Visualization Project

**Optimization of Airbnb Rentals in Copenhagen: A Data-Driven Visualization Tool for Hosts.**

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Picture of the visualization

Description

**Abstract**

*In response to the increasing demand for data-driven insights in the short-term rental market, this project presents a comprehensive visualization tool designed for Airbnb hosts in Copenhagen, Denmark´s most popular city for Airbnb rentals. Current tools offered by Airbnb provide only limited insights into pricing and demand patterns, lacking the depth needed for hosts to make data-informed decisions. To address this gap, this tool utilizes Airbnb data to offer interactive, geospatial visualizations of rental properties, incorporating criteria such as property type, location, seasonal demand and pricing benchmarks. Key features include a heat map highlighting high- and low-demand zones, a violin-plot illustrating seasonal rental trends, and customized filters for property specific data. This tool enables hosts to analyze market dynamics, optimize pricing and anticipate peak rental periods, ultimately supporting profitable decision-making in the competitive Copenhagen market. By enhancing access to actionable data, this visualization tool aims to empower hosts, new participants to the Airbnb market and contribute to Denmark´s broader tourism ecosystem.*

**1. Introduction & Motivation**

Technological advancements have introduced platforms like Airbnb, part of the sharing economy, which enables direct transactions between private individuals (VisitDenmark) This trends sheds light on sectors of the Danish tourism industry. A 2019 VisitDenmark survey shows that about 45% of Airbnb guests in Denmark chose Copenhagen as their destination, making it the most popular Danish city for Airbnb rentals. Consequently, this study narrows its focus to the Copenhagen area. Existing Airbnb data visualizations primarily depicts guest information using pie and bar charts, revealing an opportunity to leverage data more comprehensively. Rather than focusing solely on guest trends, this project seeks to support hosts by providing data visualizations specific to Airbnb listings in Copenhagen.

**1.1. Problem Statement**

Based on the motivation, a scenario is developed in which Airbnb aims to provide potential hosts with a visualization tool that offers a clear under-standing of the market, helping them optimize their rentals and make informed pricing decisions based on factors like seasonality and competition.

This interactive tool enables hosts to identify peak rental times and potential pricing strategies, delivering a clear, data-drive overview of their listings position in the market. The visualization intends to simplify hosting for new and existing users, potentially encouraging more listings in Copenhagen and contributing to Denmark´s tourism offerings.

**2. Related Work**

Currently for this study, besides the existing over-view from VisitDenmark 2019, Airbnb provides a tool that estimates nightly rates based on property type, location, and bedroom count, along with a map displaying nearby prices. However, this basic tool analyzes only limited parameters, potentially leading to generalized results.

**3. Project Overview**

Based on an iterative, participatory visualization design (Ref) approach our analysis tool…

* Geospatial Analysis

We have chosen to keep the geovisualization since we are dealing with geo-reference data objects.

The proposed tool will include additional details, such as seasonality, number of bathrooms and bed count, enabling a more nuanced analysis.

To ensure more precise results while maintaining usability, the visualization includes filters allowing users to specify property details. The data sources include Airbnb´s listings and calendar datasets, focusing on attributes such as geographic location, property type and accommodation specifics.

Additionally, the visualization has a heat map to highlight specific areas in Copenhagen incorporated, displaying individual Airbnb listings and their respective prices, as well as average prices based on selected criteria. The map uses color coding to visually distinguish high- and low-cost zones, enabling quick and clear identification.

A distinctive feature is a year-wheel that shows peak months for guest traffic, allowing users to explore seasonal trends through an interactive slider. For accurancy, the project is limited to data form the most recent year, 2023, to provide a reliable and current depiction of the market conditions.

**4. Data**

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**5. Visual Design**

In this project, a geovisualization approach is used to support exploration and analysis, aimed at a highly interactive and individualized experience for users. The system dynamically adapts to users’ criteria, which requires handling spatial and geographical data in a way that captures both high-level patterns and specific details. A geographic information system (GIS) framework forms the bases of this approach, allowing for the analysis and visualization of spatial data. The framework includes base layers such as basemaps and zoning divisions, which enable analysis across different zones in Copenhagen.

The results of these analyses are presented visually through a map interface. In this case, the map displays various areas in Copenhagen along with associated pricing attributes. A heat map is used to highlight zones with specific pricing characteristics, making spatial pricing trends easily noticeable. The system uses vector data, necessary for mapping streets and precise address-based locations The base layer is a map of CPH, overlaid with polygon data representing the different zones.

 The primary goal of this geospatial data analysis is to reveal patterns and relationships within the data, facilitating an understanding of geographic phenomena or processes related to the Airbnb market in Copenhagen.

A choropleth map is chosen for this purpose due to the quantitative nature of the data/prices. choropleth maps effectively manage large datasets by providing an approximate overview. Additionally, a scatter map box is integrated to allow users to explore individual price points. Each address is represented by a glyph, inviting inter-action with the visualization. This combination of choropleth and scatter map box provides a comprehensive view while allowing detailed exploration of individual data points.

**5.1 Area & pricing view:**

Choropleth

Scatter map box

* *What:* h
* *Why:* h
* *How:* h
* *Use:* h

**5.2 General information overview**

Piechart/Sun burst

* *What:* h
* *Why:* h
* *How:* h
* *Use:* h

**5.3 Pricing distribution and comparison:** A

Violin plot and ridgeline plot ADD short explanation

* *What:* Uses the different Airbnb attributes such as calendar data and room data to compare how the pricing differs.
* *Why:* This view supports the under-standing of the relations between the different Airbnb-attributes and the pricing.
* *How:* By showing a violin plot and a ridgeline plot it…
* *Use:* Analysts can interact with the different parameters…

**5.4 Pricing calculator & predictor**

Machine learning / predictions

* *What:* h
* *Why:* h
* *How:* h
* *Use:* h

**6. Discussion & Conclusion**

* **Limitations**
* **Future work**

**Critique**

* Recommendations functions as weights in the machine learning?

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