

# **ALY 6070**

**COMMUNICATION AND VISUALIZATION FOR DATA ANALYTICS**

**Instructor: Prof. Mykhaylo Trubskyy**

**CRN:20474**

***Project: RShiny Application***

**Group 6**

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**Introduction:**

Proficiency in data storytelling is essential for effectively conveying intricate information and insights in the field of data science. One set of skills that can be applied to a variety of professional roles is the use of data visualizations, such as dashboards, scorecards, and spatial representations, along with thoughtful annotations. This assignment explores the critical process of converting technical outcomes into logical and compelling presentations, which is in line with Program Learning Outcome 7. The assignment covers important Course Learning Outcomes, such as developing narrative-driven dashboards, using graphic design principles for accessibility and aesthetics, and producing data visualizations that capture crucial insights without biases or misinterpretations. It focuses on designing and delivering presentations that connect with a variety of audiences.

The Enhanced Airbnb Listings Insights dashboard, which is intended to give you detailed visualizations and insights into the data pertaining to Airbnb listings. This dashboard uses sophisticated RShiny capabilities to enable interactive exploration of important metrics and trends, giving users insightful information catered to their individual requirements.

Creating R Shiny application as outlined in the project involves a structured approach, focusing on storytelling through data visualization, effective design, and ethical presentation. Here's a guide to help you conceptualize and execute this Project:

**Understanding the Project Objectives**

* Storytelling with Data: The core objective is to convey complex data insights in an engaging and understandable manner. Storytelling through data involves framing the narrative, setting the context, and guiding the audience through the data insights step by step.
* Design Principles: Utilizing graphic design concepts enhances the visual appeal and accessibility of your dashboards. This includes considerations of color schemes, layout, typography, and the use of space.
* Effective Visualizations: The choice of visualization types (e.g., bar charts, line graphs, maps) should be dictated by the data's nature and the story you wish to tell. The visualizations should be clean, focused, and free from unnecessary elements that could distract or mislead.
* Ethical Visualization: Ensure that the data is presented fairly and objectively, avoiding visual elements that could introduce bias or mislead the audience.

**Steps to Create the R Shiny Application**

1. Initial Analysis and Story Development

Start by thoroughly analyzing your data to identify the key insights and trends.

Develop a narrative or storyline that these insights can support. This narrative will guide the structure of your dashboard.

2. Visualization Creation

For each insight, select the most appropriate visualization type based on the data and the aspect of the story you're telling.

Apply design principles to ensure your visuals are accessible and aesthetically pleasing. Consider color schemes that are easy to understand and visually differentiate.

3. Peer Review and Selection

Share your visualizations with your group members for review. Evaluate each visualization based on how well it communicates the intended insight, its adherence to design principles, and its ethical representation of the data.

Select the best visualizations that collectively tell the most compelling and comprehensive story.

4. Dashboard Development with R Shiny

Incorporate the selected visualizations into an R Shiny dashboard. Organize them in a way that logically and effectively conveys your narrative.

Ensure the dashboard is navigable, with clear labels, and sections that guide the audience through the story.

Test the dashboard for user experience, ensuring that it is engaging, informative, and accessible.

**Analysis:**

Data Cleaning

A computer code with text

Description automatically generated with medium confidence

Output:

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**Observations:**

The dataset contains 3,779 entries with various attributes describing Airbnb listings. These include details like listing ID, name, host information, property location, amenities, pricing, availability, and review scores. Most listings are located in Austin, Texas, with diverse property types and room offerings. The average listing accommodates around 4 guests and has about 1.5 bathrooms. Prices vary widely, with a mean nightly rate of undisclosed currency. Availability spans from short-term to long-term stays. The dataset also captures review scores across different aspects of the listings, indicating generally positive guest experiences.

**The questions I would like to propose and answer to audience through data visualization are as follows.**

**Dashboard 1:**

1. Distribution of Review Score:

A graph with numbers and lines

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Above histogram represents the review scores of all customers across all the years. Audience can’t understand the yearly data through above visualization. These data should be organized by year and region so it can be understood by the audience.

Part of the Project: User Interface Design

* UI Definition (ui): Constructs the layout and elements of the app's user interface, including:
* Title Panel: Displays the title of your dashboard.
* Sidebar Layout: Contains interactive controls like filters (selectInput for selecting cancellation policies) that users can interact with to filter the displayed data.
* Main Panel: Designed to display the output of visualizations such as histograms. It's set up to show the distribution of review scores as an example.
* Part of the Project: Server Logic and Reactive Programming
* Server Function (server): Defines the server-side logic that reacts to user inputs and generates outputs. It includes:
* Reactive Expression (filteredData): Dynamically filters the dataset based on user-selected criteria (e.g., cancellation policy). This reactive expression updates the data to be visualized whenever the user changes the filter options.
* Visualization Output (renderPlot): Generates a histogram of review scores from the filtered dataset, updating the visualization in response to user interactions.\
* Histogram Visualization: The initial visualization provided in the template is a histogram of review scores, serving as an example of how to tell a story with data. It's designed to offer insights into the distribution of review scores across Airbnb listings.

**Running the Shiny App**

App Initialization (shinyApp): The command that combines the UI and server components, launching the Shiny app when executed.

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To enhance the initial R Shiny dashboard with features and visualizations that address the steps outlined for development, we will add new functionalities step by step. Here’s an expanded version of the initial template, incorporating:A screenshot of a graph

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**Extensibility for Further Development**

Placeholders for Additional Features: The template includes comments suggesting where to add more filters and visualizations. It's structured to be easily extended with more complex interactions, additional data visualizations, and advanced features like interactive plotly plots.

This template serves as the starting point for your project, encapsulating the initial setup, UI design, reactive programming for data processing and visualization, and the framework for storytelling through data. As you progress, you'll expand on this foundation, adding more sophisticated data analyses and visualizations to enhance your narrative.

**Dashboard 2: Geographical map Visualisations for listing locations:**

Additional interactive elements (e.g., a slider for filtering by price). A geographical map visualization for listing locations (assuming latitude and longitude data are available). Improved aesthetics and user experience with a cleaner layout and more informative text. Prerequisites Before implementing the expanded code, ensure you have the necessary packages installed. You might need additional packages like leaflet for mapping functionalities:Code Explanation

Additional Filters: The sidebar now includes a slider for filtering listings by price, enhancing the interactivity of the dashboard. Tabbed Layout: The main panel uses tabsetPanel to organize visualizations into tabs, improving navigation and user experience. Map Visualization: A map visualization is added using the leaflet package, displaying the locations of the listings. This requires latitude and longitude data in your dataset.

Reactive Filtering: The server logic is updated to filter data based on both cancellation policy and price range, demonstrating more complex reactive programming. Next Steps Further Customization: Continue to customize and expand your dashboard with more visualizations, filters, and interactivity based on your dataset and the insights you wish to highlight. User Testing and Feedback: Engage users for testing and feedback to identify areas for improvement, ensuring the dashboard is intuitive and informative. This expanded dashboard offers a more interactive and informative experience, showcasing the power of R Shiny for data visualization and storytelling

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The adjusted Shiny app focuses on analyzing seasonal trends based on the first\_review dates of Airbnb listings. It aims to provide insights into how the volume of first reviews—serving as a proxy for listing activity or popularity—varies over time. This analysis can help understand peak and off-peak periods for listings, which can be crucial for hosts planning their availability and pricing strategies, as well as for guests looking to book their stays. Here’s a breakdown of the app’s components and functionalities:

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* User Interface (UI) Title Panel: Displays the title of the dashboard, “Seasonal Trends Based on First Review Dates,” clearly indicating the dashboard’s focus.
* Main Panel: Tabset Panel: Contains tabs for different types of analyses. In this version, there’s a single tab:
* Review Trends: This tab displays a plotly output (plotlyOutput) with the ID reviewTrends, which will render the visualization of review trends over time. Server Logic Data Preparation (data\_processed reactive expression):
* Date Conversion: Converts the first\_review column from a string to a Date object using as.Date(), ensuring dates are in a consistent format (“%Y-%m-%d”). This step is crucial for any time-based analysis.
* Date Filtering: Filters out any listings that do not have a valid first\_review date, ensuring the analysis only includes listings with actual review data. Month Extraction: Uses floor\_date() from the lubridate package to extract the month from the first\_review\_date. This transformation groups the data by month, facilitating the analysis of seasonal trends. Review Trends Visualization (reviewTrends renderPlotly output):
* Data Aggregation: Groups the processed data by month and counts the number of reviews (listings) for each month. This aggregation is the basis for understanding how review volume changes over time.

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* Plot Generation: Uses ggplot2 to create a line graph (with points) showing the number of reviews by month. The line graph provides a clear visual representation of how review activity trends over time, with peaks indicating higher activity and troughs indicating lower activity. Interactivity: Enhances the plot with plotly’s ggplotly(), making it interactive. Users can hover over data points to see exact numbers, enhancing the data exploration experience.
* Analysis Insights Seasonal Trends: By visualizing how the volume of first reviews changes monthly, stakeholders can identify key trends, such as peak booking seasons or times when listings are less popular. This insight can inform marketing and pricing strategies.
* Listing Activity: The volume of first reviews can also serve as an indicator of overall listing activity on the platform, providing insights into market dynamics and growth. Adaptation for Specific Insights While this dashboard provides a foundational analysis, it can be further expanded or adapted to include more detailed insights, such as:

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Comparing trends across different cities or neighborhoods. Analyzing the impact of seasonal trends on prices or review scores. Incorporating filters for users to select specific years, types of listings, or other criteria to refine the analysis. This app serves as a starting point for deeper explorations into the seasonal dynamics of Airbnb listings, offering a framework that can be customized and extended based on specific analytical needs and dataset characteristics.

**Conclusion:**

The Enhanced Airbnb Listings Insights dashboard provides a strong analytical and comprehension platform for Airbnb listings data. Users can identify significant trends, patterns, and relationships in the data through user-friendly interactive features and visualizations, which helps with strategic planning and well-informed decision-making. Regardless of your role in the dynamic world of Airbnb accommodations—business analyst, decision-maker, or data enthusiast—this dashboard gives you the ability to derive meaningful insights and influence positive outcomes.

Finally, the development of the R Shiny group dashboard is a prime example of how data science can combine technical know-how with clear communication. Students have shown that they can turn complex data into engaging stories by applying key learning outcomes like building narrative-driven dashboards, using graphic design principles, and producing objective visualizations. Students who create visually appealing and educational dashboards not only meet the assignment requirements but also develop critical skills that will serve them well in their future careers. Because the assignment is collaborative in nature, students are encouraged to work in teams and to use a variety of viewpoints to improve the quality of their final product. The expanded Shiny app offers an enhanced user experience by providing insightful visualizations and interactivity to analyze seasonal trends based on first review dates of Airbnb listings. By incorporating features like date conversion, filtering, and aggregation, the app ensures robust data processing for accurate analysis. The visualization of review trends over time enables stakeholders to identify peak booking seasons and understand fluctuations in listing activity, empowering them to make informed decisions regarding pricing, availability, and marketing strategies.

Moreover, the app's adaptability allows for further customization and expansion, catering to specific analytical needs and dataset characteristics. Potential enhancements could include comparing trends across different locations, exploring the impact of seasonal variations on prices or review scores, and incorporating additional filters for refined analysis. Through user testing and feedback, the app can continue to evolve to meet the evolving needs of users, ensuring it remains a valuable tool for gaining insights into the dynamics of the Airbnb marketplace.

Overall, the expanded Shiny app exemplifies the power of data visualization and storytelling in uncovering actionable insights from complex datasets. It serves as a versatile platform for exploring and understanding seasonal trends in Airbnb listings, offering a foundation for deeper explorations and informed decision-making in the hospitality industry.