HIT140 FOUNDATIONS OF DATA SCIENCE

Assessment 2:
Bat Behavior Analysis in the Presence of Rats

Submitted By : Group 9

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What we will discuss today ?

- Project Overview
- Research Question
- Datasets
- Methodology
- Results and Findings
- Discussion and Conclusion

Project Overview

Black rats usually found in the areas where Egyptians fruit bats are present

Bat landing actions and delay times may be determined by the risk of predation

Studying predator-pray relationships in urban settings makes it easier understanding bat responses

Figure 1. Illustration of bats and rats fighting for a slice of pizza. This image was generated by ChatGPT, 18 Jul 2025.

Research Question ?

1. Are black rats viewed as possible predators by Egyptian fruit bats?

2. Does the frequency of bat landings change when rats are present?

3. Does the presence of rats affect the hesitation time?

Data sets

What data sets are used and what do they mean ?

Datasets 1

- Start time and bat landing to food are columns
- Individual bat landings
- Includes the number of landings perbat and the hesitation time

Datasets 2

- 30-minute observation periods

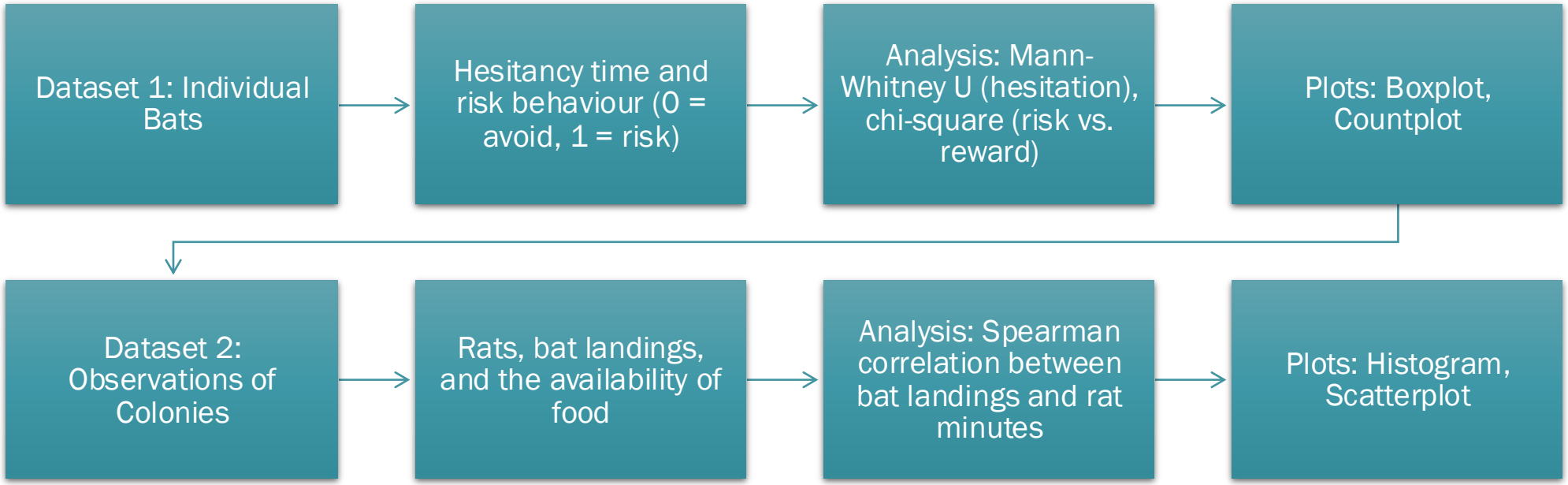
•Time, month, hours after sunset, bat landing number, food availability, and rat minutes are the columns

•Records bat activity over time in relation to the availability of food and
the presence of rats

Methodology

The study of research we used

Methodology Used:



Results and Findings

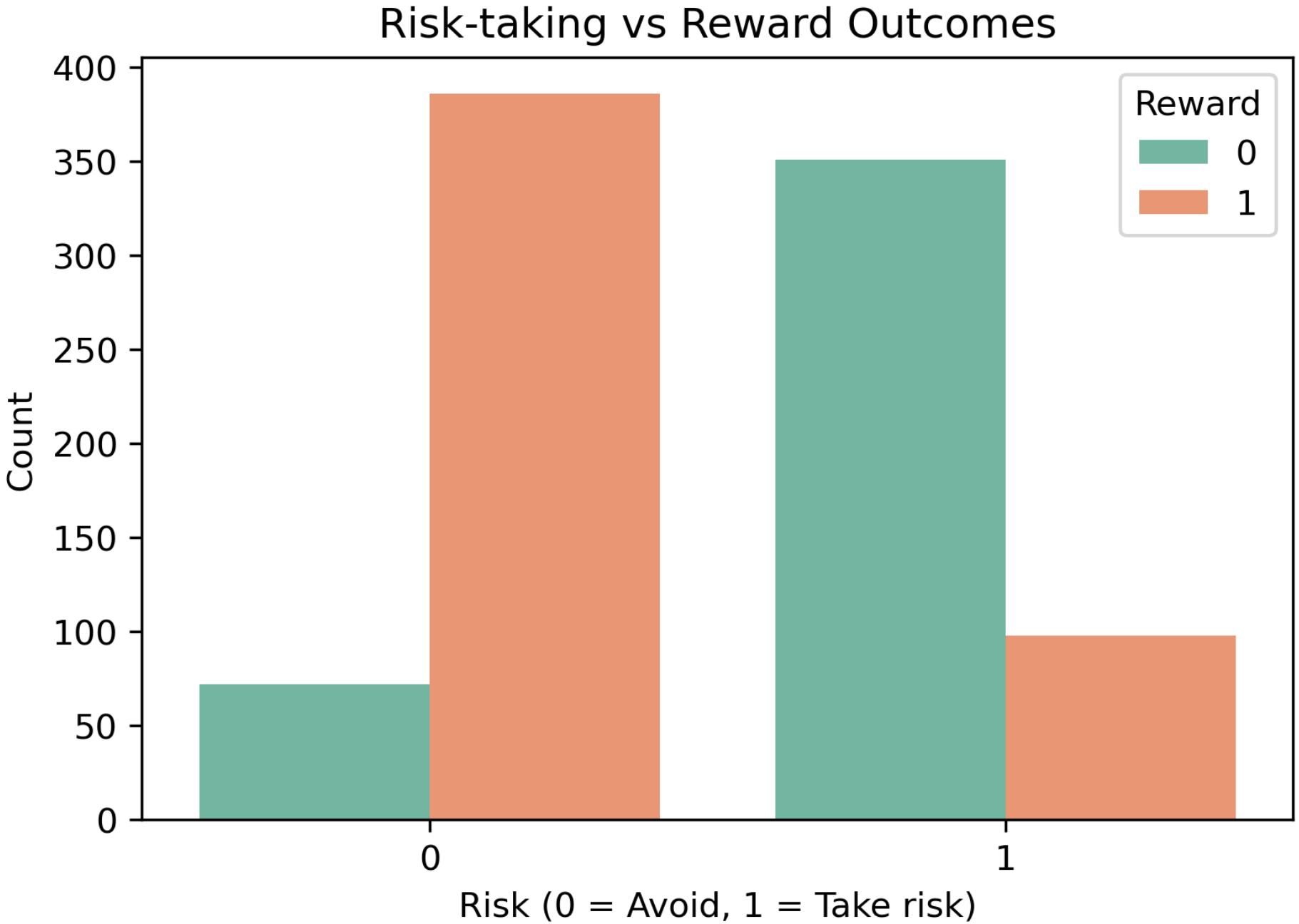
What have we found using the data and methodology ?

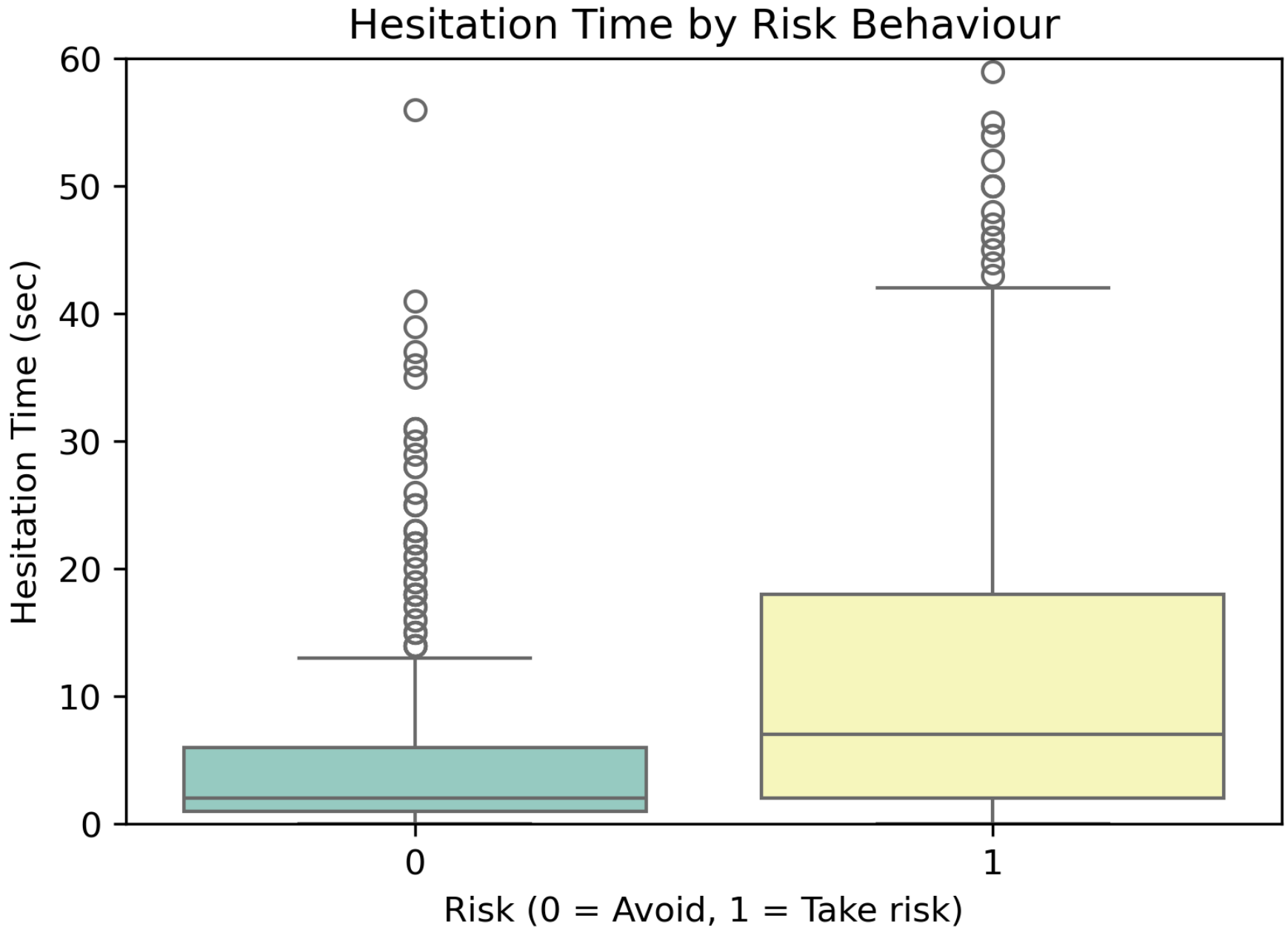
Individual Behaviour (Dataset 1)

Avoiders had much higher success rates

Risk-takers hesitated longer before feeding

Risk vs Reward, Hesitation times


Risk-taking vs Reward Outcomes
Reward
0
1
Count
400
350
300
250
200
150
100
50
0
0
1
Risk (0 = Avoid, 1 = Take risk)

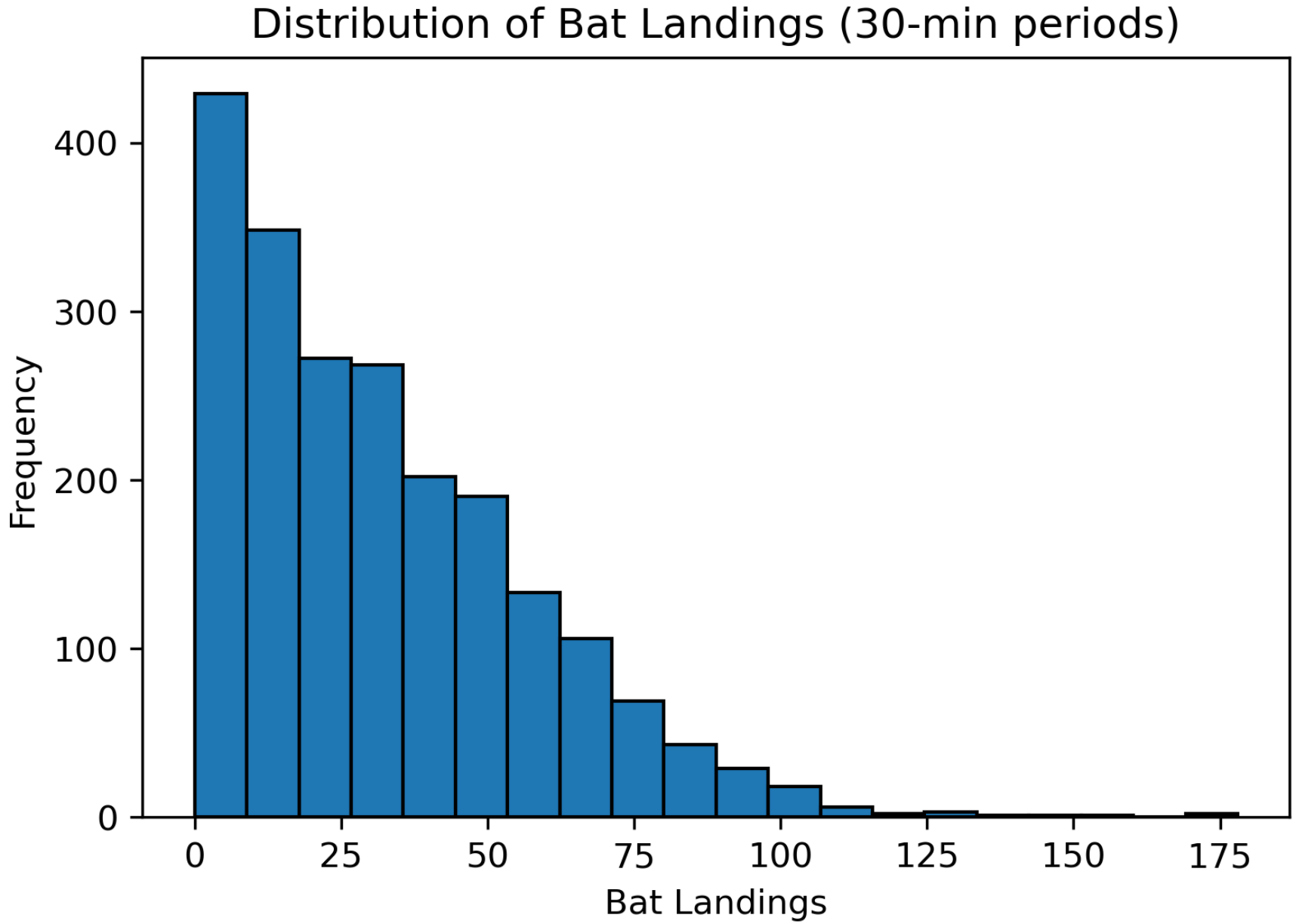

Hesitation Time by Risk Behaviour
Hesitation Time (sec)
60
50
40
30
20
10
0
0
1
Risk (0 = Avoid, 1 = Take risk)

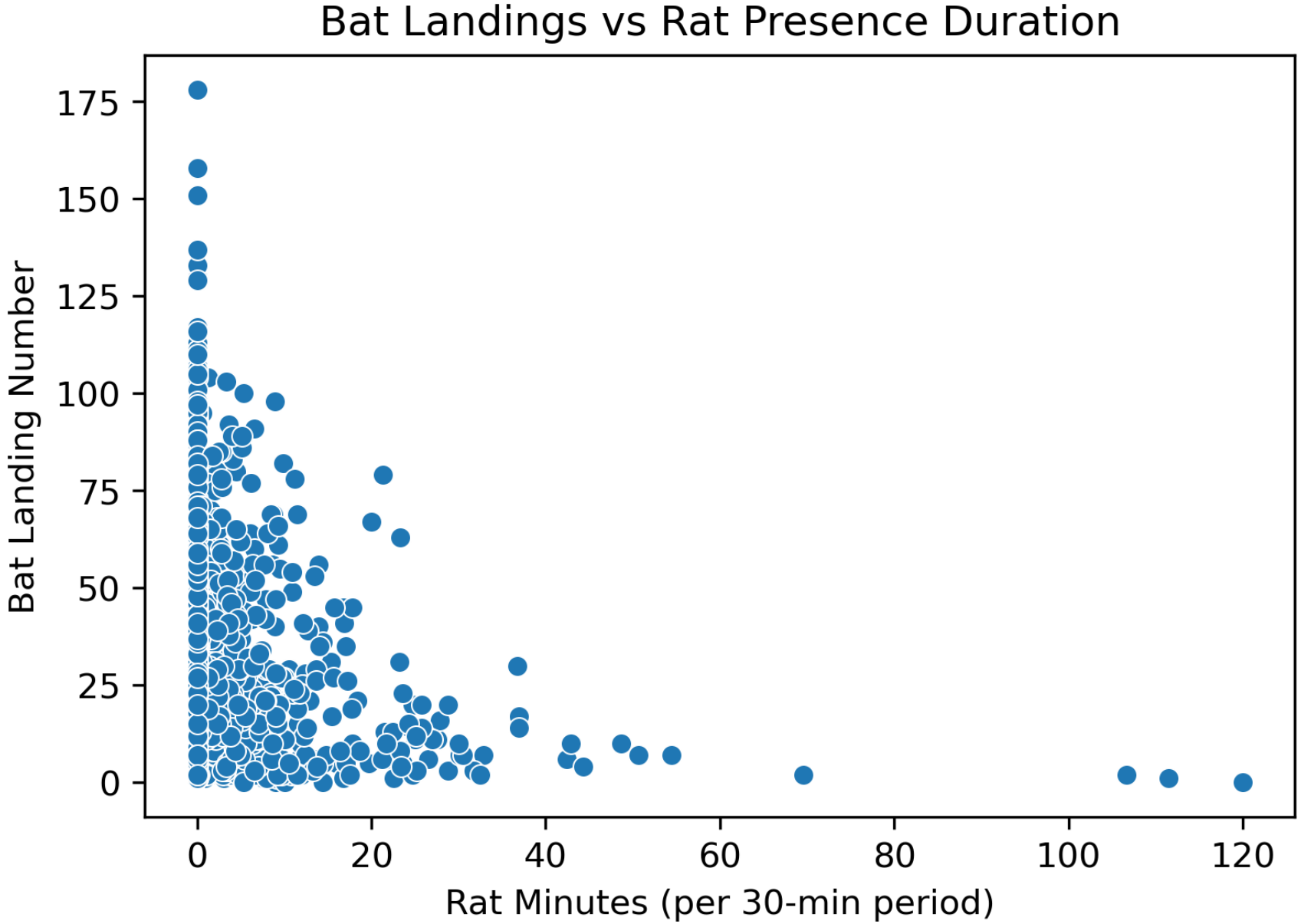
Individual Behaviour (Dataset 2)

Rat presence vs Bat landings: negative relationship.

Spearman correlation ρ ≈ −0.11 ($p < 1e\text{-}7$).

More rats ⟶ fewer bats landing.


Distribution of Bat Landings (30-min periods)
Frequency
0
100
200
300
400
0
25
50
75
100
125
150
175
Bat Landings


Bat Landings vs Rat Presence Duration
Bat Landing Number
175
150
125
100
75
50
25
0
0
20
40
60
80
100
120
Rat Minutes (per 30-min period)

Implementation

Let's see how we implemented the code and methodology

```python
# --- Investigation A (CLI + Save Plots) ---
import os
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import chi2_contingency, mannwhitneyu, spearmanr

# --- CREATE PLOTS DIRECTORY ---
os.makedirs("plots", exist_ok=True)

# --- LOAD DATA ---
dataset1 = pd.read_csv("./dataset1.csv")
dataset2 = pd.read_csv("./dataset2.csv")
```

Discussion and conclusion

Let's wrap up what we found

Discussion

Evidence from both datasets aligns

Bats behave cautiously around rats.

Rats treated as a **predator-like threat.**

Conclusion

Hypothesis supported.

Bats perceive rats as potential predators.

Evidence: hesitation, avoidance, reduced colony foraging.

Thank you

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