Airbnb Analysis for Optimizing Guest Personalization Strategies

Project Objective

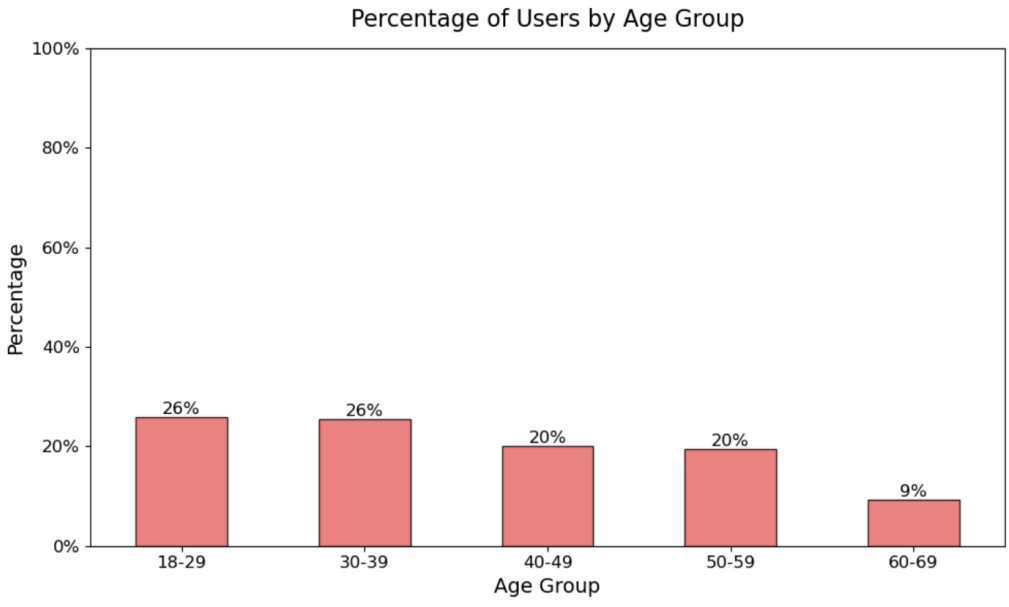
The objective of this project is to leverage Airbnb simulated data to analyze user behavior to understand current users and provide recommendations for personalization of listings and for marketing strategies. Key areas of focus include:

1. **Funnel Analysis**: Understanding user journeys from searching to booking to identify areas for improvement in conversion rates.
2. **A/B Testing**: Evaluating the impact of discounted pricing on booking behavior.
3. **User Segmentation**: Classifying users into personas based on their booking features like price, stay length, and number of amenities to enhance user experience for future bookings.

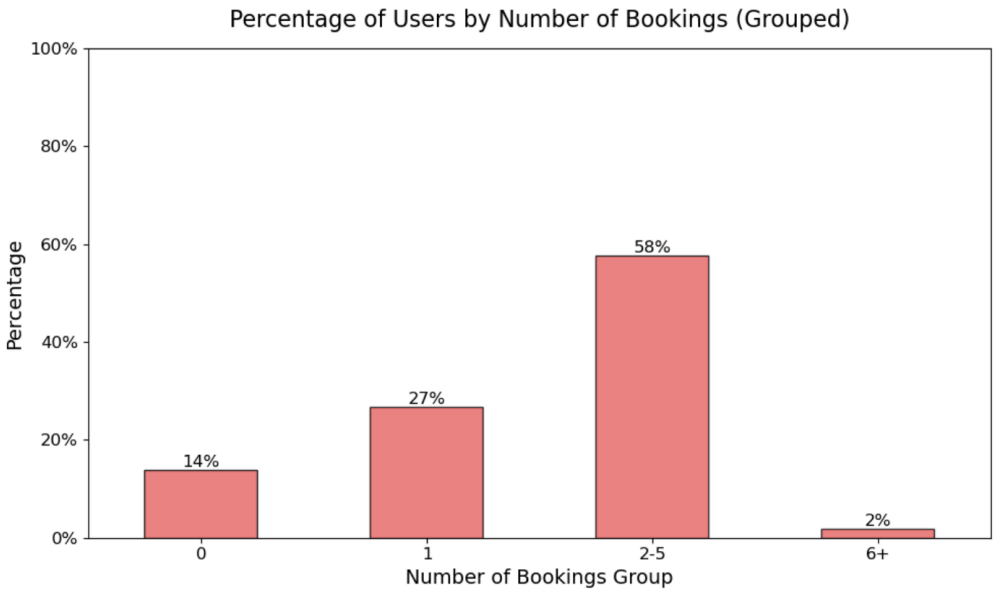
Data Collection and Initial Insights

Data from user activities, listings, events, and bookings were collected and processed. Key steps included:

- One-hot encoding of amenities.
- Grouping users by age and number of bookings.
- Exploratory analysis revealed that:
    - Over 50% of guests are aged 18-39, suggesting a younger demographic preference.

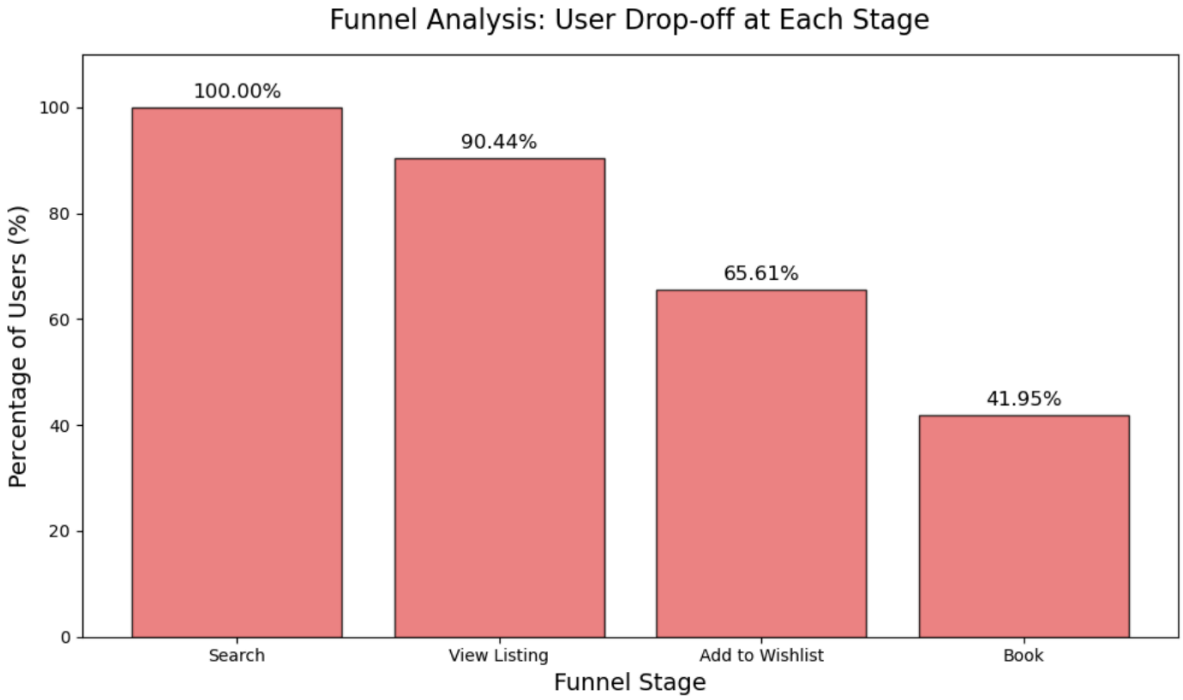


- Gender distribution is balanced.
- 58% of guests book 2-5 stays, indicating a middle-range booking frequency.



Funnel Analysis

The funnel analysis revealed the following conversion rates:



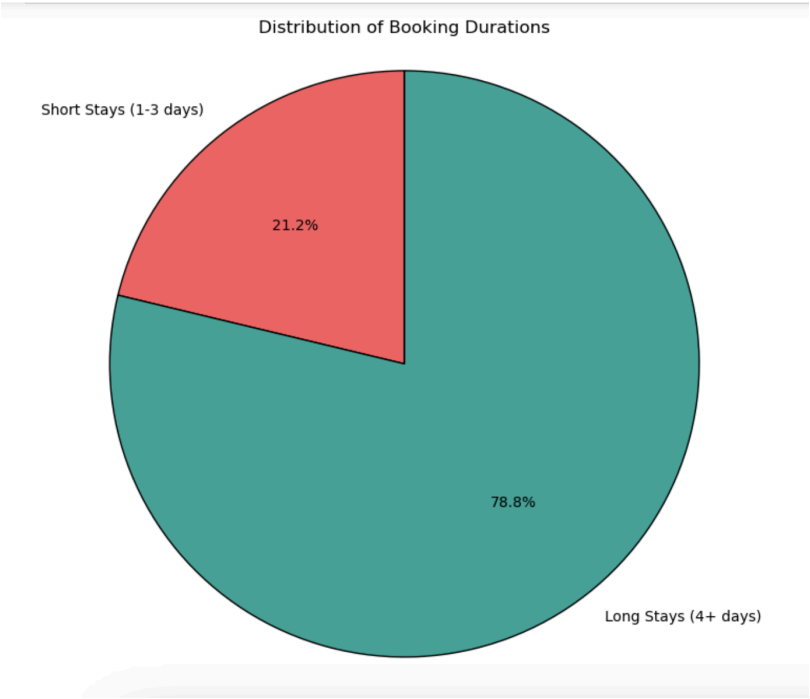
- **Search → View Listing**: 90%
- **View Listing → Add to Wishlist**: 66%
- **Add to Wishlist → Booking**: 42%

While initial engagement is high, the lower booking conversion highlights potential optimization opportunities. An alternative approach could involve testing whether the current prices are perceived as too high and evaluating the impact of offering a 15% discount on the listed daily price to improve booking rates and revenue. Additionally, it's possible that the listings may not be appealing enough to potential guests. This could be addressed by enhancing personalization through more tailored listing recommendations that align with guests' preferences and characteristics, thereby increasing their likelihood of booking.

A/B Testing on Discount Impact

To test the effect of a 15% discount on booking rates and revenue:

- Users were divided into control (original pricing) and treatment (discounted pricing) groups and the sample size need for each group was calculated.
- Key findings:
    - Booking rates between groups showed no statistically significant difference (P-value: 0.22).
    - Subgroup analysis by stay length (1-3 days vs. 4+ days) also showed no significant impact.



- Conversion rates were slightly higher for treatment groups but not significant (P-value: 0.08).

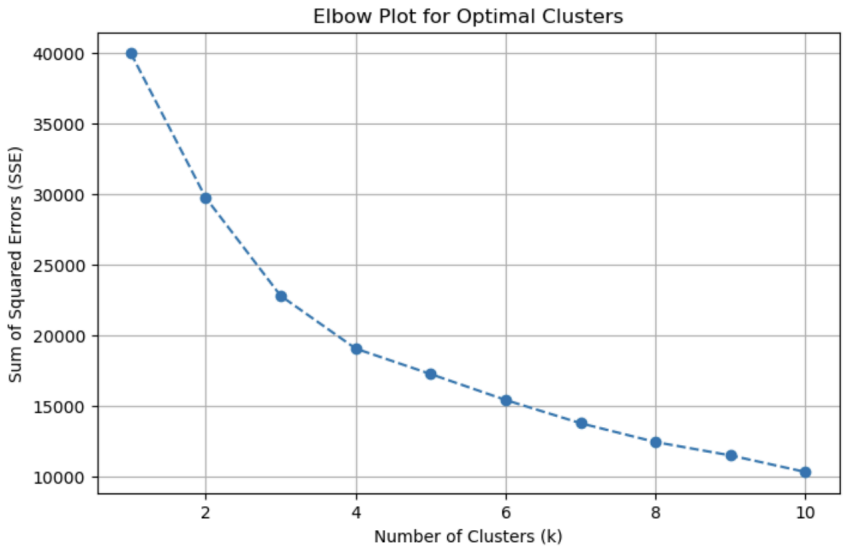
Recommendations:

- Reassess discount strategies or test alternative incentives, such as a free day included after a five day stay.
- Explore segmentation to identify whether specific user groups respond better to discounts.

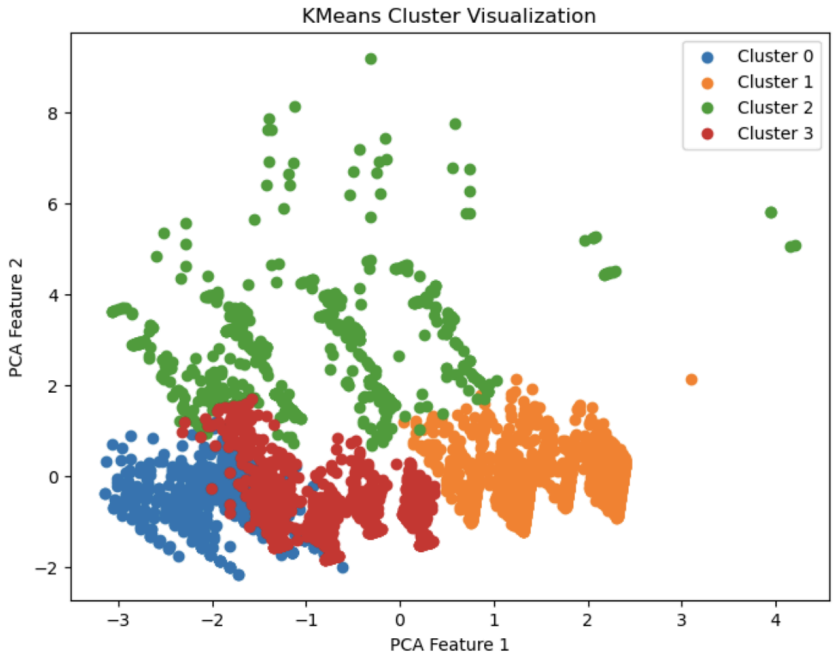
User Segmentation and Clustering Analysis

In order to understand users and group behaviors, clusters were identified using key features like booking behavior, stay length, and amenity usage:

- Optimal clusters: **4**, determined via an elbow plot.



- Clusters were visualized in 2D using principal components analysis (PCA), yielding a moderate silhouette score of **0.304**.



Insights from Clusters:

1. **Cluster 0**: Long-stay guests booking affordable homes.
2. **Cluster 1**: Group travelers requiring larger accommodations.
3. **Cluster 2**: Luxury seekers preferring premium properties with higher bookings costs and more amenities.
4. **Cluster 3**: Budget travelers using discounts frequently.

Even though the silhouette score is moderate, the clusters could still provide meaningful insights for personalizing the listings that users see and for marketing strategies, such as sending emails on discounts for guests in cluster 3 or showing new luxury listings for guests in cluster 2. However, the clusters could be further separated by adding features.

Proposed Features for Improved Clustering:

- Regional pricing trends, seasonality, guest behavior features (e.g., booking frequency, shared vs. private stays), geographic preferences, and property attributes.

Actionable Recommendations:

- Tailored listing property suggestions for each cluster.
- Enhanced search filters for personalized user experiences.
- Seasonal discounts and loyalty rewards targeting specific clusters.

Conclusion

The analysis provides a roadmap for Airbnb to:

1. Optimize conversion rates through funnel insights.
2. Refine marketing strategies using segmentation.
3. Enhance user experience via personalized recommendations and improved listing categorization.

Further steps include incorporating additional features, re-evaluating clustering, and testing refined marketing and pricing strategies to maximize user engagement and revenue.