

Bat vs. Rat: *The Forage Files*

Uncovering the wild truth behind nocturnal food fights

Background

A team of zoologists studied the foraging behaviour of the Egyptian Fruit Bats (*Rousettus aegyptiacus*) in the presence of Black Rats (*Rattus rattus*). They set out to conduct a series of observations in a semi-natural, open bat colony over a 7-month period, where the interactions of both animals' on a provisioned food platform were monitored using surveillance video cameras. The outcome of these observations was then collated into two datasets. The datasets are made accessible to you on Learnline and described in the sections below.



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



In this group project, you and your team members shall work together as ‘detectives’.

You will match curiosity with your data science skills to support the zoologists in carrying out the following investigations:

Investigations

Investigation A

Do bats perceive rats not just as competitors for food but also as potential predators? If rats are considered a predation risk by bats, scientists believe that this perception will translate into the bats’ higher level of avoidance behaviour or increased vigilance during foraging on the food platform.

Investigation B

Do the behaviours described above change following seasonal changes? It is known that in winter, alternative food sources are scarce and rat encounters are less frequent. In spring, food is more abundant and rat encounters are more common.

To provide answers to both investigations, your team should decide the appropriate data science techniques to use for analysing the following datasets.

Datasets

These are the two datasets that must be used in this project. They are downloadable from Learnline.

dataset1.csv

The first dataset focuses on what happens each time a bat lands on a provisioned food platform when rats are present. Each row in this dataset is a unique, single bat landing on the food platform. It further describes the situational context and a bat’s observed behaviours following its landing.

The zoologists manually detected each bat landings from the collected surveillance video footage, as previously described. Behavioural variables such as vigilance and foraging success of each landing were then manually annotated and quantified by watching the video recordings. Table 1 explains the meaning of variables in this dataset.

Table 1. Variables in dataset1.csv

Column No.	Variable Name	Description
1	start_time	Bat’s landing time on the food platform
2	bat_landing_to_food	Time difference (in seconds) after a bat’s landing and before it started to approach the food on the platform
3	habit	The context surrounding the landing event and the animals’ behaviour

4	rat_period_start	The time rat(s) arrived on the food platform
5	rat_period_end	The time rat(s) left the food platform
6	seconds_after_rat_arrival	Time difference (in seconds) since rats' arrival until the bat landed
7	risk	Indicates a risk-taking behaviour, such as attacking rats to gain access to food or not, as determined by the zoologist (0: risk-avoidance; 1: risk-taking)
8	reward	Whether the demonstrated behaviour is rewarding (0: no reward; 1: reward)
9	month	Month label assigned by the zoologists
10	sunset_time	Sunset time of the day
11	hours_after_sunset	Time difference (in hours) since sunset until the observed landing
12	season	Season label assigned by the zoologists

dataset2.csv

The second dataset focuses on rats' arrival events at the food platform. Each row in the dataset represents the outcome of a 30-minute continuous video surveillance recording of the same food platform as the one mentioned in dataset1.csv. The number of unique rat arrivals within each 30-minute interval was then manually counted from the recordings and aggregated. The dataset contains some other observations, such as the total number of bat landings and estimated food depletion in each period. Table 2 explains the meaning of variables in this dataset.

Table 2. Variables in dataset2.csv

Column No.	Variable Name	Description
1	time	A 30-min observation period started
2	month	Month label assigned by the zoologists
3	hours_after_sunset	Time difference (in hours) since sunset until the observation period started
4	bat_landing_number	The number of bat landings counted within the observation period
5	food_availability	Amount of food remaining (unknown unit) that the zoologists estimated based on bat feeding activity.
6	rat_minutes	The aggregated duration of rat(s) were seen present on the food platform over the observation period
7	rat_arrival_number	The number of rat arrivals within the observation period

Project Objectives

Objective 1 / Assessment 2

Objective 1 must be addressed as part of **Assessment 2** of this unit. Your team must perform descriptive and inferential data analyses in Python to carry out Investigation A only.

You should use both datasets given above for your data analysis and present the results by recording a high-quality team presentation. For more information about the required submissions, please refer to the Assessment 2 page on Learnline.

Objective 2 / Assessment 3

Objective 2 must be addressed as part of **Assessment 3** of this unit. Your team must revisit Investigation A, as well as carry out Investigation B using overall data science techniques you have learned in this unit.

To complete this objective, your team must prepare and submit a high-quality group report. In addition to using both provided datasets, you may also consider procuring external data you deem relevant to your investigations. For more information about the required submissions, refer to the Assessment 3 page on Learnline.

Notes

Dirty data, real data:

This project offers you an authentic experience in working with real datasets and carrying out investigations that have scientific value. You will encounter various data types and irregularities within the provided datasets. You may also need to deal with missing or incorrect values in the datasets. This is how real datasets often look, where your team have the opportunity to exercise good judgment on how to deal with them appropriately.

Feature engineering:

Any creative derivation of new variables from these existing variables or data transformation is permitted. This is known as feature engineering and is a common data science practice.

Be ethical:

You must not alter the original values of these datasets to suit a pre-determined conclusion. You must maintain ethical conduct during your data analyses. If in doubt, please consult the Unit Coordinator.

Acknowledgement

The descriptions, datasets and tasks in this assessment have been derived and adapted by Dr Yakub Sebastian from:

Chen, Xing; Harten, Lee; Rachum, Adi; Attia, Liraz; Yovel, Yossi (2025), "Complex competition interactions between Egyptian fruit bats and black rats in the real world", Mendeley Data, V1, doi: 10.17632/gt7j39b2cf.1 (License CC BY 4.0)