Airbnb Chicago Data Analysis: Property, Price, and Host Insights

# 1. Introduction

The Airbnb ecosystem in Chicago reflects a dynamic interplay of hosts, guests, and properties across varied locations and price ranges. This project explores those patterns through four interactive Tableau dashboards—Customer Interface, Property Analysis, Price Analysis, and Host Analysis—designed to reveal key trends and performance insights. Using advanced Tableau features like LOD calculations, parameters, and sets, the dashboards go beyond static visuals, offering users a flexible and engaging way to uncover meaningful stories from the data.

**DATASET PREPARATION AND FINDINGS**

This project used Airbnb data from Inside Airbnb, with the goal of creating interactive dashboards that enhance the rental experience for customers. We used four datasets in total: the primary one, Cleaned Chicago Airbnb, contains detailed host and property information. To support geographic insights, we included two additional datasets—Familiar Groups and Familiar Group Coordinates—which helped us categorize and map localities more effectively. The fourth dataset, Reviews, was large and required extensive cleaning before being joined with the main dataset to incorporate meaningful guest feedback. We performed thorough data cleaning—standardizing data types and removing inconsistencies—and carried out exploratory data analysis to uncover trends before dashboard creation. These well-prepared datasets, combined with advanced Tableau techniques like LOD expressions, parameters, and dynamic filters, allowed us to build dashboards that enable personalized, insightful, and user-friendly exploration of Chicago’s short-term rental landscape.

**Context and Relevance:**

This project uses Tableau to turn complex Airbnb data from Chicago into interactive dashboards that highlight trends in location, pricing, and host performance. With advanced features like LOD expressions, parameters, and filters, users can explore the data based on their own preferences—such as price range, number of bedrooms, or review scores. Instead of static reports, these dashboards offer a flexible, user-friendly way to discover insights, helping everyone from researchers to travellers make informed decisions about the Airbnb market.

**Target audience**

This project is designed to serve a broad and diverse audience who can derive value from understanding and interacting with Airbnb data at both granular and strategic levels:

* **Airbnb Hosts:** Individuals looking to gain a competitive edge by benchmarking their listings against market standards. The dashboards help them understand how pricing, availability, review scores, and property features influence performance.
* **Real Estate and Investment Analysts:** Professionals focused on identifying spatial price trends, demand hotspots, and high-performing property zones. The data can support investment decisions and neighbourhood targeting strategies.
* **Travelers and Platform Users:** End-users of Airbnb seeking to make informed decisions about where to stay. By filtering properties based on budget, room features, and guest satisfaction scores, they can identify listings best aligned with their needs.

**Analytical Focus Areas:**

**Customer Interface Analysis:**

This dashboard serves as the user's entry point into the data and was designed to be highly interactive and parameter-driven. It features a **symbol map** for geographic insights, paired with a **Top N listings table**. Users can dynamically filter listings based on **price**, **review score**, **minimum number of bedrooms and bathrooms**, **guest capacity**, and **familiar neighbourhood grouping**. The goal is to deliver a fully customized and intuitive experience that enables users to pinpoint the most relevant listings through layered, real-time filtering, ranking and experience of buying a rental property.

Key Questions Answered:

* Which listings are the top-ranked within a user-defined price range?
* How do review scores, amenities, and guest capacity influence listing visibility?
* How do different zones compare based on filtered listing criteria?

**Property Analysis:**

This segment offers a spatially grounded view of Airbnb performance across the city of Chicago. It focuses on analyzing **geographic clustering**, **review score variations**, **average price analysis by property type and place**. The analysis aims to answer where listings are most concentrated, which areas yield higher satisfaction ratings, and how different types of accommodations perform across the map.

Key Questions Answered:

* What are the most active Airbnb neighborhoods in Chicago?
* Which property types are most common, and how do their review scores differ?
* What spatial patterns emerge from listings with high guest satisfaction?

**Price Analysis:**

This dashboard focuses on uncovering pricing strategies implemented across various Airbnb listings in Chicago. It evaluates how pricing fluctuates across **room types**, **property categories**, and **availability levels**. The dashboard is designed with user-driven interactivity, enabling customized exploration through **parameter controls**. Users can dynamically adjust price thresholds and availability filters to analyse trends based on their preferences.

Key Questions Answered:

* What are the pricing distributions for listings below a custom threshold?
* How does availability status (e.g., highly or rarely available) affect average price?
* Which room types and property types deliver the best value based on user budgets?

**Host Analysis:**

This dashboard provides an in-depth examination of **host performance**, operational consistency, and service excellence across Airbnb listings in Chicago. It is designed to help users identify and analyze top-performing hosts using a variety of performance metrics such as **listing count**, **average review score**, **Superhost status**, **host tenure**, **response rate**, and **acceptance rate**. The dashboard enables comparison between hosts by incorporating filters, parameters, and ranking metrics for an advanced user-driven analysis experience

Key Questions Answered:

* Who are the top-performing hosts based on listing volume and review score consistency?
* How do Superhost traits like response time, acceptance rate, and tenure influence guest satisfaction?
* Which hosts consistently deliver high-quality service across multiple performance dimensions?

**Key Takeaways**

* **Downtown, Lincoln Park, and North Side** emerge as the highest-performing neighbourhoods in terms of listing count, guest engagement, and average review scores.
* **Entire home/apartment listings** account for the largest share of affordable and high-rated accommodations, indicating a preference among guests for private, fully available spaces.
* **Listings with limited availability** — categorized through custom availability segmentation — tend to command **significantly higher nightly prices**, showcasing supply-constrained pricing dynamics.
* **Top-performing hosts** exhibit strong operational consistency, characterized by **100% response and acceptance rates**, frequent **Superhost designations**, and high average review ratings (typically above 4.7).
* The **Customer Interface Dashboard** provides the most flexible and user-centric view, enabling parameter-driven filtering for:
  + **Top N Property Listings** ranked by price, review score, or listing name
  + **Custom Price Thresholds** to explore affordability across locations
  + **Minimum accommodation criteria** (bedrooms, bathrooms, guest capacity)
  + **Neighbourhood group filters** for geographic comparison
* Advanced chart types such as **symbol maps**, **dual-axis bar comparisons**, and **heatmap tables** are used to visualize trends across dimensions including availability, price brackets, and property categories.

# 2. Technical Complexity

## Type of Visualization & Technical Scope

To support analytical accuracy and enhance dashboard responsiveness, several advanced Tableau functionalities were implemented:

**Customer Interface Dashboard:**

* **Level of Detail (LOD) Expressions** — Used to generate precise aggregations unaffected by filters, such as fixed average ratings or host-level review scores.
* **Calculated Fields** — Created to build custom metrics such as pricing brackets, review classifications, and host tenure segmentation.
* **Ranking Calculations**: Applied to dynamically display the Top N listings based on user-selected metrics like price, rating, or number of reviews.
* **Parameterized Controls:** Enabled users to define thresholds for price, bedroom/bathroom count, review score, and other listing characteristics, ensuring tailored results.
* **Dynamic Filtering and Tooltips**: Included real-time updates to map visuals and table views based on parameter selections, supported by informative tooltips that provide context for each property.
* **Website Links and Navigation buttons**: To help the customers to navigate to the right page and having set up a proper URLs to guide the customers to the target webpage links.
* **Tooltip Enhancements** — Custom tooltips were added across all charts to provide users with contextual listing information and metric breakdowns without crowding the interface.

**Property Analysis:**

* **Level of Detail (LOD) Expressions:** Used to calculate fixed average review scores by neighborhood group and property type to provide accurate benchmarking across regions.
* **Scatter Plot Positioning Logic:** Plotted average price against listing count using calculated X/Y coordinates.
* **Categorical Calculated Fields:** Developed to group neighborhoods and property types for comparative analysis.

**Price Analysis:**

* **Availability Classification Logic:** Used calculated fields to segment listings into "Rarely Available," "Moderately Available," or "Highly Available" categories based on availability thresholds.
* **Parameterized KPI Calculations:** Enabled real-time aggregation of key metrics like min, max, and average prices using user-selected price thresholds.
* **Heatmap Matrix Design:** Combined availability category with room type to visualize pricing variations using conditional formatting.
* **Room Type Segmentation:** Applied calculated fields to isolate patterns in price behaviour by listing type.
* **Pie Chart Segmentation:** Applied Min (1\_) to make the donut chart and to find the room type behaviours.

**Host Analysis Dashboard:**

* **LOD Expressions:** Used to calculate fixed values such as total listings per host and host-specific average review scores, regardless of applied filters.
* **Superhost Status Logic:** Implemented conditional logic to flag Superhosts based on multiple criteria including response rate, acceptance rate, and review score.
* **Host Ranking Parameters:** Enabled metric-based dynamic rankings (e.g., by listings, average price, or ratings) using parameter selection.
* **Host Tenure Calculation:** Used DATEDIFF ('year', [Host Since], TODAY ()) to quantify how long each host has been active.

## Charts/References:

Among the visualizations employed, the star symbol chart used in the Property Analysis Dashboard qualifies as a novel chart not typically discussed in class settings. This chart was used to compare multiple dimensions of review scores—such as cleanliness, communication, value, and location—for each property type, allowing a clear and compact view of guest experience dimensions this chart was taken from the tableau public apart from that we had implemented taken inspiration from other dashboards as well.

Reference Source:

* [InsideAirbnb | Tableau Public](https://public.tableau.com/app/profile/j.trajkovic/viz/InsideAirbnb/InsideAirbnb)
* [Airbnb\_price\_analysis|TableauPublic](https://public.tableau.com/app/profile/dien.nhut.vo/viz/Airbnb_price_analysis/Dashboard1)

# 3. Data Story & Dashboard Components

This project communicates its insights through four integrated Tableau dashboards — **Customer Interface**, **Property Analysis**, **Price Analysis**, and **Host Analysis**t. The dashboards are designed to be visually coherent, highly interactive, and user-friendly, applying best practices in data visualization, dashboard design, and storytelling.

**Customer Interface:**

Narrative Objective: To provide a personalized and interactive view that allows users to explore top-performing Airbnb listings across Chicago. This dashboard features user-driven filters for price, guest capacity, review scores, number of bedrooms and bathrooms, and neighborhood zones. These filters enable flexible, real-time exploration tailored to specific user needs to give them a real time experience of renting a property.

Key Charts and Components:

1. **Map**

* Chart Type: Geospatial map with color-coded familiar zones
* Variables: Latitude, Longitude, Neighborhood Group, Filtered Listings
* Goal : Show spatial distribution of listings and visually compare neighborhood activity.

1. **Top N Listings Table:**

* Chart Type: Ranked Table
* Variables: Price, Host Name, Property Name, Review Scores
* Goal Addressed: Display the top listings that meet the selected criteria, updated dynamically through user inputs.

1. **Filters and Parameter:**

* Location, Room type, Property type, Accommodations, Reviews are adjustable filters.
* Price threshold, Min Bathrooms and Min Bedrooms are parameters to make the customer experience insightful listings.

**Dashboard 2**

Narrative Objective: It gives a proper experience of detailed view of the selected Listings

1.**Actions and Set Filters**

* The Top N list has an action to move to the next sheet which contains the specific property’s detailed comments, reviews, host name and ratings.

2**. Webpage Links**

* The Hostname and Proceed to buy navigations help the user to reach to the specific URL to make them make the final decision

**3.Estimated Calculator**

* Through the use of Parameters like No of guest, Max Nights the calculator measures the estimated stay on the particular property to give the customers brief understanding of price.

**Property Analysis Dashboard**

Narrative Objective: To analyze how property types and guest satisfaction scores are distributed across different Chicago neighborhoods. This dashboard provides insights into listing density, customer experience, and property-type trends.

Key Charts and Components:

1. **Map**

* Chart Type: Geospatial map
* Variables: Neighborhood Group, Listing Count
* Goal :Identify zones with high density and satisfaction ratings.

1. **Scatter Plot: Avg. Price vs. Listing Count**

* Chart Type: Scatter Plot
* Variables: Property Type, Average Price, Listing Count
* Goal: Visualize pricing trends and popularity among different property types and Through Parameters like Average price and Average Revenue Metric helps the customers for their desired listings.

1. **Tooltip Listings**

* By clicking a specific Scatter point, the Tooltip shows the respective informative detail of the listings in tabular format to make the customers easily identify the property**,**

1. **Set Actions Buttons**

* Property type: Private room, shared room, hotel room are set actions which affects the scatter plot detailing to find the property types specific listings.

1. **Star Symbol chart**

* Variables: Accuracy, Cleanliness, Communication, Location, Value, Check-in
* Goal Addressed: Evaluate the guest experience across multiple review categories.

Key Insight: Entire homes in familiar zones such as Lincoln Park and Lakeview show consistent strength in all review metrics, indicating high guest satisfaction.

**Price Analysis Dashboard**

Narrative Objective: To evaluate pricing patterns based on listing availability, room types, and property categories. This dashboard empowers users to explore price dynamics and identify value-based segments.

Key Charts and Components:

1. **KPI Cards with Parameterized Price Slider**

* Chart Type: KPI Panel
* Variables: Average Price, Minimum Price, Maximum Price, Total Listings
* Goal Addressed: Present snapshot metrics for listings below a user-defined price threshold.

**2.Donut Chart: Room Type Distribution**

* Chart Type: Donut Chart
* Variables: Room Type, Listing Share
* Goal Addressed: Show which room types dominate within affordable listings through Price threshold Parameter.

**3.Bar Chart: Avg. Price by Property Type**

* Chart Type: Horizontal Bar Chart
* Variables: Property Type, Average Price
* Goal Addressed: Compare average prices across property types through price threshold.

1. **Heatmap: Availability-Based Price Comparison:**

* Chart Type: Highlight Table
* Variables: Availability Status, Room Type, Avg. Price
* The Heatmap shows the property availability also with Alert symbols to make the customer aware of their budget constraints.
* Goal Addressed: Understand pricing differences by availability level.

Key Insight: Listings with lower availability (i.e., “Rarely Available”) often charge higher prices. Entire home listings remain the most expensive, while shared and private rooms offer budget-friendly options.

**Host Analysis Dashboard**

Narrative Objective: To evaluate host performance through metrics such as number of listings, review quality, response rate, acceptance rate, and Superhost status. This dashboard reveals patterns among the most successful Airbnb hosts in Chicago.

Key Charts and Components:

**Bar Chart: Total Listings vs. Listings Rated Above 4.7:**

* Chart Type: Side-by-side Bar Chart
* Variables: Host Name, Listing Count, High Review Count
* Goal Addressed: Identify top-performing hosts by both quantity and quality.

1. **Host Panel**

* Chart Type: KPI Cards with Icons
* Variables: Acceptance Rate, Response Rate, Experience (in years), Superhost Status.
* Goal Addressed :Measure operational excellence among hosts.

1. **Top Host Ranking Chart**

* Chart Type: Ranked Bar Chart
* Variables: Host Name, Ranking Metric (e.g., Avg. Price, Listing Volume)
* Goal Addressed: Dynamically compare hosts based on user-selected metrics.

Key Insight: Superhosts consistently maintain high response and acceptance rates, often paired with extensive hosting experience and a large number of listings.

**Design Considerations & Visual Best Practices**

* Clarity and Minimalism: Removed unnecessary elements like extra gridlines, titles, and borders to reduce visual clutter.
* Consistent Visual Themes: Maintained a unified color palette and style across dashboards to improve coherence and user experience.
* Use of Pre-attentive Attributes: Color, size, iconography, and positioning were used to guide user focus toward key metrics and comparisons.
* Interactive Flow: Each dashboard supports parameter-driven interactivity and filter actions to allow exploratory data analysis tailored to user preferences.

**Background Materials:**

This project was inspired by a variety of sources, including public Tableau dashboards and academic studies on platform economies. A particular influence was the extensive use of interactive Airbnb dashboards on **Tableau Public**, which demonstrated best practices in dynamic storytelling, parameterized filtering, and the use of spatial data to reveal booking trends.

**🔗 Sources of Inspiration and References:**

* **Tableau Public – Airbnb Dashboards:** These dashboards provided inspiration for map-based analysis, star rating visualizations, and top-N ranking filters. https://public.tableau.com
* **Airbnb Data Portal:** Provided additional contextual understanding of how hosts and guests interact on the platform.

## DATASET COLUMNS EXPLAINATION

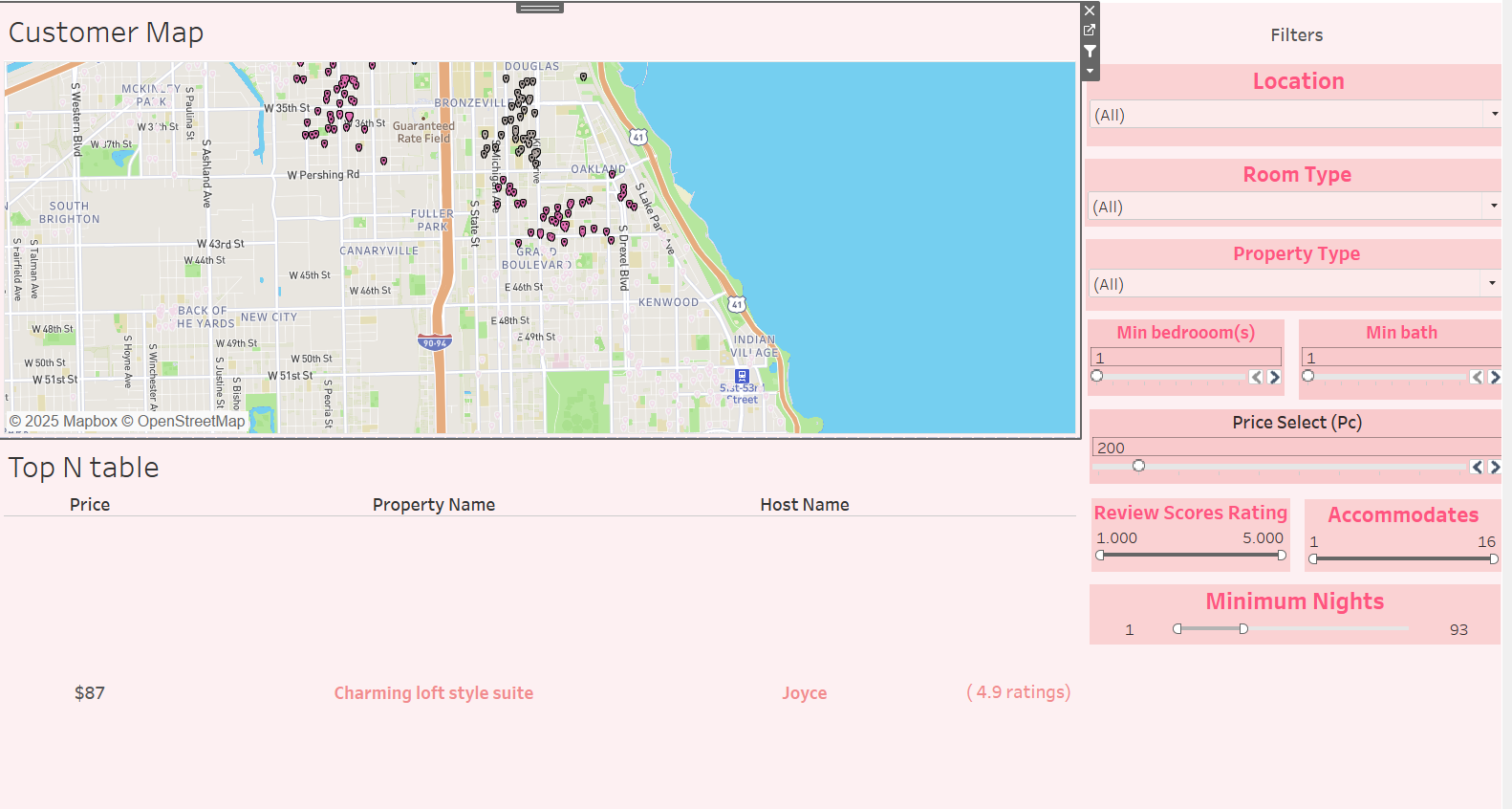
## Cleaned\_Chicago\_Airbnb.csv

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| |  |  | | --- | --- | | Column | Description | | id | Unique listing identifier | | listing\_url | URL to the listing on Airbnb | |  |  | | Property Name | Title or name of the property | | Description | Text description provided by the host | | picture\_url | URL to the main listing image | | host\_id | Unique ID for the host | | host\_url | URL to the host's profile | | host\_name | Name of the host | | host\_since | Date when the host joined Airbnb | | host\_response\_rate | Host's response rate to inquiries | | host\_acceptance\_rate | Rate at which the host accepts booking requests | | host\_is\_superhost | Whether the host is a Superhost (t/f) | | host\_thumbnail\_url | Thumbnail image of the host | | host\_picture\_url | Full profile image of the host | | host\_identity\_verified | Host identity verification status | | neighbourhood\_cleansed | Standardized neighborhood name | | latitude | Latitude of the property location | | longitude | Longitude of the property location | | property\_type | Type of property (e.g., Apartment, House) | | room\_type | Type of room offered (e.g., Private room, Entire home) | | accommodates | Maximum number of guests the property accommodates | | bathrooms | Number of bathrooms | | bathrooms\_text | Text description of bathroom details | | bedrooms | Number of bedrooms | | price | Price per night (USD) | | minimum\_nights | Minimum nights required for booking | | maximum\_nights | Maximum nights allowed per stay | | availability\_30 | Availability over the next 30 days | | availability\_60 | Availability over the next 60 days | | availability\_90 | Availability over the next 90 days | | availability\_365 | Availability over the next 365 days | | number\_of\_reviews | Total number of reviews | | number\_of\_reviews\_recent | Recent number of reviews | | availability\_eoy | Availability at the end of the year | | estimated\_revenue\_l365d | Estimated revenue in the last 365 days | | first\_review | Date of the first review | | last\_review | Date of the most recent review | | review\_scores\_rating | Overall rating out of 5 | | review\_scores\_accuracy | Accuracy of listing description | | review\_scores\_cleanliness | Cleanliness score | | review\_scores\_checkin | Check-in experience rating | | review\_scores\_communication | Communication with host rating | | review\_scores\_location | Location rating | | review\_scores\_value | Value-for-money rating | | instant\_bookable | Whether the listing is instant bookable (t/f) | | calculated\_host\_listings\_count | Total listings managed by the host | | calculated\_host\_listings\_count\_entire\_homes | Host's entire home/apartment listings count | | calculated\_host\_listings\_count\_private\_rooms | Host's private room listings count | | calculated\_host\_listings\_count\_shared\_rooms | Host's shared room listings count | | reviews\_per\_month | Average number of reviews per month | |
| Chicago\_Familiar\_Groups.csv |
| |  |  | | --- | --- | | Column | Description | | neighbourhood\_cleansed | Standardized neighborhood name in Chicago | | familiar\_group | Broader region grouping for mapping and analysis (e.g., North Side, Downtown) | |
| Familiar\_Groups\_Coordinates.csv |
| |  |  | | --- | --- | | Column | Description | | Familiar Group | Grouped region name used for analysis and mapping | | Latitude | Central latitude coordinate of the region | | Longitude | Central longitude coordinate of the region | | **Reviews. Csv**  Column  Listings Id  Review Id  Comments | Description  Property listings  Reviews identification  Comments on the particular property | |

### Conclusion

This project explores Airbnb in Chicago by turning raw data into clear and useful insights using four interactive Tableau dashboards—Customer Interface, Property Analysis, Price Analysis, and Host Analysis. With advanced features like LOD calculations, filters, interactive actions, and dynamic tooltips, the dashboards are both detailed and easy to use. Together, they help a variety of users—from travelers and hosts to analysts and policymakers—understand trends in rental behavior, pricing, and performance. Overall, the project shows how data visualization can make complex information easy to explore and support better decision-making.

**SCREENSHOT OF THE DASHBOARDS**

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