The Effect of Image Choice on Airbnb Reservations: A Combination of Deep Learning and Econometric Analysis

TREO Talk Paper

Vivek Kumar Singh
University of South Florida, USA
vivek4@mail.usf.edu

Anol Bhattacherjee
University of South Florida, USA
abhatt@usf.edu

Jaideep Sai K
University of South Florida, USA
jaideepsai@mail.usf.edu

Utkarsh Srivastava
Western Michigan University, USA
utkarsh.srivastava@wmich.edu

Shixuan Fu
University of International Business and Economics
fsx8888@163.com

Abstract

The last several years has seen dramatic growth in the sharing economy, enabled by digital sharing economy platforms such as Airbnb and Uber, which have profoundly altered the dynamics of competition in lodging and transportation sectors. Sharing economy is characterized by peer-to-peer access to goods and services and use of idle resources for collaborative consumption. Digital sharing platforms bring together global participants to enable online transactions, by matching available resources on the supply side to the demand side customers. For example, in Airbnb.com (hereafter “Airbnb”), a digital lodging platform, people willing to use their spare bedroom, house, or condo to host visitors (hereafter ‘guests’), post their available inventories on the platform for potential customers to view and make a renting decision. Unlike the traditional online hospitality market, where customers may expect a certain level of standards, properties on Airbnb may vary significantly in location, amenities, and price. The potential customers seek cues to lessen their uncertainty related to listings’ quality and their search cost required to evaluate of the listings to make transaction on such platforms.

Airbnb hosts provide two types of property images on their listings: indoor and outdoor images. Indoor images include interior pictures of the house including the rental space, interior design, interior space, furniture, etc. On the other hand, outdoor images provide exterior pictures of the surrounding or neighborhood of the house. The host has the flexibility of including as many of these images they want and in their preferred order on the Airbnb platform. In essence, these images are a means to ‘signal’ the quality of their listing to potential guests. Using signaling theory and information processing theory as our theoretical lens, we examine whether the order of presentation of indoor and outdoor images influence guests’ renting decision on Airbnb, and if so, how. Hence, the research question of interest to this study is: Do the order and the number of different types of images provided by the host impact the occupancy of their listings on sharing economy platforms?

To answer this research question, we collected Airbnb listing data from insideairbnb.com and images of corresponding houses from Airbnb website. We use both manual labeling and deep learning-based scene recognition to code images into indoor images and outdoor images. We use a Convolutional Neural Network based deep learning model for scene recognition to classify indoor and outdoor images with 96.57 percent accuracy. This data is integrated with other Airbnb listings and occupancy data for econometric analysis for hypotheses testing.

Our results demonstrate that the listings presenting outdoor image as their first image have lower occupancy compared to listings presenting indoor image as their first image. Moreover, the number of outdoor images is negatively associated with listing occupancy. We also test our hypothesis for self-selection bias using propensity score matching as part of our robustness test and found consistent results. Our study provides practical implications to hosts on Airbnb in selecting order of presenting different listings’ images. Moreover, our study also contributes to the theoretical understanding of how images influence guests’ decision making on Airbnb.