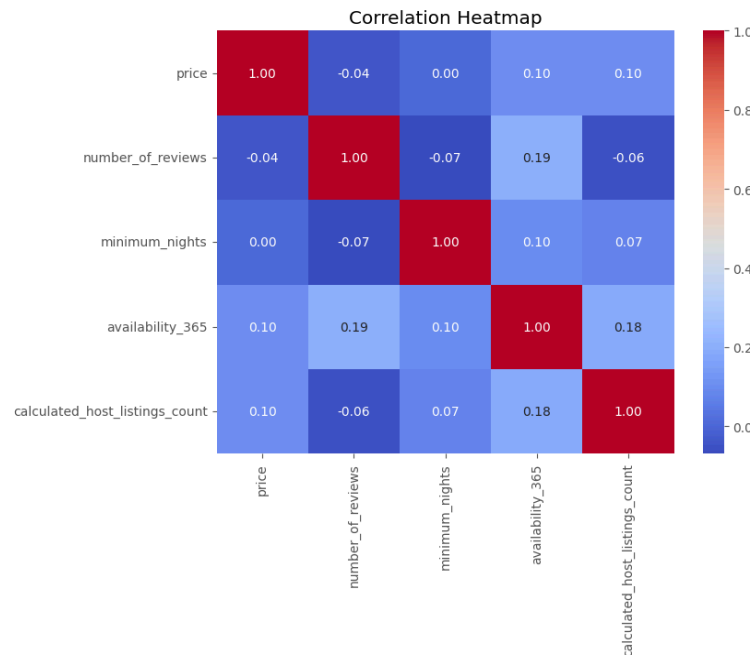
Price vs Number of Reviews: Correlation = **-0.04**
Almost no correlation — price does not depend on the number of reviews.

Price vs Availability: Correlation = **0.10**
Very weak positive correlation — listings with higher availability may have slightly higher prices.

Price vs Host Listings Count: Correlation = **0.10**
Weak correlation — hosts with more listings might charge a bit more, but it's minimal.

Number of Reviews vs Availability: Correlation = **0.19**
Slight positive correlation — more available listings tend to receive more reviews.

Minimum Nights vs Other Variables (Price, Reviews, Availability): Correlation ≈ **0**
Almost no correlation — setting a higher minimum stay doesn't clearly relate to other metrics.

Availability vs Host Listings Count Correlation = **0.18**
Slight positive correlation — hosts with more listings tend to have them available for more days.

2.5 Host Behavior

- Most hosts (75%) manage fewer than 1 listings, but a small subset (max: 207 listings) operate at scale.

- Listings with more reviews are priced more competitively to attract guests.

Price vs Number of Reviews

3.Visualizations

3.1 Price vs. Neighborhood

Manhattan commands a premium, while the Bronx offers budget-friendly options.

Average Price by Room Type and Neighbourhood Group
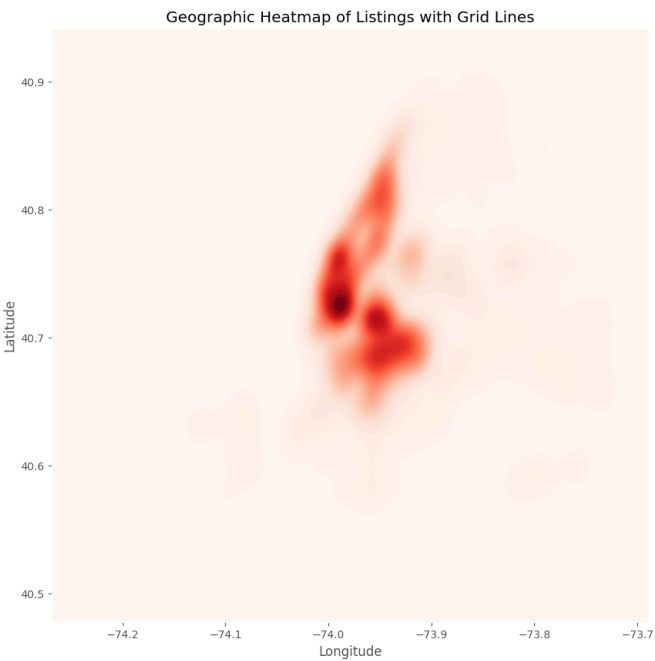

Price Distribution by Room Type
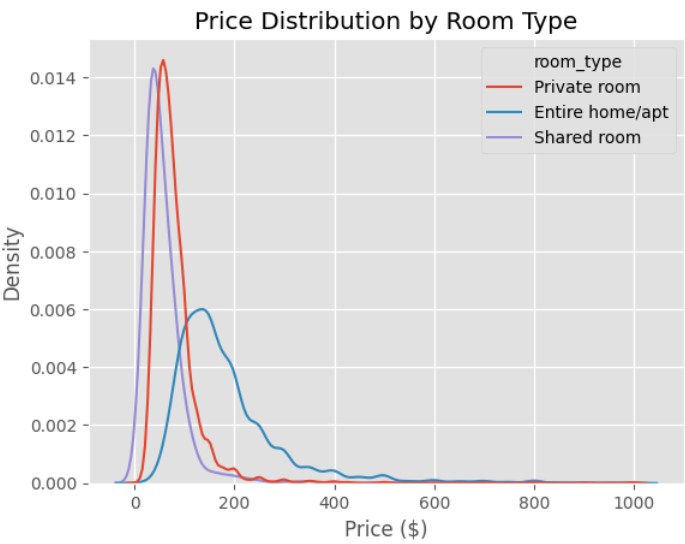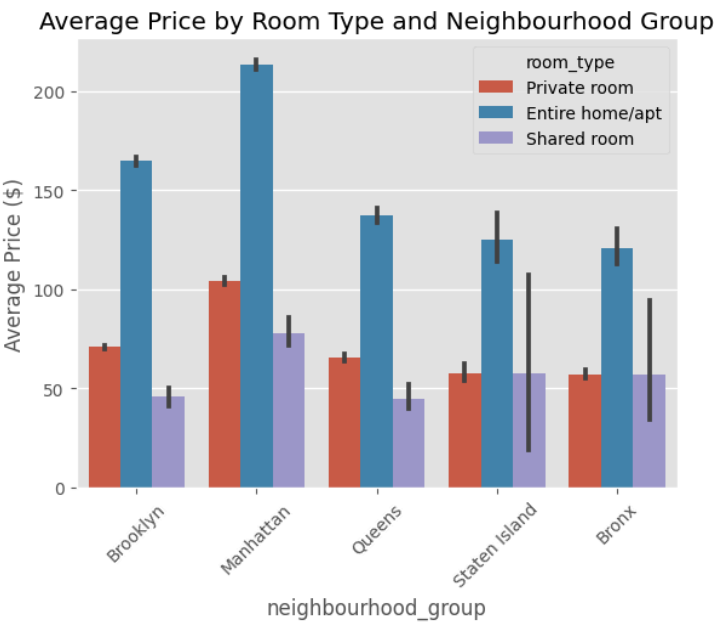
3.2 Room Type Distribution

Entire homes/apartments have a wider price range compared to private/shared rooms.

3.3 Geographic Heatmap

Geographic heat map showing total revenue intensity by location (latitude and longitude).

Geographic Heatmap of Listings with Grid Lines

4. Conclusions

- **Pricing Strategy:** Listings in Manhattan and Brooklyn are priced 50–100% higher than in other boroughs, reflecting their premium location value.

- **Regulatory Impact:** NYC's short-term rental laws explain the prevalence of 30-day minimum stays and limited availability of entire home listings.

- **Demand Drivers:** Private rooms priced affordably (often under $150), especially in central or accessible areas, tend to receive the most reviews — suggesting higher guest satisfaction and perceived value.

- **Host Optimization:** Large-scale hosts tend to focus on listing volume and operational efficiency, while smaller hosts often set higher prices per listing to maximize return.

---

5. Recommendations

- **For Hosts:** Price private rooms below $150/night in high-demand areas like Manhattan to improve occupancy and attract more reviews.

- **For Guests:** Consider staying in Queens or the Bronx for budget-friendly options. Booking 3–6 months in advance is recommended for high-demand neighborhoods.

- **For Policymakers:** Monitor and enforce compliance with 30-day minimum stay regulations, particularly among entire home listings, to ensure fair housing practices and adherence to city laws.