AirBNB EDA for Paris[*]

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This exploratory data analysis of Airbnb listings in Paris provides insights into the city's short-term rental market, revealing key trends in pricing, property types, and geographical distribution. By examining the relationships between price, location, and guest reviews, we uncover patterns that influence rental desirability and profitability. The study employs a variety of data visualization techniques to present a comprehensive overview of market dynamics. The findings aim to assist hosts in optimizing their listings and inform travelers about the factors affecting their accommodation choices.

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1 Code

```
# Get the data

url <-
  paste0(
    "http://data.insideairbnb.com/france/ile-de-france/paris/2023-12-12/data/listings.csv.gz"
  )

airbnb_data <-
  read_csv(
    file = url,
```

[*] Code and data are available at: https://github.com/AdrianUofT/mini-essay-8

```
    guess_max = 20000
  )

write_csv(airbnb_data, "airbnb_data.csv")
```

```
# Make the Parquet File

airbnb_data_selected <-
  airbnb_data |>
  select(
    host_id,
    host_response_time,
    host_is_superhost,
    host_total_listings_count,
    neighbourhood_cleansed,
    bathrooms,
    bedrooms,
    price,
    number_of_reviews,
    review_scores_rating,
    review_scores_accuracy,
    review_scores_value
  )

write_parquet(
  x = airbnb_data_selected,
  sink =
    "2023-12-12-paris-airbnblistings-select_variables.parquet"
  )
```

```
# Analyze the data

airbnb_data_selected$price |>
  head()
```

```
[1] "$150.00" "$146.00" "$110.00" "$140.00" "$180.00" "$71.00"
```

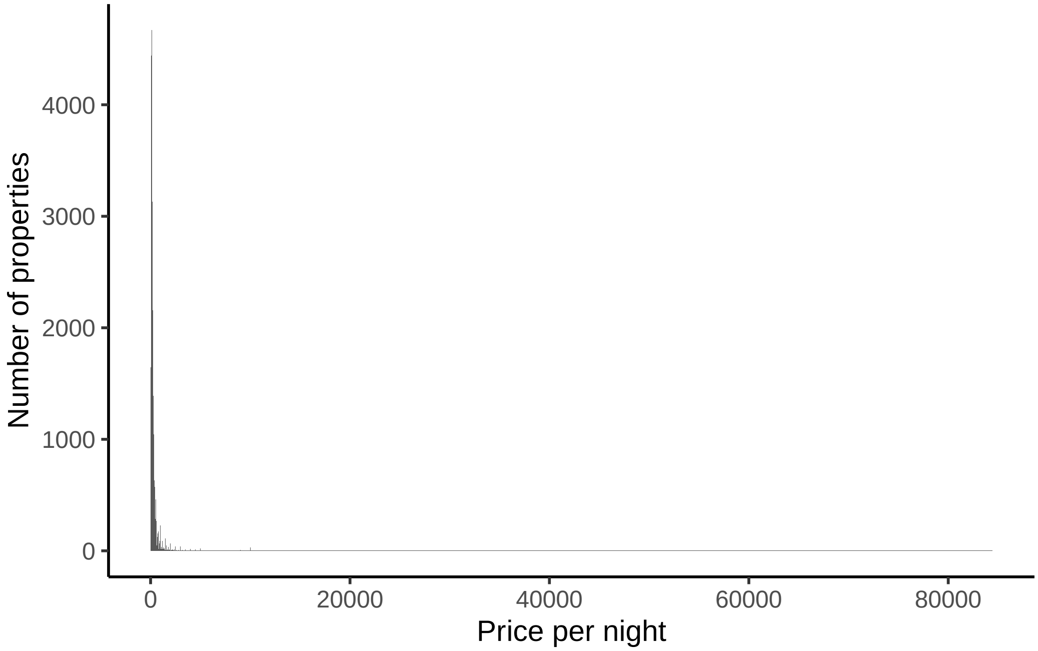
```
airbnb_data_selected$price |>
  str_split("") |>
  unlist() |>
  unique()
```

```
 [1] "$" "1" "5" "0" "." "4" "6" "8" "7" "3" "2" "9" NA  ","
```

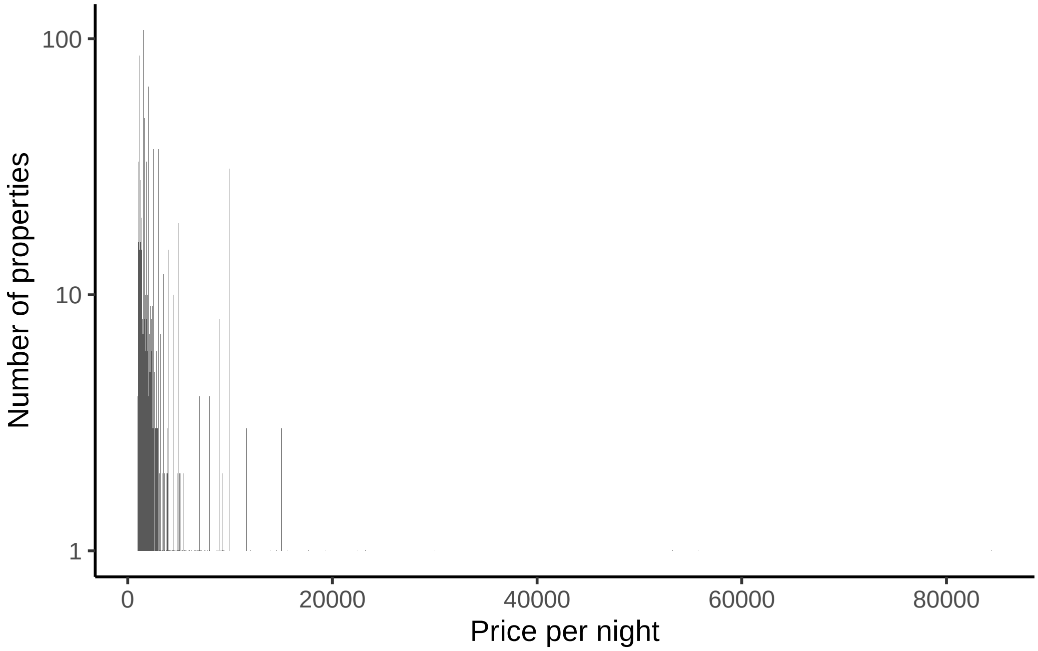
```r
airbnb_data_selected |>
  select(price) |>
  filter(str_detect(price, ","))
```

```
# A tibble: 1,550 x 1
   price
   <chr>
 1 $1,200.00
 2 $8,000.00
 3 $7,000.00
 4 $1,997.00
 5 $1,000.00
 6 $1,286.00
 7 $2,300.00
 8 $1,500.00
 9 $1,200.00
10 $1,357.00
# i 1,540 more rows
```

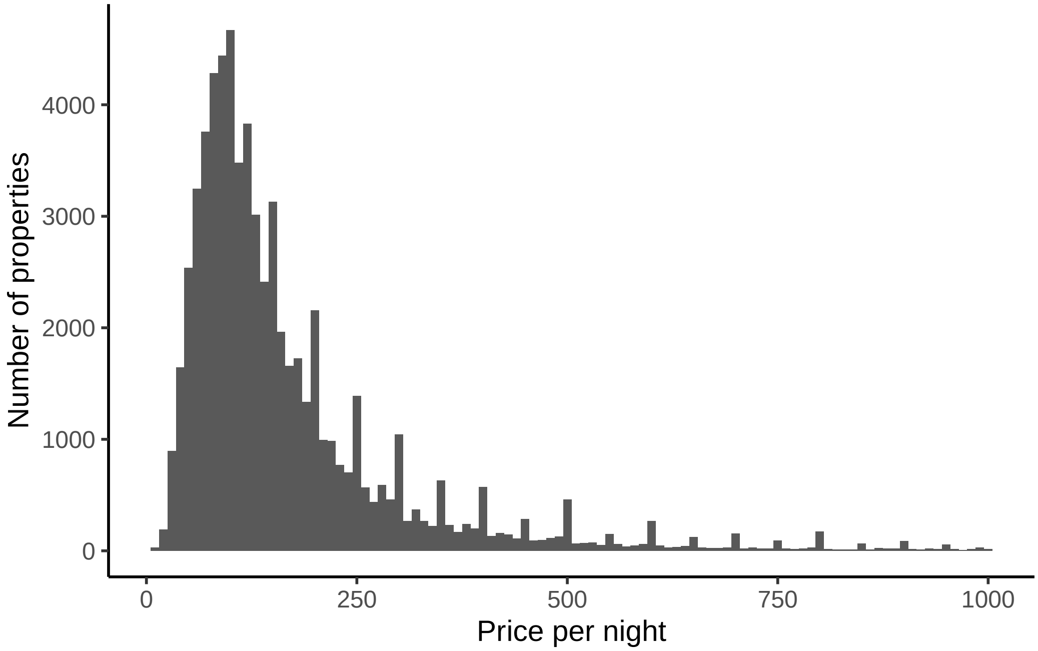
```r
# Make the graph

airbnb_data_selected <-
  airbnb_data_selected |>
  mutate(
    price = str_remove_all(price, "[\\$,]"),
    price = as.integer(price)
  )

airbnb_data_selected |>
  ggplot(aes(x = price)) +
  geom_histogram(binwidth = 10) +
  theme_classic() +
  labs(
    x = "Price per night",
    y = "Number of properties"
  )
```



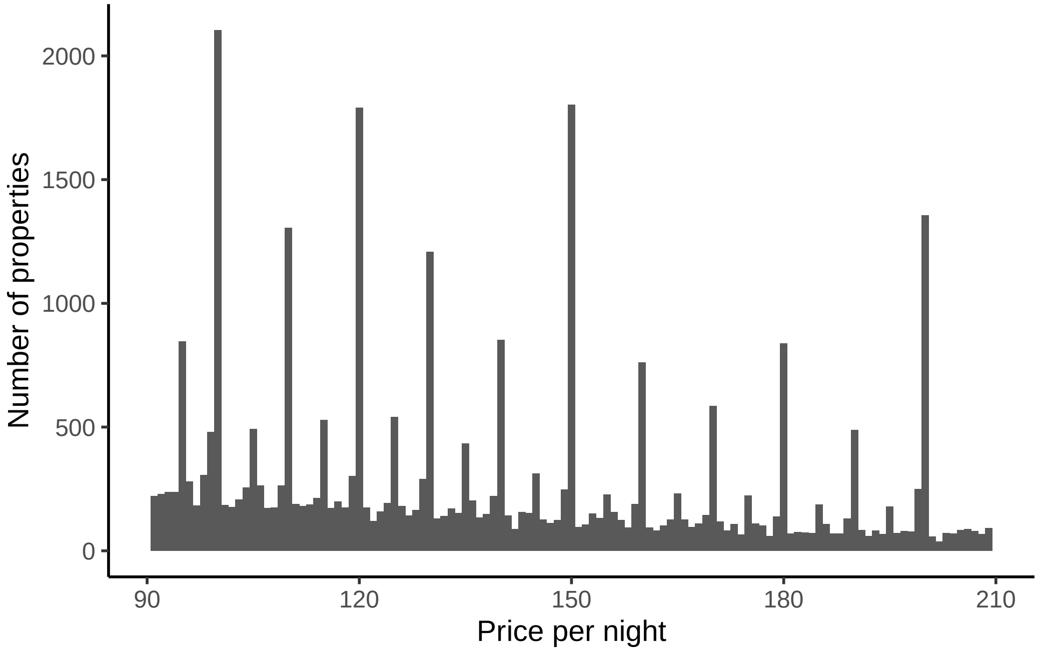
```r
airbnb_data_selected |>
  filter(price > 1000) |>
  ggplot(aes(x = price)) +
  geom_histogram(binwidth = 10) +
  theme_classic() +
  labs(
    x = "Price per night",
    y = "Number of properties"
  ) +
  scale_y_log10()
```



```
airbnb_data_selected |>
  filter(price < 1000) |>
  ggplot(aes(x = price)) +
  geom_histogram(binwidth = 10) +
  theme_classic() +
  labs(
    x = "Price per night",
    y = "Number of properties"
  )
```



```r
airbnb_data_selected |>
  filter(price > 90) |>
  filter(price < 210) |>
  ggplot(aes(x = price)) +
  geom_histogram(binwidth = 1) +
  theme_classic() +
  labs(
    x = "Price per night",
    y = "Number of properties"
  )
```

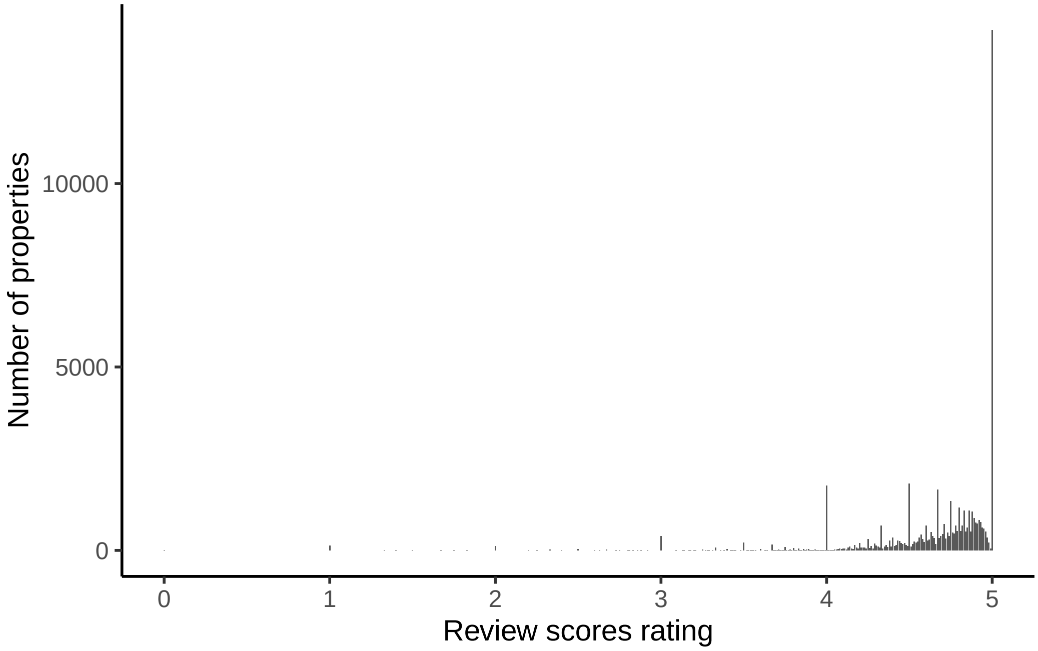


```r
# Now we will just remove all prices that are more than $999

airbnb_data_less_1000 <-
  airbnb_data_selected |>
  filter(price < 1000)

airbnb_data_less_1000 |>
  filter(is.na(host_is_superhost))
```

```
# A tibble: 83 x 12
    host_id host_response_time host_is_superhost host_total_listings_count
      <dbl> <chr>              <lgl>                                 <dbl>
 1 29138344 within an hour     NA                                        3
 2  5869840 within a few hours NA                                        7
 3 35125972 within an hour     NA                                        3
 4 13827149 within a few hours NA                                        3
 5 62919059 within a few hours NA                                        3
 6 22167607 N/A                NA                                        2
 7 10259782 N/A                NA                                        2
 8 62919059 within a few hours NA                                        3
 9 20056470 N/A                NA                                        4
10 20056470 N/A                NA                                        4
```

```
# i 73 more rows
# i 8 more variables: neighbourhood_cleansed <chr>, bathrooms <lgl>,
#   bedrooms <dbl>, price <int>, number_of_reviews <dbl>,
#   review_scores_rating <dbl>, review_scores_accuracy <dbl>,
#   review_scores_value <dbl>
```

```
airbnb_data_no_superhost_nas <-
  airbnb_data_less_1000 |>
  filter(!is.na(host_is_superhost)) |>
  mutate(
    host_is_superhost_binary =
      as.numeric(host_is_superhost)
  )

airbnb_data_no_superhost_nas |>
  ggplot(aes(x = review_scores_rating)) +
  geom_bar() +
  theme_classic() +
  labs(
    x = "Review scores rating",
    y = "Number of properties"
  )
```



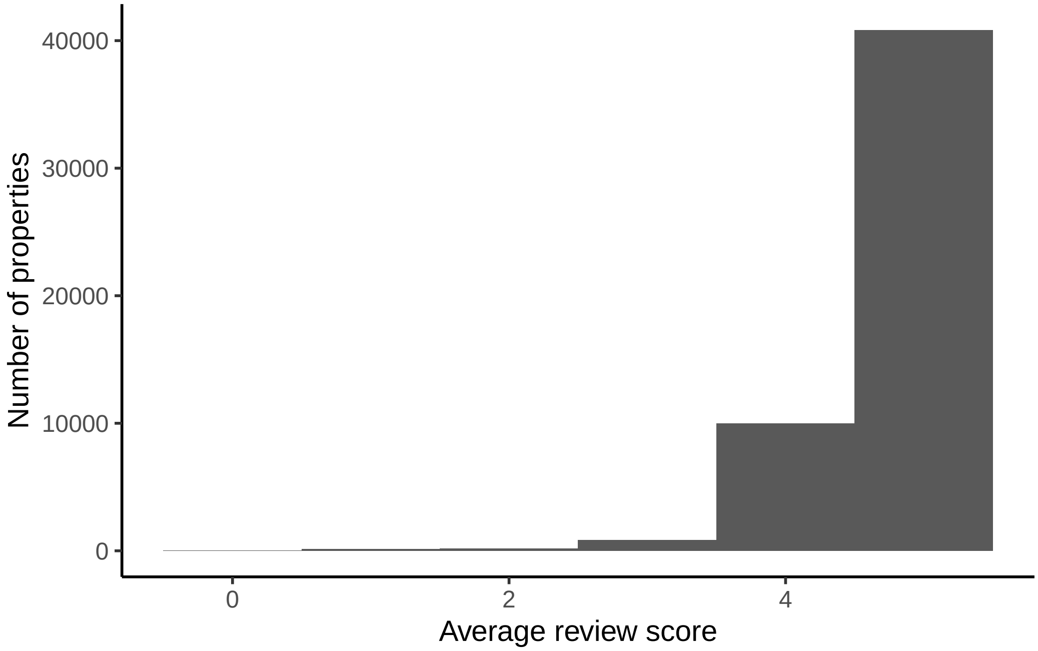
```r
# Deal with NA scores

airbnb_data_no_superhost_nas |>
  filter(is.na(review_scores_rating)) |>
  nrow()
```

```
[1] 13497
```

```r
airbnb_data_no_superhost_nas |>
  filter(is.na(review_scores_rating)) |>
  select(number_of_reviews) |>
  table()
```

```
number_of_reviews
    0
13497
```

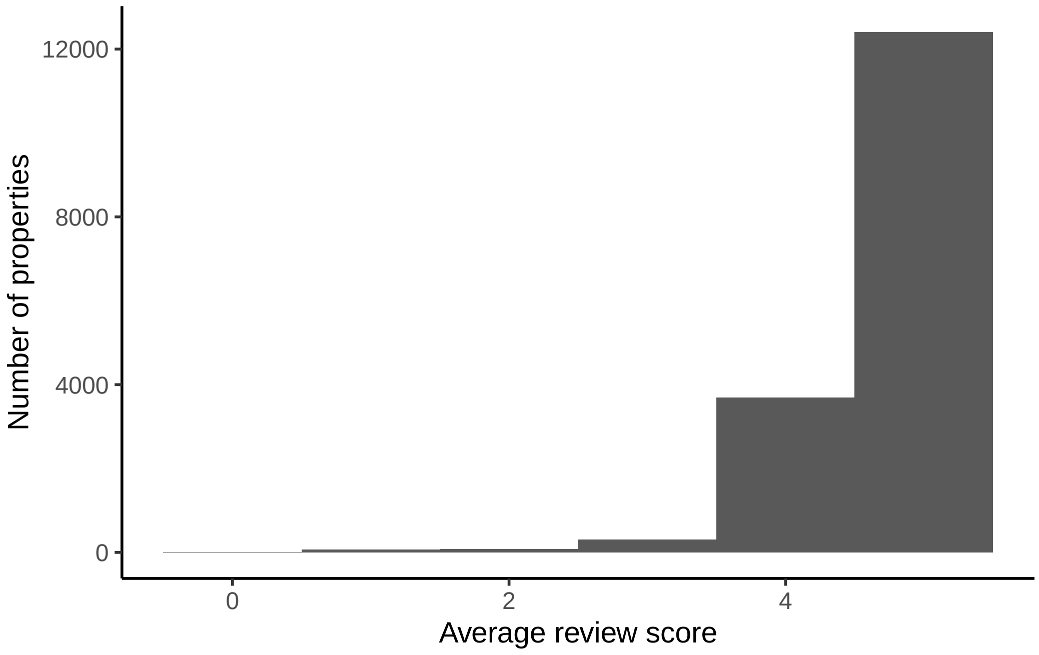
```r
airbnb_data_no_superhost_nas |>
  filter(!is.na(review_scores_rating)) |>
  ggplot(aes(x = review_scores_rating)) +
  geom_histogram(binwidth = 1) +
  theme_classic() +
  labs(
    x = "Average review score",
    y = "Number of properties"
  )
```



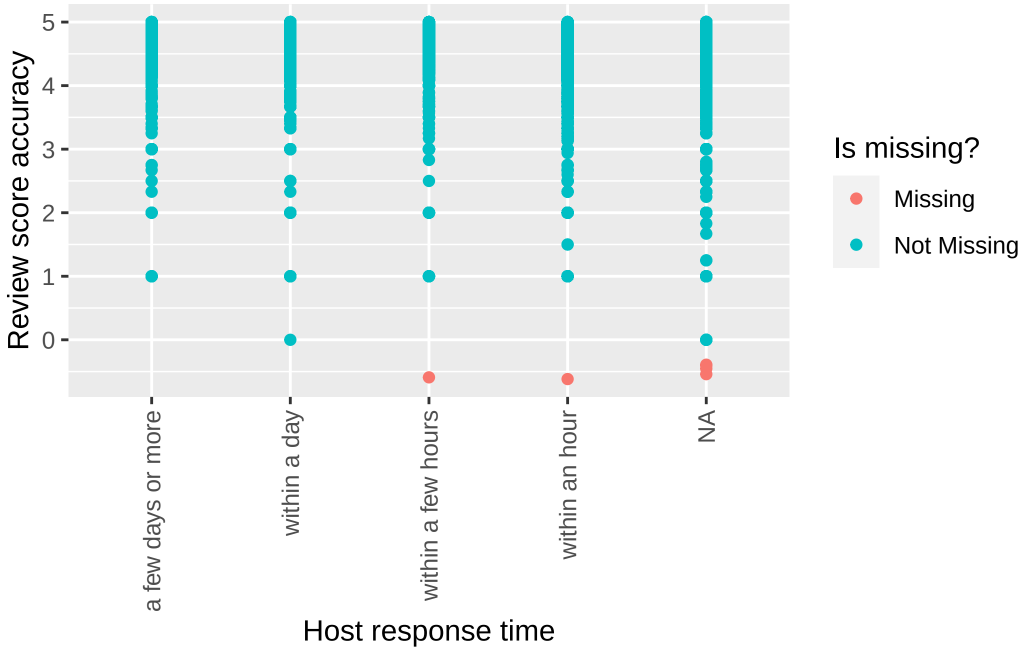
```
# Remove anyone with NA in their main review score

airbnb_data_has_reviews <-
  airbnb_data_no_superhost_nas |>
  filter(!is.na(review_scores_rating))

airbnb_data_has_reviews |>
  count(host_response_time)
```

```
# A tibble: 6 x 2
  host_response_time     n
  <chr>              <int>
1 N/A                16531
2 a few days or more  1243
3 within a day        5297
4 within a few hours  6811
5 within an hour     22094
6 <NA>                   2
```

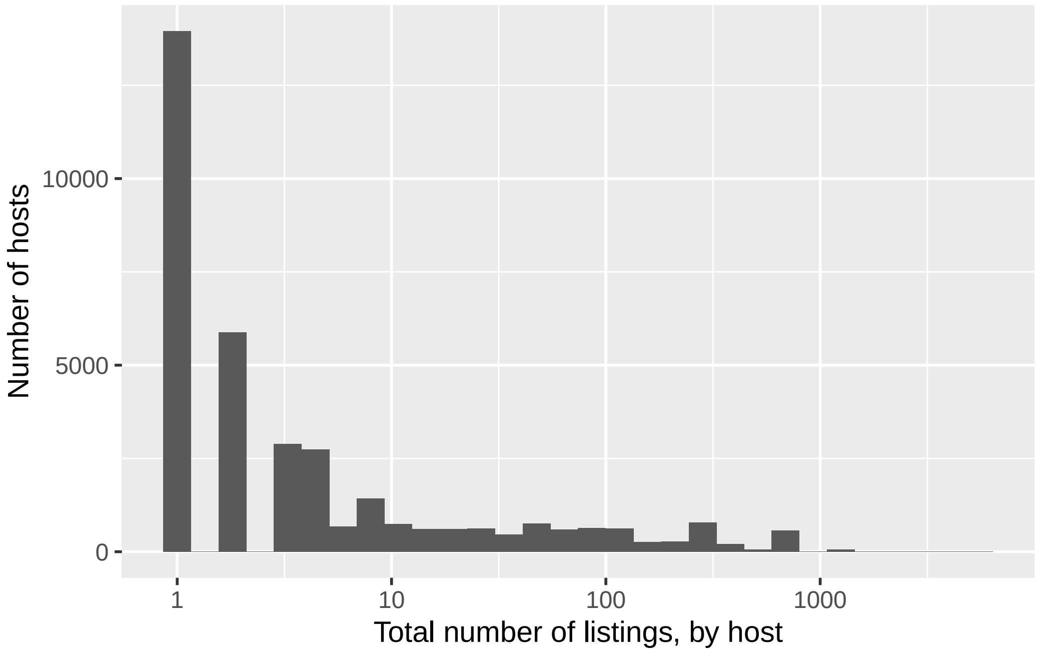
```
airbnb_data_has_reviews <-
  airbnb_data_has_reviews |>
  mutate(
    host_response_time = if_else(
      host_response_time == "N/A",
      NA_character_,
      host_response_time
    ),
    host_response_time = factor(host_response_time)
  )

airbnb_data_has_reviews |>
  filter(is.na(host_response_time)) |>
  ggplot(aes(x = review_scores_rating)) +
  geom_histogram(binwidth = 1) +
  theme_classic() +
  labs(
    x = "Average review score",
    y = "Number of properties"
  )
```



```
airbnb_data_has_reviews |>
  ggplot(aes(
    x = host_response_time,
    y = review_scores_accuracy
  )) +
  geom_miss_point() +
  labs(
    x = "Host response time",
    y = "Review score accuracy",
    color = "Is missing?"
  ) +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1))
```



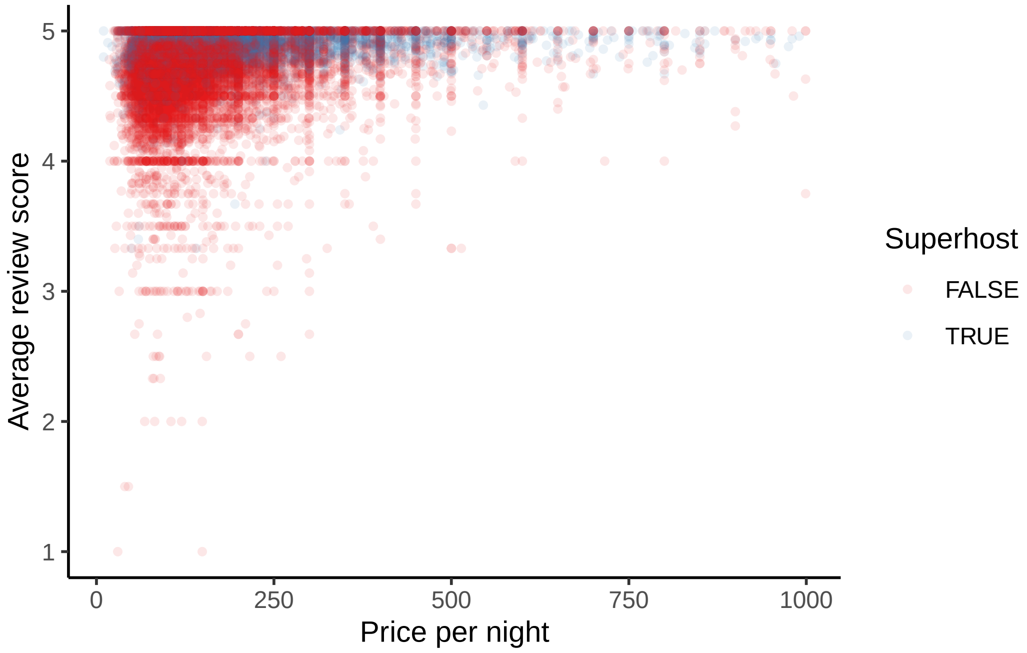
```
# How many properties a host has on Airbnb

airbnb_data_selected <-
  airbnb_data_has_reviews |>
  filter(!is.na(host_response_time))

airbnb_data_selected |>
  ggplot(aes(x = host_total_listings_count)) +
  geom_histogram() +
  scale_x_log10() +
  labs(
    x = "Total number of listings, by host",
    y = "Number of hosts"
  )
```



```
# Price per night

airbnb_data_selected |>
  filter(host_total_listings_count >= 500) |>
  head()
```

```
# A tibble: 6 x 13
   host_id host_response_time host_is_superhost host_total_listings_count
     <dbl> <fct>              <lgl>                                 <dbl>
1 50502817 within an hour     FALSE                                   778
2 50502817 within an hour     FALSE                                   778
3 50502817 within an hour     FALSE                                   778
4 50502817 within an hour     FALSE                                   778
5 50502817 within an hour     FALSE                                   778
6 50502817 within an hour     FALSE                                   778
# i 9 more variables: neighbourhood_cleansed <chr>, bathrooms <lgl>,
#   bedrooms <dbl>, price <int>, number_of_reviews <dbl>,
#   review_scores_rating <dbl>, review_scores_accuracy <dbl>,
#   review_scores_value <dbl>, host_is_superhost_binary <dbl>
```

```
airbnb_data_selected <-
  airbnb_data_selected |>
  add_count(host_id) |>
  filter(n == 1) |>
  select(-n)

airbnb_data_selected |>
  filter(number_of_reviews > 1) |>
  ggplot(aes(x = price, y = review_scores_rating,
             color = host_is_superhost)) +
  geom_point(size = 1, alpha = 0.1) +
  theme_classic() +
  labs(
    x = "Price per night",
    y = "Average review score",
    color = "Superhost"
  ) +
  scale_color_brewer(palette = "Set1")
```



```
airbnb_data_selected |>
  count(host_is_superhost) |>
  mutate(
    proportion = n / sum(n),
    proportion = round(proportion, digits = 2)
  )
```

```
# A tibble: 2 x 3
  host_is_superhost     n proportion
  <lgl>             <int>      <dbl>
1 FALSE             15820       0.72
2 TRUE               6227       0.28
```

```
airbnb_data_selected |>
  tabyl(host_response_time, host_is_superhost) |>
  adorn_percentages("col") |>
  adorn_pct_formatting(digits = 0) |>
  adorn_ns() |>
  adorn_title()
```

```
                   host_is_superhost
 host_response_time             FALSE         TRUE
 a few days or more        6%   (953)  0%     (24)
       within a day       22% (3,511) 12%    (770)
 within a few hours       24% (3,802) 26% (1,614)
     within an hour       48% (7,554) 61% (3,819)
```

```
airbnb_data_selected |>
  tabyl(neighbourhood_cleansed) |>
  adorn_pct_formatting() |>
  arrange(-n) |>
  filter(n > 100) |>
  adorn_totals("row") |>
  head()
```

```
 neighbourhood_cleansed    n percent
      Buttes-Montmartre 2842   12.9%
             Popincourt 2202   10.0%
               Entrepôt 1713    7.8%
              Vaugirard 1681    7.6%
           Ménilmontant 1438    6.5%
        Buttes-Chaumont 1430    6.5%
```

	(1)
(Intercept)	−16.262
	(0.481)
host_response_timewithin a day	2.019
	(0.211)
host_response_timewithin a few hours	2.695
	(0.210)
host_response_timewithin an hour	2.972
	(0.209)
review_scores_rating	2.624
	(0.089)
Num.Obs.	22 047
AIC	24 165.0
BIC	24 205.0
Log.Lik.	−12 077.507
F	342.291
RMSE	0.43

```r
logistic_reg_superhost_response_review <-
  glm(
    host_is_superhost ~
      host_response_time +
      review_scores_rating,
    data = airbnb_data_selected,
    family = binomial
  )

modelsummary(logistic_reg_superhost_response_review)
```

```r
# Save analysis dataset

write_parquet(
  x = airbnb_data_selected,
  sink = "2023-12-12-paris-airbnblistings-analysis_dataset.parquet"
  )
```