



What are we expecting from the stay?

Forecasting NYC Airbnb ratings using image-processing and machine learning

MACS 30250 Project Proposal
Yijia Lyu

Research Question

What leads to high rating of Airbnb stay and how can we predict?

MOTIVATION



- The rising sharing economy
- The competition between Airbnb and traditional hotel industry (similarity & difference)
- Quantify customer needs/expectation and improve the user experience
- Provide implications for host to attractive bookings.

Literature

- Little is known about how customers using peer-to-peer accommodations services evaluate their experiences, versus those who use traditional tourism services (Heo, 2016)

- Host as a core?

- Earlier studies treated the social (guest-host) interactions as a core dimension of the Airbnb experience (Festila and Müller, 2017).

- Stay as a core?

- 'location' was found to not be statistically significant in influencing Airbnb users' satisfaction, whereas 'enjoyment', 'amenities' and 'cost saving' were ranked positively (in order of significance) (Tussyadiah, 2016).

Festila, M., Müller, S., 2017. The impact of technology-Mediated consumption on identity: the case of airbnb. Paper Presented at the Proceedings of the 50th Hawaii International Conference on System Sciences

Heo, C.Y. (2016), "Sharing economy and prospects in tourism research" , Annals of Tourism Research, Elsevier Ltd, Vol. 58, pp. 166–170.

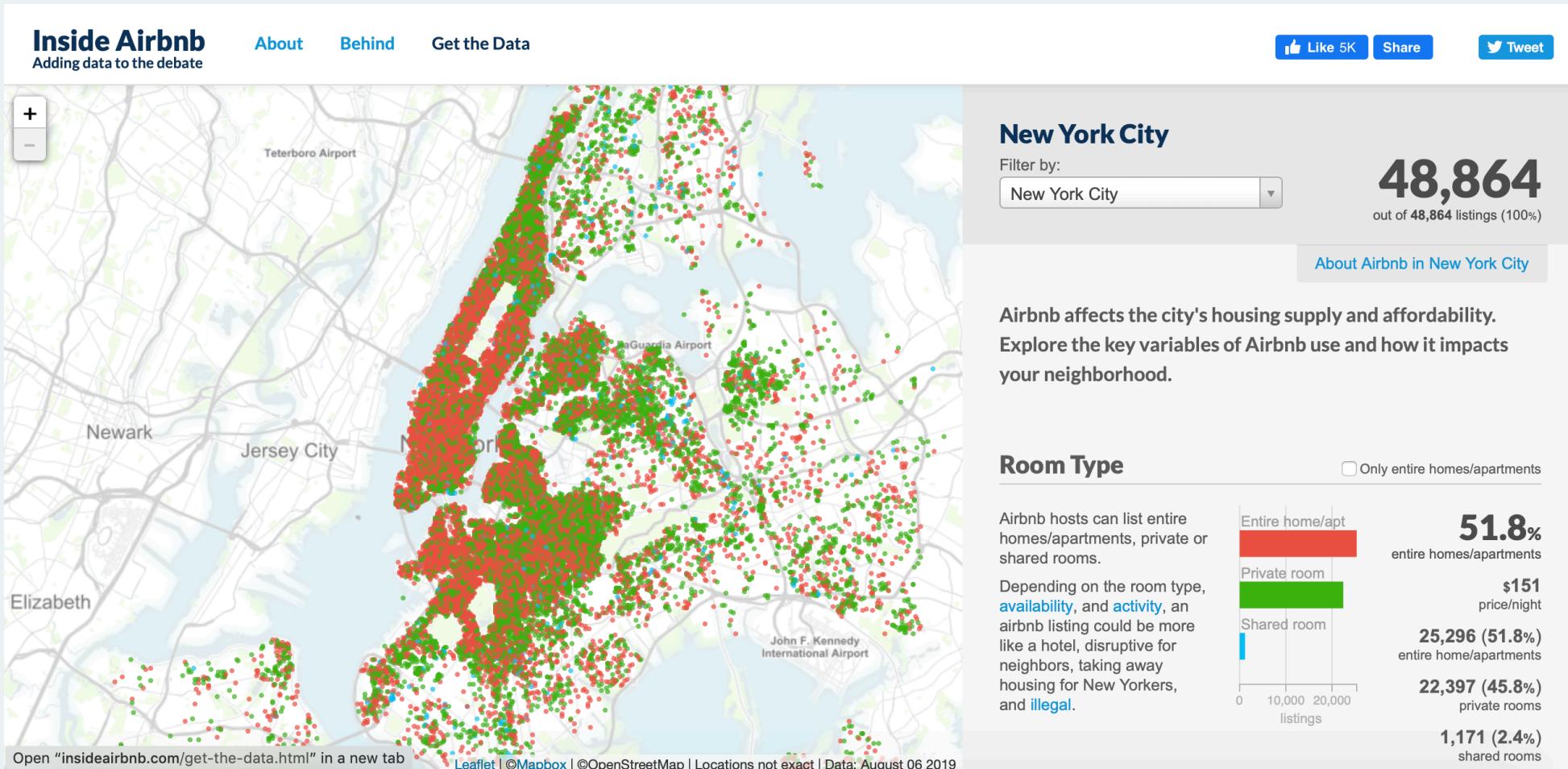
Tussyadiah, L., Pesonen, J., 2016. Impacts of peer-to-Peer accommodation use on travel patterns. J. Travel Res. 55 (8), 1022–1040. <http://dx.doi.org/10.1177/0047287515608505>.

Data Sources



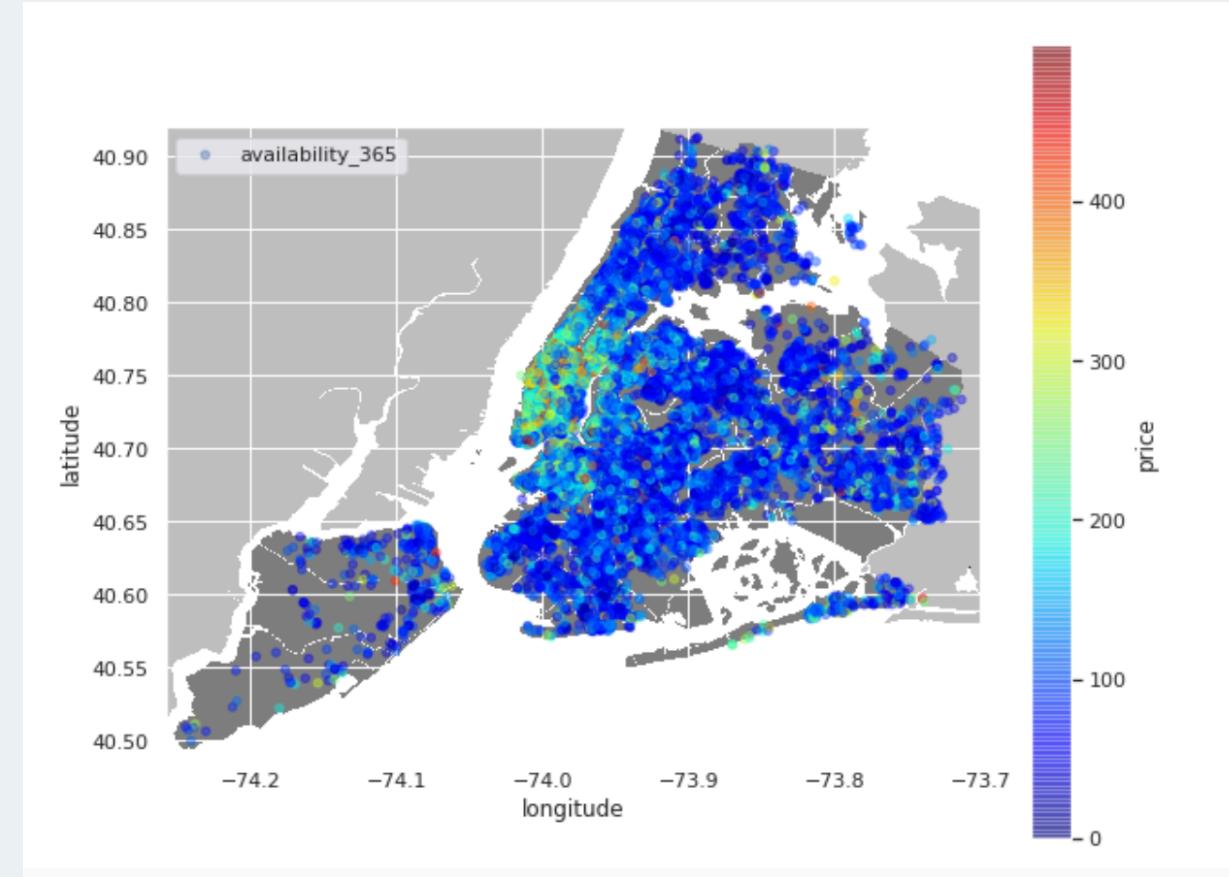
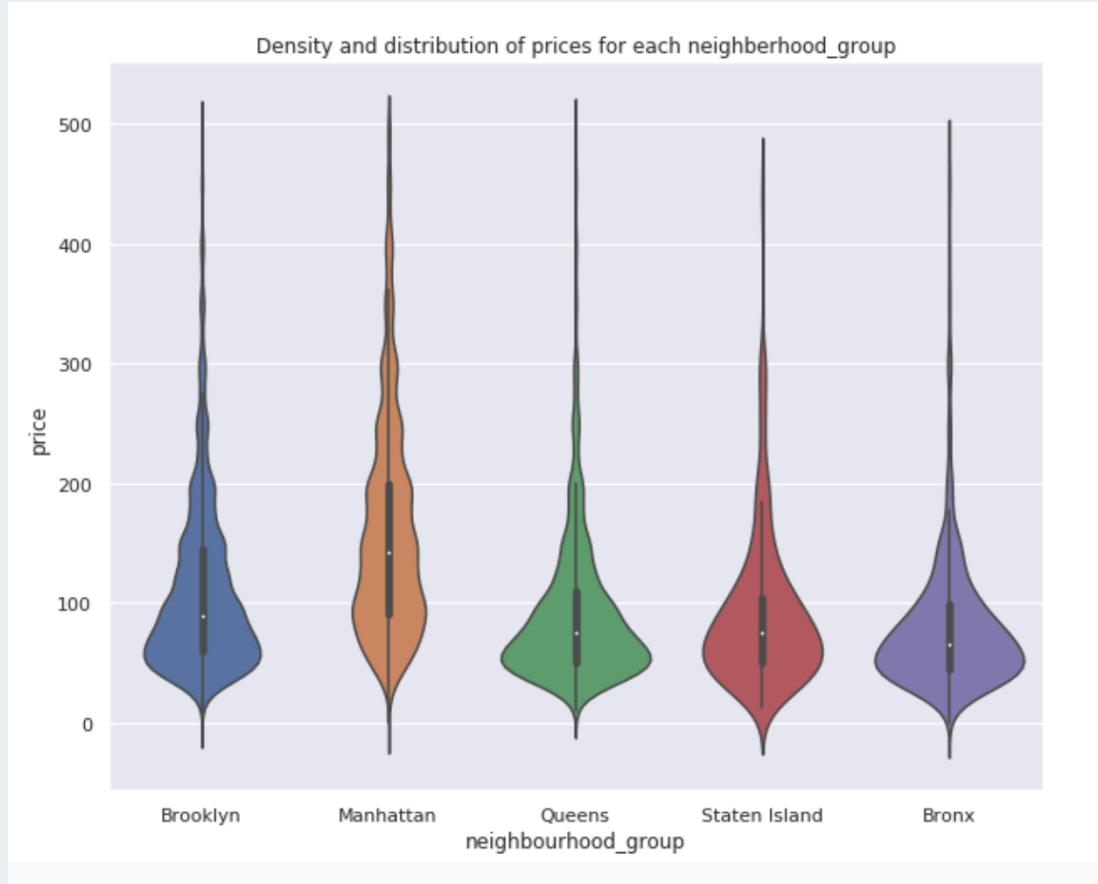
NYC Airbnb listing: InsideAirbnb.com

Description of house/host/amenities/past reviews/price, etc.



Preprocessing the Data – Geographical Factors

- Does location matter, similar to hotels?



Property picture classification

“The property images provide visual information and reduce uncertainty about experiential aspects (e.g., cleanliness, mood) of units in ways that written reviews and descriptions cannot, which alleviates quality uncertainty.” (Zhang, 2019)



- **Amazon Mechanical Turk Labelling: classify a random (stratified) set of pictures into binary categories of high- and low-quality images**

- **Convolutional Neural Networks (if feasible)**

1. input an unlabeled property image,
2. extract the hierarchical set of image features
3. predicts the label on the output layer and assigns 1 to high-quality images and 0 to low-quality images.

Input: bathroom image
(224 x 224 RGB image)

Layer Block A : 64 filters
Layer Block A : 128 filters

Layer Block B : 256 filters
Layer Block B : 512 filters
Layer Block B : 512 filters

FC1: 4096X1

FC1: 4096X1

Output : binary
(Sigmoid function)

Preprocessing the Data – Feature Selection

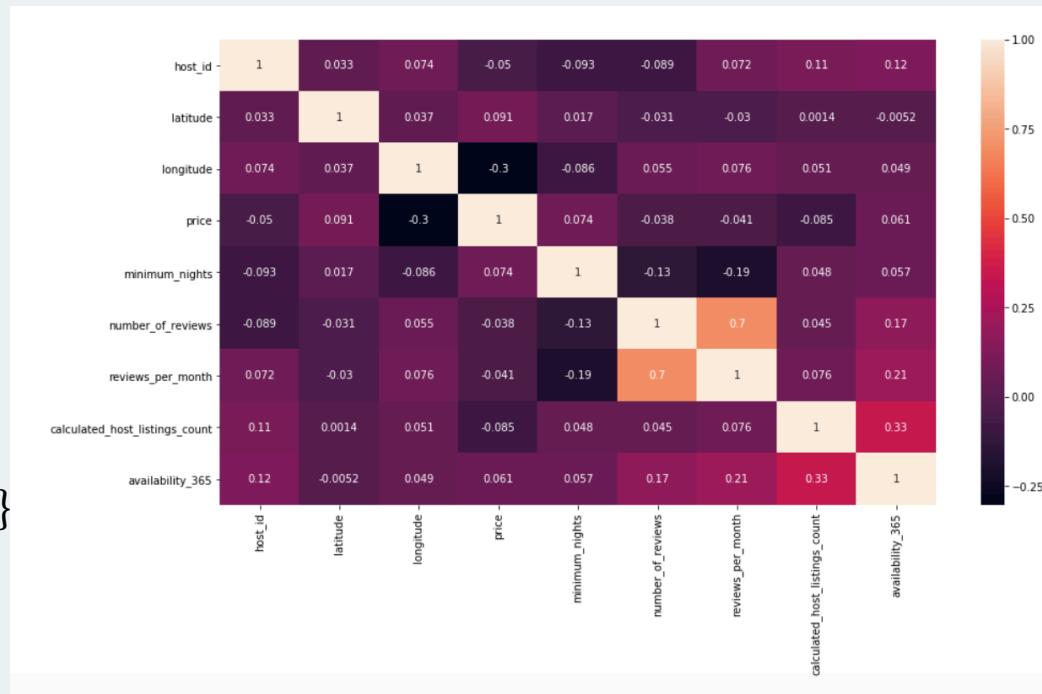
• Predictors Grouping

[Static VS Dynamic]:

- room size {accommodates, bathrooms, bedrooms, beds, ...}
- location {neighborhood, latitude, longitude, ...}
- facilities {transit, amenities, property type, ...}
- booking related {availability, cancellation policy, host verification}
- extra fees {security deposit, cleaning fee, extra people, ...}

Or

[Host VS Amenities/Facilities VS Locations]

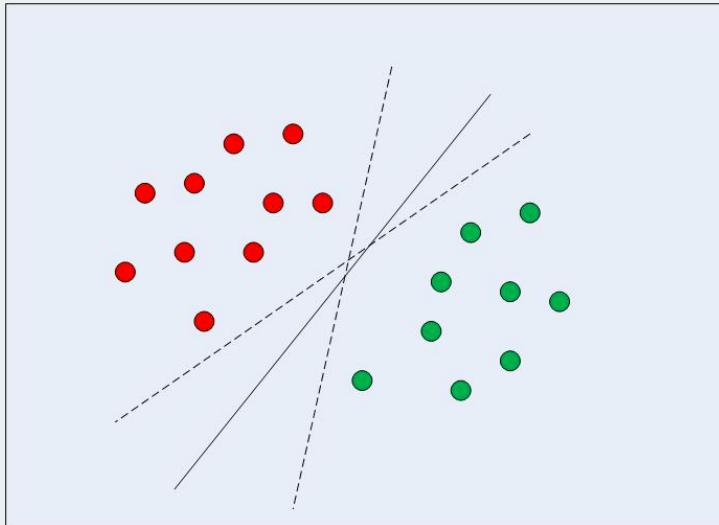


identifying correlations

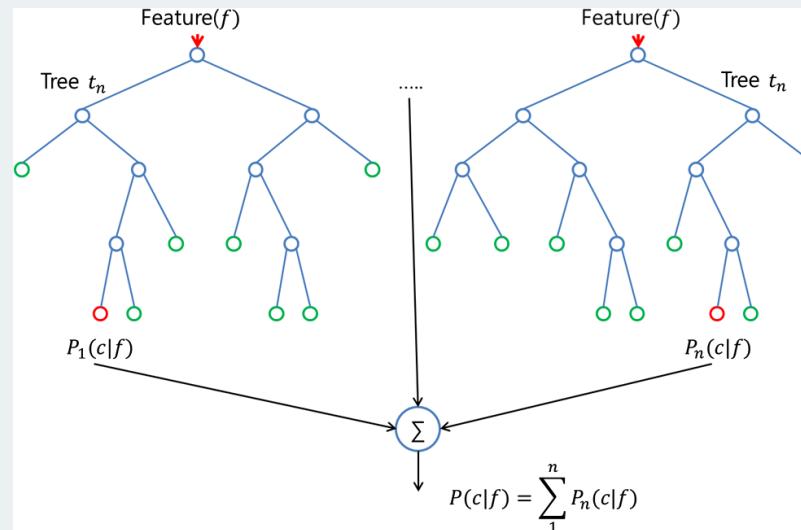
Machine Learning Models

compare the accuracy/MSE of each model

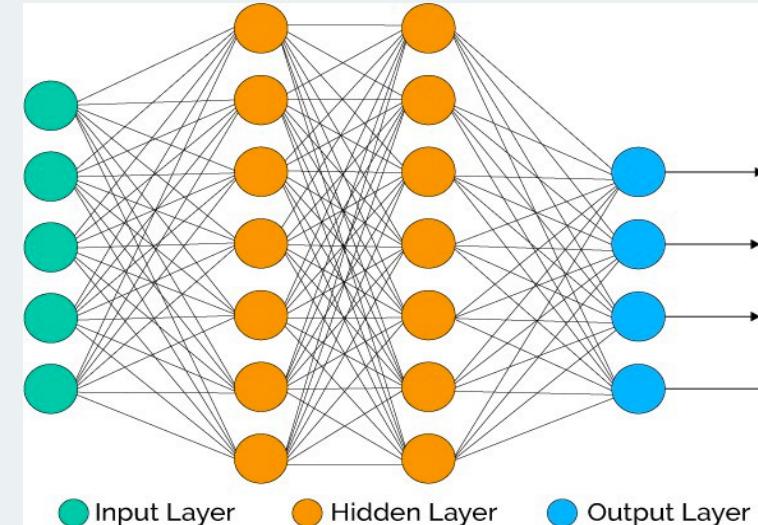
SVM



Tree Models



Neural Networks



Feature Importance

Anticipated Outcomes

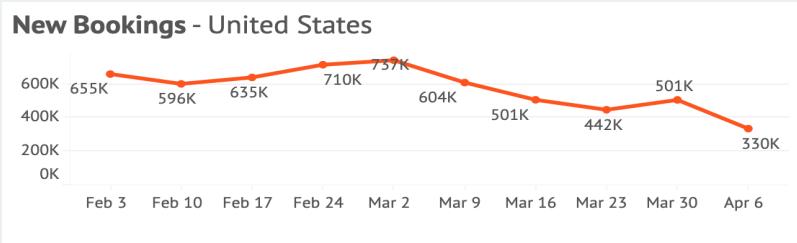
- Location may still be an important factor like hotels
- The service availability from host is crucial
- Not sure if the interaction with host is significant:
a substitute for hotel stay?
a way to experience localness and discover serendipity?

Limitation and Future Work



01

Covid19 Impact: will the pandemic change the weights of major factors when a stay is being scored?



(cited from
airdna.com)

02

This study does not include textual reviews from customers, which may lose important insights from their side, datasets can be supplemented.

03

This could be area-specific. For example, people may have different expectation and evaluation standards when staying in different districts. Therefore, if we narrow down the scope of area, we may have more accurate prediction on ratings.