# MEMORANDUM

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| **To:** | Carole Voulgaris, Course Instructor, SES 5215 |
| **From:** | Chunfeng Yang, Student, SES 5215 |
| **Date:** | November 6, 2022 |
| **Subject:** | Assignment 3, Describing and visualising data |

The purpose of this memo is to test for relationships among variables relevant to the question:

**What is the effect of the distance to an Airbnb's nearest gallery on its listing price for each night, after accounting for the effects of the distance to the nearest subway station and room type in Manhattan, New York?**

I will be addressing this question using Airbnb listing data from a mission-driven project "Inside Airbnb" (http://insideairbnb.com/explore/) and public amenities data from NYC OpenData (https://data.cityofnewyork.us/Transportation/Subway-Stations/arq3-7z49). My dataset includes 21,598 Airbnb listings in Manhattan, New York, shown in Figure 1 below.

I am testing the relationship between Airbnb listing price (the expense of one night stay in an Airbnb listing, in USD), and each of the following variables.
1. Vicinity of the Gallery: The distance from one Airbnb listing to its nearest gallery.
2. Vicinity of the Subway Station: The distance from one Airbnb listing to its nearest subway station.
3. Room Type: A categorical variable representing the types of Airbnb listing.
   *Inside my categorical variable Room Type, I choose Entire Home/Apartment as my reference category.

Table 1 and Figure 1 show a 95-percent confidence interval for the average value of Airbnb Listing Price (my outcome variable) within each category of Room Type (my categorical variable) and the difference in means between the value of Airbnb Listing Price (my outcome variable) in Entire home/apt (my reference category) and the value of the outcome variable in each of the other categories.

## Table 1

| | Entire home/apt | Private room | Shared room |
|---|---|---|---|
| 95-percent confidence interval for the average value of Airbnb Listing Price within Room Type | $230 - 236 | $110 - 115 | $81 - 97 |
| number | 13145 | 7973 | 480 |
| means | $233 | $112 | $89 |

### *Relationship between room types and Airbnb listing price*

Figure 1 shows the average Airbnb listing price within different usual room types. Error bars represent 95-percent confidence intervals. The 95-percent confidence interval for the average Airbnb listing price within Entire home/apts is between $230 and 236. The 95-percent confidence interval for the average Airbnb listing price within private rooms is $110 and 115. The 95-percent confidence interval for the average Airbnb listing price within shared rooms is $81 and 97.
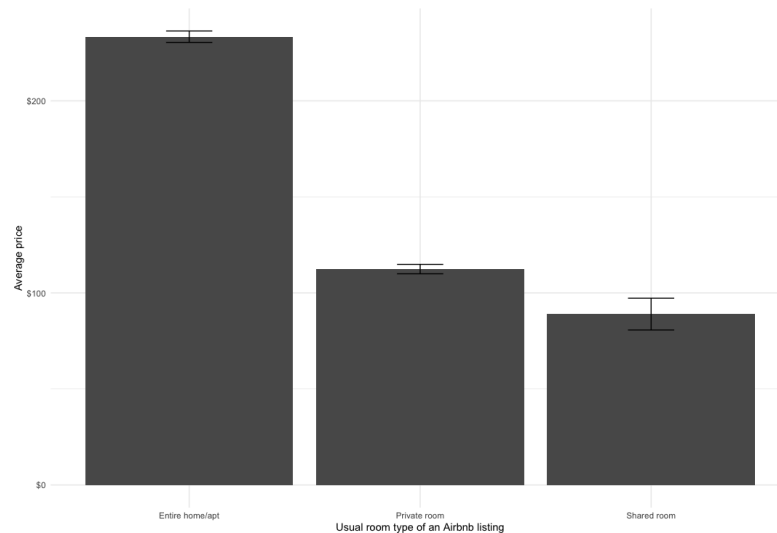


Figure 1: Distribution of Airbnb Listing Price

### *Relationship between vicinity of the gallery and Airbnb listing price*

The relationship between an Airbnb listing's vicinity to its nearest gallery and its listing price is illustrated in Figure 2 (both axes are log-transformed).The 95-percent confidence interval for the correlation between the log of an Airbnb listing price and the log of the distance to its nearest gallery is between -0.30 and -0.28. This suggests that we can be 95-percent confident that there is a negative relationship between an Airbnb listing price and the distance to its nearest gallery.
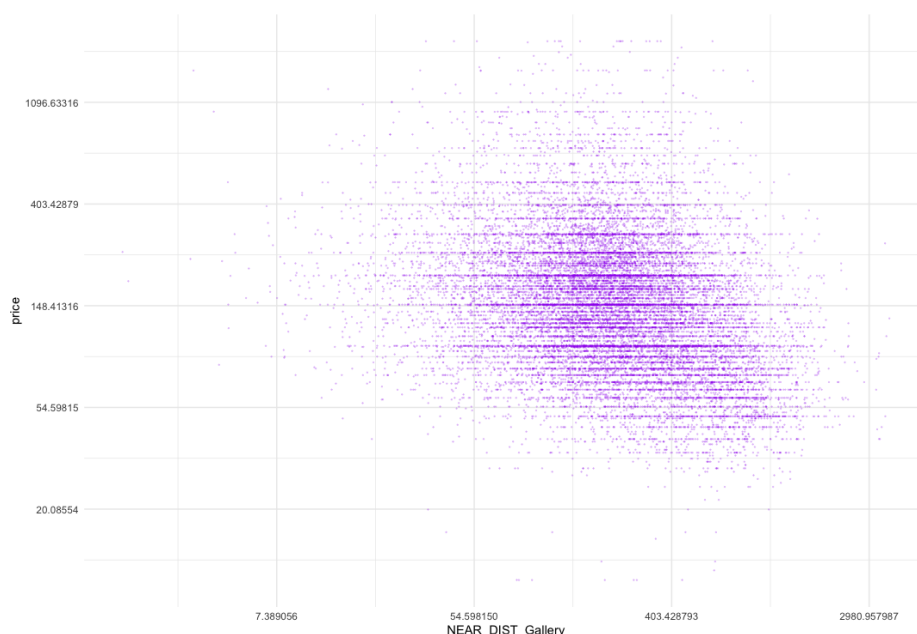


Figure 2: Relationship between Airbnb listing price and distance to its nearest gallery

***Relationship between vicinity of the subway station and Airbnb listing price***

The relationship between an Airbnb listing's vicinity to its nearest subway station and its listing price is illustrated in Figure 3 (both axes are log-transformed).The 95-percent confidence interval for the correlation between the log of an Airbnb listing price and the log of the distance to its nearest gallery is between -0.05 and -0.02. This suggests that we can be 95-percent confident that there is a negative relationship between an Airbnb listing price and the distance to its nearest gallery.
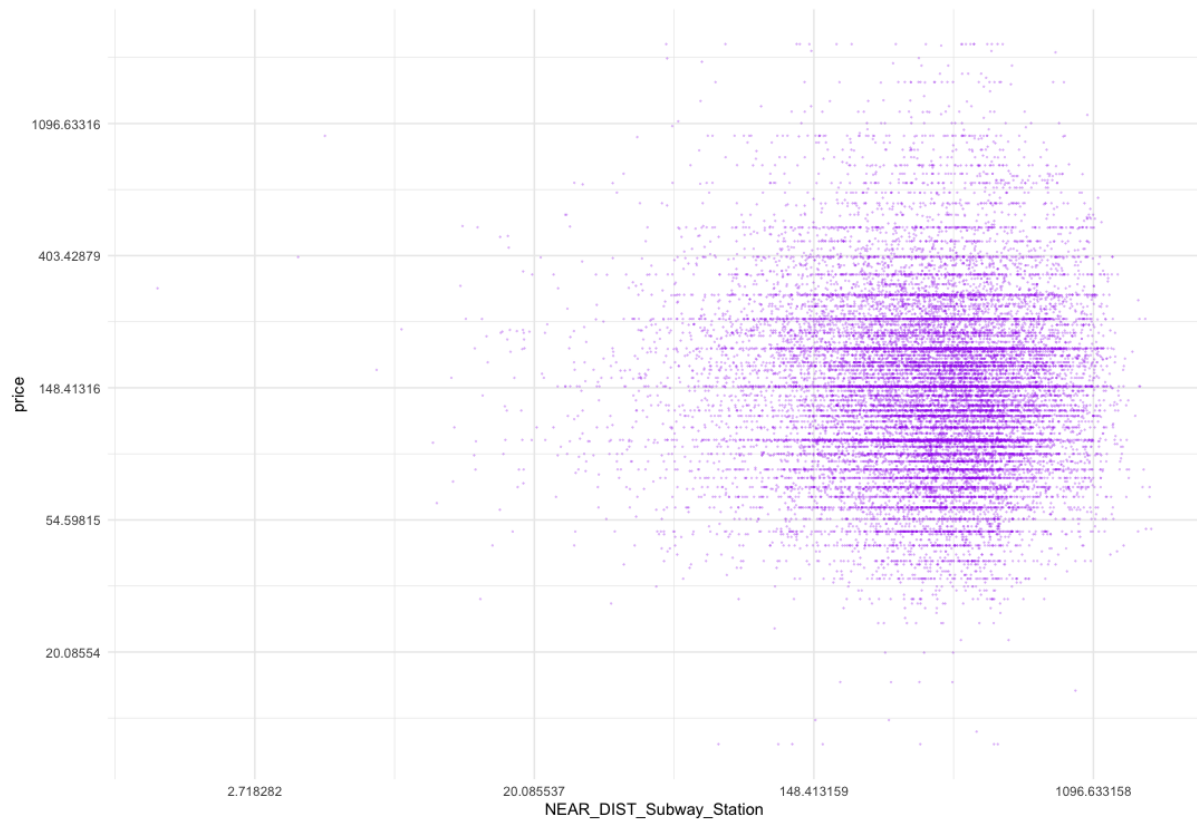


Figure 3: Relationship between Airbnb listing price and distance to its nearest gallery