

Airbnb Price Optimization

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AAI 510: Machine Learning

University of San Diego

June 2024

Business Objective

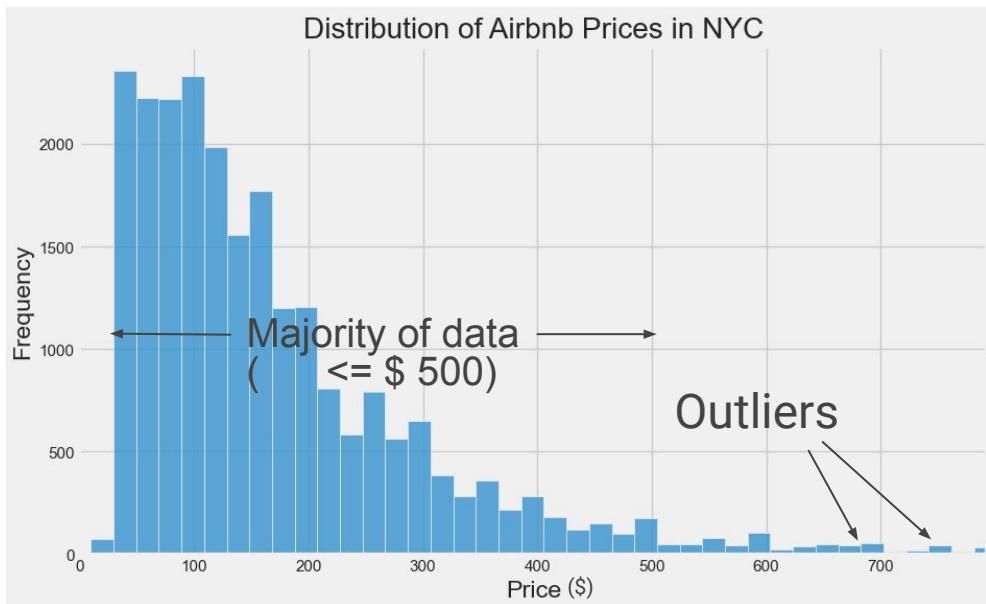
- Airbnb is a company that makes money when customers rent locations from hosts
- Each location is unique and therefore it can be difficult to figure out a suggested price
- If the price is too high, the location will not be rented
- If the price is too low, the company and the host will miss out on profits
- The model made is intended to help provide a suggested price
 - Based on the geographical location of the Airbnb rental
 - Also based on the amenities of the Airbnb rental

Exploratory Data Analysis (EDA)

- Key exploratory features:
 - Price (the price of the listing per night)
 - Coordinate
 - Latitude
 - Longitude
 - Room Type
 - Entire Home or Apartment
 - Private Room (Separate room from the host)
 - Shared Room (Same room as the host)
 - Hotel Room

Exploratory Data Analysis (EDA)

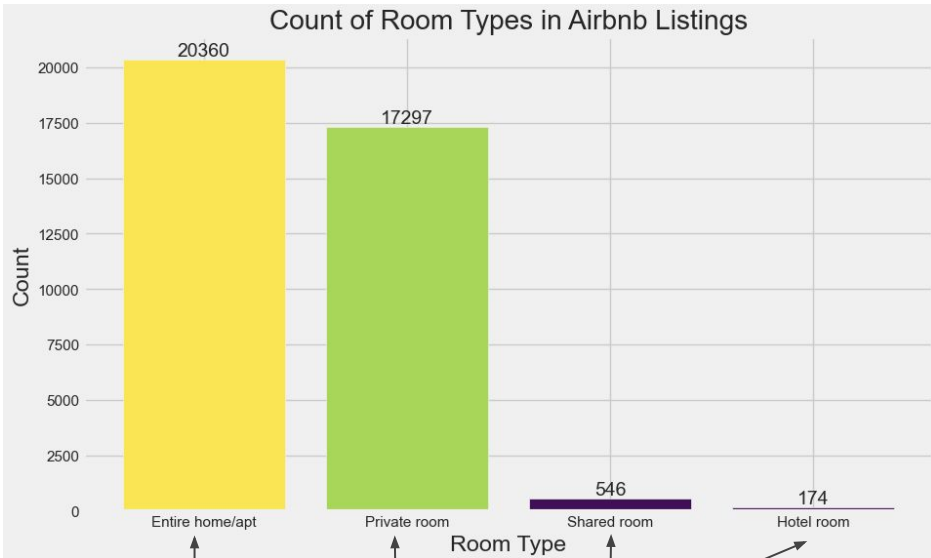
EDA helps with business decisions by uncovering patterns, trends, and insights in data, enabling informed, data-driven strategies and actions



Which non-Manhattan areas are high priced? Why?

Exploratory Data Analysis (EDA)

Count of Room Types in Airbnb Listings



strong preference for privacy and space

cost effective option with some privacy

budget conscious (niche market)

Histogram of Availability (365 days) in Airbnb Listings



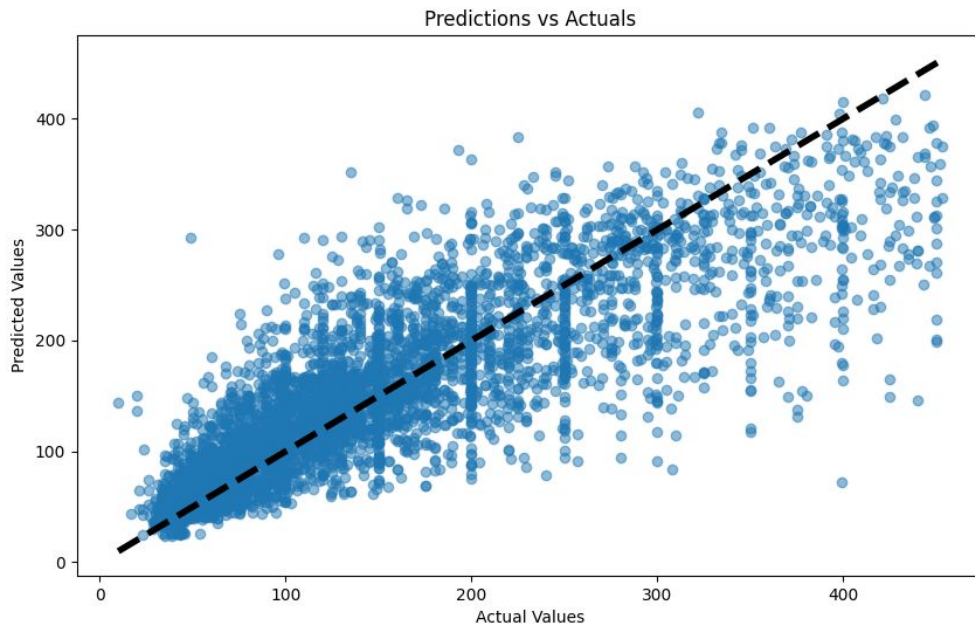
Why are there so many listing with 7 days availability?

Are these generating business?

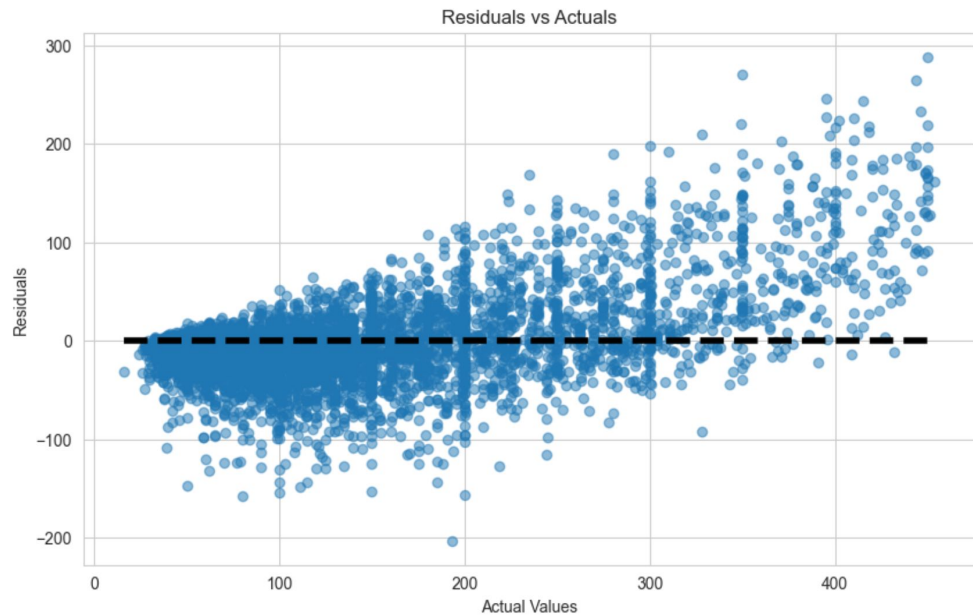
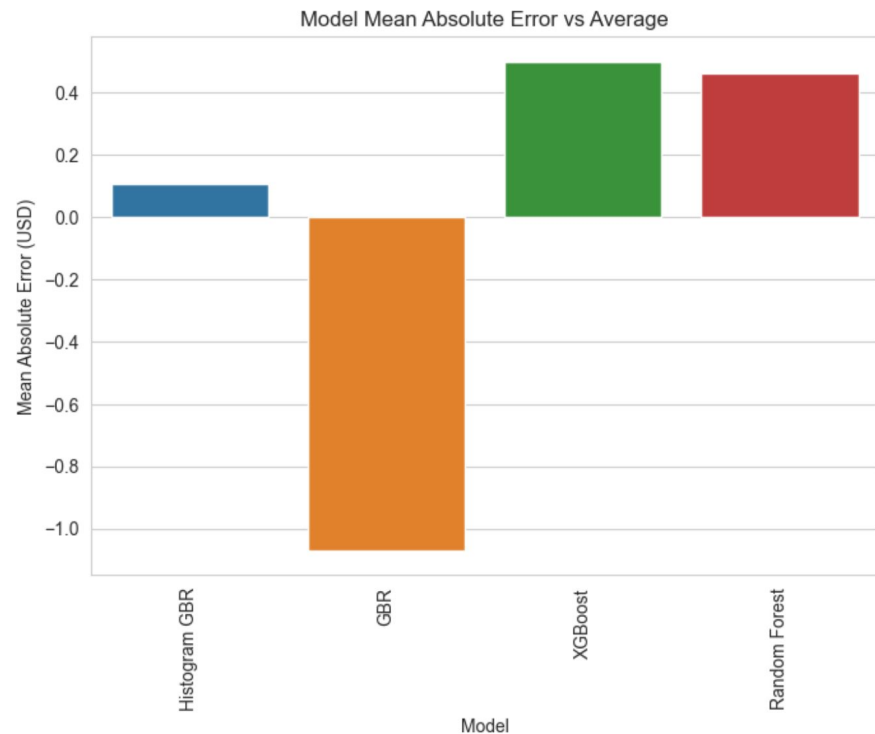
Can the availability be increased?

Solutions Explored

- Tested a wide range of data, different models
- Decided on tree-based algorithms
- Final data incorporates host responsiveness, location, reviews, rental size and type, availability, and amenities

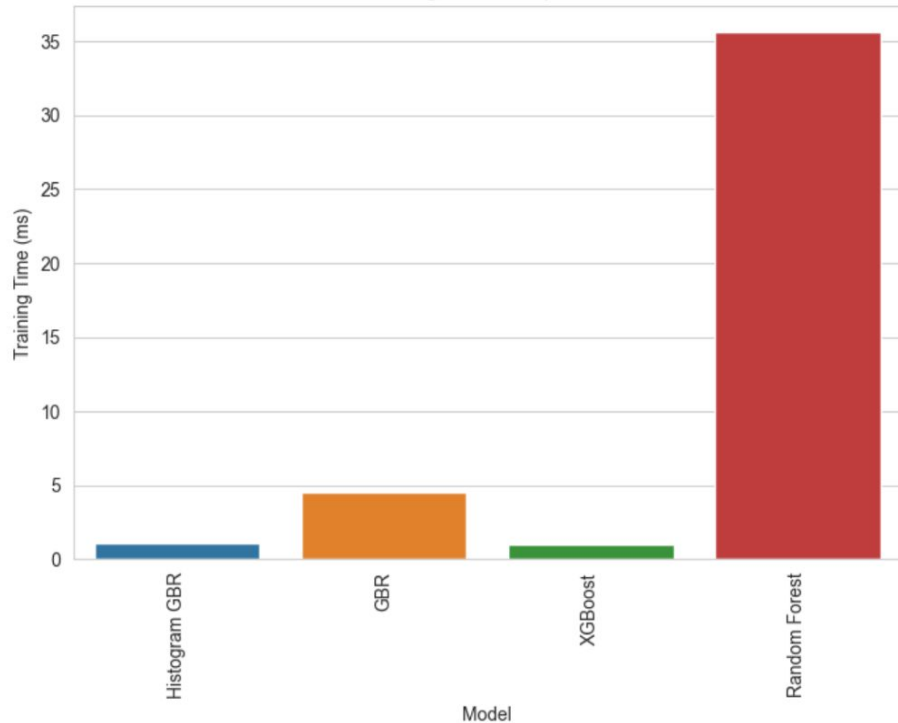


Modeling Outcomes

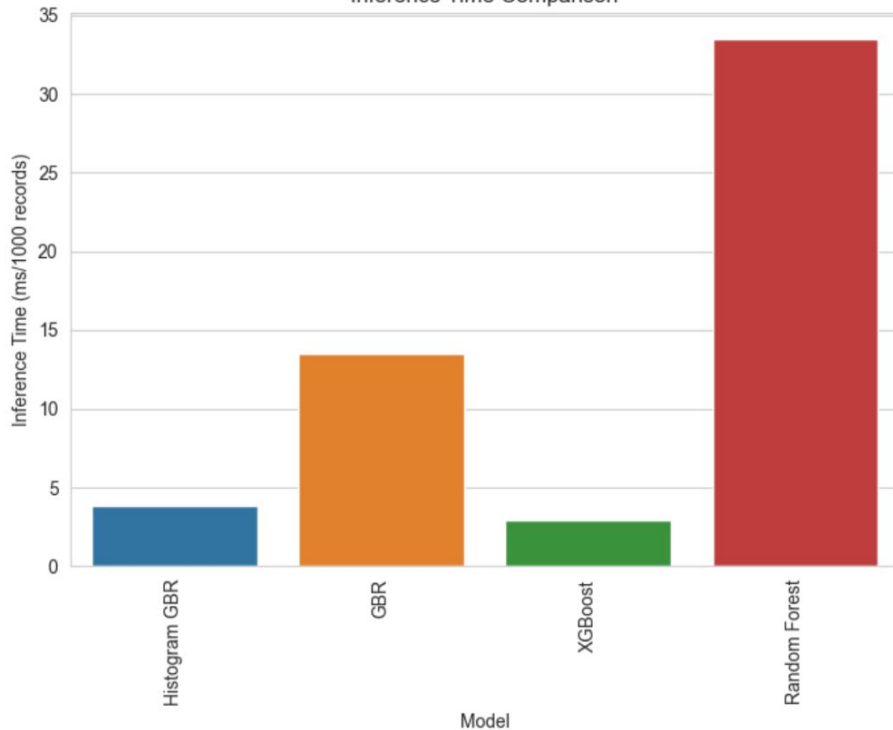


Modeling Outcomes

Training Time Comparison



Inference Time Comparison



Deployment Considerations

- Data is readily available
- Training speeds allow large cities like NYC to be processed quickly
- Inference speeds allow the model to be usable for real-time estimation
- Limited need for refreshing data

Risks

- Market volatility
 - Economic downturns or financial crises
 - Seasonal variations
- Competitive landscape
 - New entrants
 - Pricing wars
- Data accuracy and availability
 - Incomplete data
 - Outdated data
- Operational risks
 - Maintenance costs
 - Guest experience
- External risks
 - Global events
 - Natural disasters

Business Recommendations

- We can develop a strategic approach to optimize pricing using the identified top features for Airbnb price estimation.
- Here are detailed **recommendations** for the some of the top features and **implementation strategies**:
 - Host Response Time:
 - *Recommendation*: Ensure quick response time to queries
 - *Implementation*: Work with hosts to utilize automated AI-based messaging systems
 - Host Response Rate:
 - *Recommendation*: Maintain a high response rate
 - *Implementation*: Coordinate with hosts to regularly monitoring of inquiries
 - Host Acceptance Rate:
 - *Recommendation*: Maintain a high acceptance rate
 - *Implementation*: Work with hosts to increase high acceptance rate thus increasing guest trust
 - Host Listings Count:
 - *Recommendation*: Pay special attention to hosts with multiple listing to optimize price, and promote multiple listings
 - *Implementation*: Work with hosts to take advantage of economies of scales, e.g., shared maintenance, cleaning and operational services

Business Recommendations

- Neighborhood:
 - *Recommendation:* Adjust pricing based on neighborhood
 - *Implementation:* Provide guidance for pricing by estimating average pricing based on neighborhood
- Room Type:
 - *Recommendation:* Set pricing based on room type (entire home/apartment)
 - *Implementation:* Provide guidance for pricing by estimating average pricing based on room type
- Accommodation:
 - *Recommendation:* Price according to the number of guests properties can accommodate
 - *Implementation:* Work with hosts to optimize your space to increase the number of guests if possible
- Bedrooms/Bathrooms:
 - *Recommendation:* Properties with more bedrooms/bathrooms command higher prices
 - *Implementation:* Help hosts showcase the size of each bedroom/bathrooms by using high-quality photos
- A complete list of the all the top 60 features and corresponding recommendations and implementation strategies can be developed with additional time