

EXPLORING ONLINE RENTAL MARKETPLACES: THE CASE STUDY OF AIRBNB

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The work of Mya I. Robinson was conducted at Saint Louis University (SLU) thanks to a McNair Scholarship. Waqar Muhammad and Flavio Esposito are with the Computer Science Department at SLU. Reference authors: robinsonm@fontbonne.edu, waqar.muhammad@slu.edu, flavio.esposito@slu.edu.

Abstract

Since its entrance in the market, Airbnb has grown into a popular way for people to lodge both locally and internationally. Airbnb is an online marketplace that provides hospitality services. As the hospitality market expands and international travel increases, Airbnb is thriving globally. This study's objective is to identify and analyze various factors that may have an impact on an Airbnb listings price. The study aims to see how much the factors of an individual Airbnb listing determine an Airbnb listing price. Many factors are used by Airbnb to describe a listing, such as, but not limited to, zip code, number of amenities, and host information. A web crawler was used to gather and interpret datasets from the Airbnb website. While this hypothesis is interesting, and a basic web crawler has been implemented, we are still collecting data to be able to validate our assumptions.

Introduction

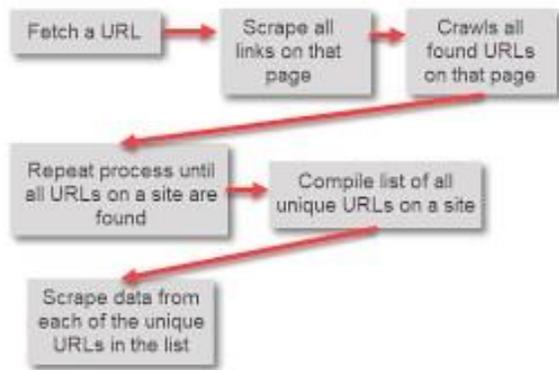
Airbnb advertises itself as a community marketplace that brings together people who have additional space and people who are in search of places to stay. Airbnb works by allowing people to become hosts and offer accommodation to guests. Hosts post descriptions and photos of their spare space for others to book. Hosts establish their nightly, weekly or monthly prices, and listings are ranked (somewhat mysteriously), after a location query. This shared marketplace provides convenience to hosts and guests in terms of flexibility and price. Guests can book unique accommodations from cities and countries all over the world. Host and guests have (mostly) direct contact with each other. Guests and hosts have the opportunity to write a review about their experience with the host and the property after their stay. Guests are also encouraged to rate their stay based on elements like cleanliness and host communication. There is no cost for guests and host to sign up for Airbnb. Their business

model is to charge guests an escrow fee ranging from 9% to 12% for each reservation, depending on the length of the stay, and an additional host service fee of 3%. Since its launch, Airbnb has grown rapidly, and it has millions of properties around the world. There are 2.9 million hosts on Airbnb averaging roughly 800,000 Airbnb stays a night.

The increasing popularity of Airbnb has gained worldwide attention, and several studies were conducted, see e.g., [1]–[3]. There is much debate as to whether Airbnb properties are a smart investment for those looking to become Airbnb hosts [4]. According to U.S. News & Money Report, the rise in Airbnb popularity is influencing people to buy real estate with the assumption that it will be lucrative [5]. Financial experts warn that this strategy may not be as simple or lucrative as it seems. This initial study aims at providing potential hosts with information that could be used to generate more revenue through better planning. Being knowledgeable

of the factors that determine an Airbnb listing's price, could help host see what type of Airbnbs are working in the market, especially as it relates to location [6]. For people looking into Airbnb for investment purposes, more data on listing factors could help them determine what properties are worth the investment [7]. The data used in this study was collected directly from crawling the Airbnb website [8].

Fig. 1: General process of crawling a website in six consecutive steps.



Methods

The research data was gathered and analyzed through the creation of a web crawler. To collect data from the Airbnb website, the web crawler had to mimic the structure of the Airbnb website. The web crawler had to be able to read in the same information that is provided on the Airbnb website. During our research, we analyzed the Airbnb website by looking at the HTML structure of the website. The web crawler browses through the website and reads each room link. Crawling the room links, extracted data on the room amenities, room owner, room owner rating, room images and all the other relevant information provided on each listing. The features of the Airbnb listing, such as zip codes, are being scraped from the Airbnb listings and being written into a database.

Fig. 2: Screenshot of the Airbnb website showing the way listings are described and displayed upon visiting the site. The factors that are shown for listings include the number of rooms available, the name of the listing, the rate, and ranking. Rankings are shown using the five-star rating system

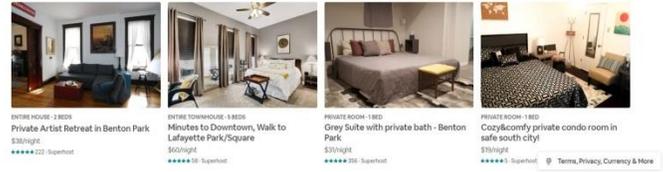


Fig. 3: Snapshot of the dataset collected from airbnb

city	name	plan	price	state	state2	zipcode
Lebanon	Nice Camper to Relax for the Night.	[2 bedrooms, 2 beds, 1 bath]	\$90	Missouri	MO	65536
Lebanon	Cedar Glen Condo Bdrm, no steps, near orange beach	[2 bedrooms, 3 beds, 2 baths]	\$230	Missouri	MO	65536
Lebanon	Beautiful 188/26A Cedar Glen Condo	[3 bedrooms, 4 beds, 2 baths]	\$165	Missouri	MO	65536
Lebanon	Buffalo Cedar Interior Getaway	[2 bedrooms, 3 beds, 2 baths]	\$40	Missouri	MO	65536
Lebanon	Nautical Guestroom	[1 bedroom, 1 bed, 1 private bath]	\$90	Missouri	MO	65536
Lebanon	NEW! Condo w/Screened Porch on Lake of the Ozarks!	[2 bedrooms, 2 beds, 2 baths]	\$170	Missouri	MO	65536
Lebanon	Kindershook Castle	[7 bedrooms, 16 beds, 15 baths]	\$996	Missouri	MO	65536
Lebanon	Bennett Springs Harqua River Cabin	[2 bedrooms, 3 beds, 1 bath]	\$90	Missouri	MO	65536
Lebanon	Lake Side Cabins #5 at Fisherswaters Resort	[2 bedrooms, 3 beds, 1 bath]	\$70	Missouri	MO	65536
Lebanon	NEW! Lakefront Camdenton Condo w/Deck, Shared Pool	[3 bedrooms, 4 beds, 2 baths]	\$160	Missouri	MO	65536
Lebanon	Elegant accommodations near FLW and Route 66/144	[1 bedroom, 1 bed, 1 bath]	\$60	Missouri	MO	65536
Lebanon	Off Market	[1 bedroom, 1 bed, 1 bath]	\$500	Missouri	MO	65536
Lebanon	Esperanza Lodge at Lake of the Ozarks. Sleeps 12	[3 bedrooms, 7 beds, 2 baths]	\$170	Missouri	MO	65536
Lebanon	The Lodge @ White Buffalo Ranch - Sleeps 20	[10 bedrooms, 24 beds, 5 baths]	\$1,290	Missouri	MO	65536
Lebanon	Quiet Cottage	[1 bedroom, 2 beds, 1 bath]	\$55	Missouri	MO	65536
Lebanon	Island Street Cottage	[2 bedrooms, 3 beds, 1 bath]	\$70	Missouri	MO	65536
Lebanon	Clean room for travelers :)	[1 bedroom, 1 bed, 2 baths]	\$60	Missouri	MO	65536
Lebanon	Minnowbrook Retreat	[5 bedrooms, 8 beds, 4.5 baths]	\$659	Missouri	MO	65536
Lebanon	Magge's the Shed (not really a shed!)	[1 bedroom, 4 beds, 1 bath]	\$54	Missouri	MO	65536
Lebanon	Private spacious room near Fort Leonard Wood	[1 bedroom, 1 bed, 1 private bath]	\$90	Missouri	MO	65536
Lebanon	Condo on Lake of the Ozarks w/ Boat Slip & Fossil	[3 bedrooms, 4 beds, 2 baths]	\$235	Missouri	MO	65536
Lebanon	Lakeview Suite at Swan Song Inn	[1 bedroom, 1 bed, 1 bath]	\$140	Missouri	MO	65536

Data description

Each listing comprises of seven attributes and 15,000 state-wide normally distributed listings. Some of the attributes used in the analysis are: price (continuous), state (categorical) and zipcode (categorical). We had to perform a few data transformations to create the desired visualizations. There were no major inconsistencies or mismatches in the data, but most of the features of interest did not contain data in the required format and hence were manipulated in a way that their meanings are retained.

Key Feature Engineering

The first feature is the price (listing's value). The price column contained data in string format with the currency symbol '\$' and comma separator, attached to it. This column was manipulated to contain integer values for time-series and other analysis. The second feature was the plan (listing's floor plan): The floor plan column contained data with all the information about number of bedrooms, bathrooms and guest bedrooms available in

one single comma separated string. The column was manipulated to engineer 2 additional columns “bathrooms” and “guest rooms” so it can be used in later analysis.

Finally, the state (state names): the state column contained the full string of state name for example “Missouri” which later then converted to state name’s abbreviation ”MO” and we generated an additional column for this purpose “state1” Dealing with missing values. Data likewise had NULL/Missing values in columns like “*price*” and *floor plan*. To preserve the information without creating any bias, we filled those NULL values with the average of other listings based on their floor plans and dropped the data points with missing both floor plans and price to avoid any misleads regarding data because filling those values by usual means without enough information might lead to create unintentional outliers, so we could conduct meaningful analysis based on these attributes.

Initial price statistics

After observing various parameters such as Name, Floor Plan, Price, City, State and Zip Code, we were able to execute basic analysis on the dataset still being collected.



Fig. 4: Price variation based on different states over a sample of 15,000 crawled airbnb listings.

Figure 4 depicts price differences on average, by state. For example, Airbnb listing in the state of Washington, according to our sample,

appear to be the most affordable with the average of \$76.22. On the other hand, the central tendency for New York state under the same condition and parameters came to be \$188.68.

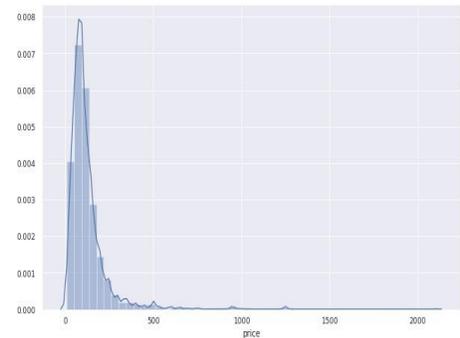


Fig. 5: Price parameter distribution over 15,000 listings

Figure 5 shows the normally distributed but positively skewed prices towards right meaning that the mean values are higher than the median and mode of the date set. While these are merely basic statistics concerning the 15,000 listings, in this pilot study, we were interested in merely learning the process of crawling and basic data analysis. Much further investigation is needed to mine the dataset and provide fruitful insights.

Conclusion

It is known that Airbnb has grown into a competitive alternative that has impacted the revenue of some hotel categories. What is not well known instead is what the factors are that may have an impact on an Airbnb listing’s price, since many comparable listings exist in most popular locations. This first characterization study aimed at determining some of these factors with a first crawling and data collection stage. We observed that the uneven distribution of low-priced and high-priced properties depends on several factors. Perhaps surprisingly, such factors are — the type of floor plan, and more obvious factors, such as the neighboring areas, user ratings, and reviews. This initial report is a petri dish for more advanced studies that

may help validate patterns and identify causes of low-priced properties that

appear to be too similar to listing with high prices.

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