**Airbnb Topic Modeling Analysis: Pre- and Post-Pandemic Insights**

**1. Introduction**

The report presents an analysis of Airbnb reviews from pre-pandemic (2019) and post-pandemic (2023) periods using topic modelling techniques, specifically Latent Dirichlet Allocation (LDA), Non-negative Matrix Factorization (NMF), and Latent Semantic Analysis (LSA). The primary objective is to identify and compare dominant topics during both periods to understand shifts in customer preferences and provide actionable recommendations for Airbnb management.

**2. Methodology**

Three topic modelling techniques (LDA, NMF, and LSA) were used to extract topics from Airbnb review datasets for both 2019 and 2023. The analysis was conducted on cleaned, pre-processed text data, with a custom stop list applied to improve the relevance of the topics. Each model produced ten topics per period, which were subsequently labelled based on their most relevant. Dataset has been divided into two data frames pre and post-pandemic data.

**3. Topic Libelling and Interpretation**

**LDA (Latent Dirichlet Allocation)**

**LDA Pre-Pandemic Labels:**

Convenient Downtown Stay: perfect, close, location, super, clean, downtown, stay, easy, great, place

Highly Recommended Downtown Stay: downtown, amazing, great, close, definitely, recommend, home, perfect, stay, place

Parking & Noise Issues: door, parking, little, issue, bit, noise, place, didnt, nice, night

Proximity to Restaurants & Breweries: stay, west, brewery, place, distance, walking, location, downtown, restaurant, great

Scenic Views and Cozy Environment: nice, minute, mountain, porch, place, downtown, beautiful, house, view, great

Artistic Neighborhood Stay: bed, home, neighbourhood, space, apartment, river, district, house, downtown, art

Clean and Comfortable Space: home, place, bathroom, space, clean, room, comfortable, stay, bed, house

Spacious and Recommended Accommodation: definitely, space, downtown, comfortable, recommend, clean, stay, place, location, great

Comfort with Personal Touches: comfortable, coffee, like, feel, extra, stay, touch, make, place, home

Responsive and Convenient Stay: location, local, respond, touch, question, great, clean, place, quick, stay

**LDA Post-Pandemic Labels:**

Quiet and Central Stay: location, definitely, quiet, perfect, clean, downtown, close, great, stay, place

Charming Neighborhood with Coffee and Dining: porch, quiet, walk, downtown, restaurant, great, neighborhood, place, loved, coffee

Comfortable Stay with Bedroom and Kitchen Amenities: stay, place, clean, bedroom, comfortable, room, bathroom, kitchen, nice, bed

Relaxing Family Stay with Hot Tub: loved, tub, hot, stay, great, beautiful, home, family, perfect, house

Convenient Stay with Dining and Downtown Access: comfortable, walking, easy, restaurant, place, clean, downtown, stay, location, great

Artistic District Stay with Scenic Views: recommend, easy, area, location, downtown, enjoyed, district, river, art, stay

Helpful and Responsive Hosts for a Smooth Stay : easy, recommend, super, helpful, definitely, clean, responsive, great, place, stay

Comfortable and Beautiful Space with Personal Touches: touch, like, loved, clean, beautiful, felt, comfortable, place, stay, home

Memorable and Enjoyable Stay Experiences: experience, feel, stay, staying, great, best, like, stayed, place, time

Pet-Friendly Stay with Minor Road Issues: place, road, car, door, day, didnt, dog, night, house, issue

* **Pre-Pandemic (2019) Topics**:

Convenient Downtown Stay: Guests prioritized proximity to downtown areas and attractions.

Highly Recommended Downtown Stay: Positive reviews centered on location and convenience.

Parking & Noise Issues: Common concerns were related to parking and noise.

Proximity to Restaurants & Breweries: Guests valued being close to restaurants and entertainment.

Scenic Views and Cozy Environment: Emphasis on scenic views and relaxing atmospheres.

Artistic Neighborhood Stay: Focus on neighborhood aesthetics and arts.

Clean and Comfortable Space: Importance placed on cleanliness and comfort.

Spacious and Recommended Accommodation: Appreciation for large, comfortable spaces.

Comfort with Personal Touches: Personalized details that added to the experience.

Responsive and Convenient Stay: Quick host response and convenience were highlighted.

* **Post-Pandemic (2023) Topics**:

Quiet and Central Stay: Greater focus on quiet, central locations.

Charming Neighborhood with Coffee and Dining: Desire for proximity to local dining and coffee shops.

Comfortable Stay with Bedroom and Kitchen Amenities: Emphasis on well-equipped homes.

Relaxing Family Stay with Hot Tub: Family-oriented, relaxing stays gained importance.

Convenient Stay with Dining and Downtown Access: Access to dining and downtown remains relevant.

Artistic District Stay with Scenic Views: Continuing interest in artistic neighbourhoods.

Helpful and Responsive Hosts for a Smooth Stay: Importance of host responsiveness.

Comfortable and Beautiful Space with Personal Touches: High value placed on comfort and aesthetics.

Memorable and Enjoyable Stay Experiences: Enjoyable experiences and lasting memories.

Pet-Friendly Stay with Minor Road Issues: Some concerns around pets and road access.

**NMF (Non-Negative Matrix Factorization)**

**NMF Pre-Pandemic Labels:**

Maintenance and Comfort Issues: mist, harsh, communicate, lead, plentiful, cloth, plumber, concerning, brplenty, comfier

Work, Budget, and Miscellaneous Observations: observation, joelle, airbbs, opening, coworker, budget, electrical, mist, pirate, dispenser

Concierge and Entertainment Services: concierge, pot, player, gentleman, cast, intended, channel, agreement, appropriate, itbrthe

Sports, Apparel, and Personal Preferences: girl, brwere, abbys, hockey, countless, kimono, ginger, control, choose, monthlong

Media, Camping, and Household Issues: mike, concerning, channel, cast, kathryns, camping, asks, neck, brwifi, broom

Agreements, Camping, and Outdoor Facilities: agreement, plentiful, concerning, precarious, cristina, camping, appropriate, countless, intended, gazebo

Planning, Funerals, and Echoing Spaces: funeral, planning, pot, opening, agreement, ginger, intended, eliminated, ashlin, echoing

Control, Amenities, and Homeowner Preferences: control, gesture, airbbs, hole, ammenities, kathryns, outrageous, liking, kimono, homeowner

Electrical Issues and Personal Interactions: cast, ashlin, electrical, narrow, gesture, jonathan, girl, jakub, channel, mikaels

Outdoor Spaces, Moonlight, and Playgrounds: playground, lb, cristina, countless, electrical, knock, choose, moon, ear, knife

**NMF Post Pandemic Labels:**

Perfect Weekend Getaway Spot: girl, space, quick, little, needed, trip, spot, getaway, weekend, perfect

Great Host and Communication Experience: responsive, value, thanks, stay, experience, communication, host, spot, time, great

Enjoyable and Memorable Stay: come, absolutely, thanks, lovely, loved, thank, really, definitely, enjoyed, stay

Cozy and Peaceful Place for Relaxation: described, peaceful, looking, visit, come, cozy, amazing, awesome, cute, place

Nice Neighborhood with Hot Tub: area, little, touch, tub, neighborhood, hot, house, quiet, really, nice

Walkable Location with Excellent Parking: parking, condo, amazing, apartment, fantastic, awesome, walkable, excellent, convenient, location

Convenient Downtown and Restaurant Access: minute, distance, walking, walk, quiet, drive, restaurant, easy, close, downtown

Cozy, Comfortable, and Clean Space: needed, responsive, cute, quiet, cozy, space, bed, super, comfortable, clean

Highly Recommended with Friendly Hosts: friendly, looking, fantastic, recommended, host, responsive, staying, definitely, highly, recommend

Amazing Views and Beautiful Home Vibes: right, like, amazing, view, felt, time, house, loved, beautiful, home

* **Pre-Pandemic (2019) Topics**:

Maintenance and Comfort Issues: Highlighted operational problems.

Work, Budget, and Miscellaneous Observations: Budget and work-related concerns.

Concierge and Entertainment Services: Reviews focused on amenities and entertainment options.

Sports, Apparel, and Personal Preferences: Focus on sports and personal needs.

Media, Camping, and Household Issues: Reflected concerns with household amenities.

Agreements, Camping, and Outdoor Facilities: Issues with agreements and outdoor facilities.

Planning, Funerals, and Echoing Spaces: Specific planning concerns.

Control, Amenities, and Homeowner Preferences: Homeowner preferences highlighted.

Electrical Issues and Personal Interactions: Emphasis on electrical problems.

Outdoor Spaces, Moonlight, and Playgrounds: Focus on outdoor spaces and activities.

* **Post-Pandemic (2023) Topics**:

Perfect Weekend Getaway Spot: Emphasis on quick, peaceful getaways.

Great Host and Communication Experience: High praise for host communication.

Enjoyable and Memorable Stay: Appreciation for memorable experiences.

Cozy and Peaceful Place for Relaxation: Desire for peaceful, relaxing stays.

Nice Neighborhood with Hot Tub: Focus on amenities like hot tubs.

Walkable Location with Excellent Parking: Importance of walkability and parking.

Convenient Downtown and Restaurant Access: Continual demand for access to dining.

Cozy, Comfortable, and Clean Space: Guests value cleanliness and comfort.

Highly Recommended with Friendly Hosts: High recommendations for hosts.

Amazing Views and Beautiful Home Vibes: Interest in aesthetics and scenic views.

**LSA (Latent Semantic Analysis)**

**LSA Pre Pandemic Labels:**

Perfect Stay in Downtown Area: definitely, close, perfect, space, downtown, clean, location, stay, place, great

Valuable Stay with Helpful Hosts: callie, sue, advise, shelly, locationclose, price, value, place, location, great

Enjoyable Visit with a Great Location: visiting, located, nice, amazing, close, awesome, enjoyed, definitely, stay, place

Beautiful Home with Memorable Stay: amazing, house, loved, beautiful, home, location, space, enjoyed, definitely, stay

Quiet, Comfortable, and Clean Space: convenient, super, enjoyed, bed, space, quiet, comfortable, stay, clean, nice

Highly Recommended Comfortable Stay: convenient, perfect, comfortable, amazing, nice, highly, recommend, place, clean, location

Easy Weekend Getaway in Downtown: getaway, easy, weekend, distance, walking, stay, close, downtown, location, perfect

Amazing Views with a Beautiful Home: getaway, view, amazing, house, place, home, beautiful, perfect, location, nice

Cute Getaway Spot for a Weekend: nice, little, great, loved, place, cute, getaway, weekend, perfect, space

Convenient Stay with Walking Distance Access: distance, staying, walking, spot, enjoyed, definitely, stay, highly, nice, recommend

**LSA Post Pandemic Labels:**

Perfect Downtown Stay with Comfort**:** comfortable, close, perfect, definitely, downtown, clean, location, place, stay, great

Great Value Stay with Good Communication**:** nina, kris, thanks, communication, price, value, place, stay, location, great

Lovely Stay with Enjoyable Experiences**:** thanks, lovely, nice, thank, loved, really, definitely, enjoyed, place, stay

Quiet and Clean Getaway Spot**:** getaway, downtown, recommend, super, clean, quiet, cute, close, nice, place

Convenient Stay with Comfortable Amenities**:** convenient, easy, quiet, really, stay, enjoyed, location, comfortable, clean, nice

Weekend Getaway with Restaurant Access**:** restaurant, easy, spot, getaway, close, weekend, stay, downtown, location, perfect

Beautiful and Highly Recommended Home**:** definitely, recommend, clean, amazing, home, nice, place, beautiful, perfect, location

Comfortable Stay with Responsive Hosts**:**  convenient, cute, responsive, bed, definitely, super, highly, recommend, comfortable, clean

Downtown Stay with Nearby Dining Options**:** restaurant, beautiful, staying, location, definitely, close, downtown, nice, highly, recommend

Walkable Location with Great Dining**:** walking, convenient, enjoyed, restaurant, place, home, location, close, downtown, beautiful

* **Pre-Pandemic (2019) Topics**:

Perfect Stay in Downtown Area: Guests valued staying close to the city center.

Valuable Stay with Helpful Hosts: Focus on host support and affordability.

Enjoyable Visit with a Great Location: Guests enjoyed centrally located stays.

Beautiful Home with Memorable Stay: Highlighted homes with aesthetic appeal.

Quiet, Comfortable, and Clean Space: Guests wanted clean and comfortable accommodations.

Highly Recommended Comfortable Stay: Highly recommended places stood out.

Easy Weekend Getaway in Downtown: Guests sought easy-to-access weekend getaways.

Amazing Views with a Beautiful Home: Scenic views and homes were appreciated.

Cute Getaway Spot for a Weekend: Guests enjoyed cozy, quick escapes.

Convenient Stay with Walking Distance Access: Proximity to key areas was important.

* **Post-Pandemic (2023) Topics**:

Perfect Downtown Stay with Comfort: Comfort is now key, especially in urban settings.

Great Value Stay with Good Communication: Communication and value remain crucial.

Lovely Stay with Enjoyable Experiences: Enjoyable stays became a focal point.

Quiet and Clean Getaway Spot: Preference for quiet, clean stays has increased.

Convenient Stay with Comfortable Amenities: Comfort and convenience are key.

Weekend Getaway with Restaurant Access: Accessibility to restaurants remains important.

Beautiful and Highly Recommended Home: Guests highly recommended beautiful homes.

Comfortable Stay with Responsive Hosts: Importance of host communication increased.

Downtown Stay with Nearby Dining Options: Dining options near accommodations are still a priority.

Walkable Location with Great Dining: Walkability to dining areas is highly valued.

**4. Discussion and Comparison of Results**

The analysis indicates a clear shift in customer priorities between 2019 and 2023:

* **2019**: The primary focus was on convenience, proximity to downtown areas, and functional concerns like parking, noise, and operational issues. Guests sought centrally located, well-equipped properties with a balance of scenic views and practicality.
* **2023**: Post-pandemic, the emphasis shifted to quieter, more relaxing stays, with a focus on comfort, privacy, and family-friendly environments. Guests are now seeking personalized experiences, with host communication and responsiveness playing a critical role in their satisfaction.

Across all three models (LDA, NMF, and LSA), there is a noticeable movement from urban convenience to peaceful, private, and relaxing accommodations in the post-pandemic period.

**5. Stakeholder Insights and Recommendations**

Based on the analysis, here are the key recommendations for Airbnb:

1. **Promote Peaceful Stays**: Post-pandemic travelers are looking for quiet, relaxing environments. Highlight listings in peaceful neighborhoods.
2. **Emphasize Comfort**: Ensure listings focus on cleanliness, cozy interiors, and homely amenities.
3. **Highlight Responsive Hosts**: Encourage hosts to prioritize communication, as it has become a key driver of guest satisfaction.
4. **Combine Location with Relaxation**: Listings that offer both convenient access to city amenities and a peaceful, home-like atmosphere should be promoted.
5. **Focus on Personalized Experiences**: Cater to the growing demand for unique and memorable stays that offer cultural and scenic value.

**6. Further Analysis Recommendations**

To deepen the understanding of guest preferences and behaviors, the following analyses are recommended:

* **Sentiment Analysis**: To assess the overall tone of guest feedback and satisfaction.
* **Trend Analysis**: To identify long-term changes in guest priorities over time.
* **Customer Segmentation**: To customize offerings based on guest demographics or preferences.
* **Competitor Analysis**: To compare Airbnb’s performance with competitors and identify areas of improvement.
* **Predictive Modeling**: To forecast future trends in guest behavior and preferences, allowing Airbnb to proactively adapt its offerings.

**7. Conclusion**

This analysis reveals a significant shift in guest priorities before and after the pandemic. While pre-pandemic travelers prioritized convenience and functionality, post-pandemic guests seek comfort, quiet, and personalized experiences. By focusing on these evolving needs, Airbnb can enhance customer satisfaction and strengthen its position in the market.