Key to '*Fruit Fly Feeding Behaviour*'

OBJECTIVE

To study the feeding behaviour of the starved and fed flies, and their differences by visualizing the data.

DEFINITIONS

(1) Feeding state: at a given time point, the fly is on the pad. This is also known as state 1.

(2) Resting state: at a given time point, the fly is not on the pad. This is also known as state 0.

(3) *True* Feeding time interval: the fly stays on the sensing pad, where it drinks the glucose water, for at least 5 seconds or longer, until it is no longer on the pad. This is considered one interval. Furthermore, the state of the true feeding time interval is ***true* feeding state**.

(4) *False* Feeding time interval: the fly stays on the sensing pad for less than 5 seconds.

(5) *True* Resting time interval: the fly stays outside the sensing pad for at least 10 seconds or longer, until it lands on the pad. This is considered one interval. Furthermore, the state of the true resting time interval is ***true* resting state**.

(6) *False* Resting time interval: the fly stays outside the sensing pad for less than 10 seconds.

Note: The time required to be considered as true feeding/resting time interval, is chosen by the lab. It is important to note that the result of the analysis heavily depends on this definition and the method of categorizing the states.

ASSUMPTIONS

Assumption 1

The time data is in seconds and for each given point of time it must be categorized as either feeding (1) or resting (0); there is no other state than feeding and resting.

Assumption 2

The time for data collection starts as soon as the fly is released, and the fly's initial state is resting. The fly's last state interval is omitted when preparing for data visualization as the data

collection may have stopped in the midst of the last state. The fly's first state interval is also omitted as it may inaccurately represent the fly's general behaviour.

Assumption 3

Due to high sensitivity of the pad and frequent movement of flies, we make the following assumptions for the cases.

Case 1: There are two, same, *true* state time intervals (both state 0 or both state 1). In between them, there is a single (or multiple) *false* state time interval(s) (can be a mix of different states).

- Then the intervals altogether are considered as one true state time interval. The state of this time interval is equivalent to whatever state the two true intervals is.

Case 2: There are two, different, *true* state time intervals. The first is a true resting interval and the second is a true feeding interval. In between them, there is a single (or multiple) *false* state time interval(s) (can be a mix of different states).

- Then the true resting interval and its following false interval(s) are together considered as one true resting time interval, and the true feeding interval remains as its own true interval; there is a true resting interval followed by a true feeding interval.

Case 3: There are two, different, *true* state time intervals. The first is a true feeding interval and the second is a true resting interval. In between them, there is a single (or multiple) *false* state time interval(s) (can be a mix of different states).

- Then the true feeding interval and its following false interval(s) are together considered as one true feeding time interval, and the true resting interval remains as its own true interval; there is a true feeding interval followed by a true resting interval.

Case 4: Consider the following examples

- *True* feeding state – *True* resting state – *False* state(s) – *True* resting state
  - Solution: *True* feeding interval – *True* resting interval
- *True* feeding state – *True* resting state – *False* state(s)– *True* feeding state
  - Solution: *True* feeding interval – *True* resting interval – *True* feeding interval
- *True* resting state – *True* feeding state – *False* state(s)– *True* feeding state
  - Solution: *True* resting interval – *True* feeding interval
- *True* resting state – *True* feeding state – *False* state(s)– *True* resting state
  - Solution: *True* resting interval – *True* feeding interval – *True* resting interval

Case 5: Consider the following examples

- *True* feeding state –*False* state(s) **– LAST STATE**: *True*/*False* state
    - Solution: *True* feeding interval
- *True* feeding state – *False* state(s) – *True* resting state **– LAST STATE**: *True*/*False* state
    - Solution: *True* feeding interval – *True* resting interval
- *True* feeding state – *False* state(s) – *True* feeding state **– LAST STATE**: *True*/*False* state
    - Solution: *True* feeding interval

DATA COLLECTION

For each collection of data, one fly is placed in a container with the sensing pad on which the fly can consume glucose water. Once the fly is released in the container, the data is collected for approximately 60 minutes. For this analysis, six female fruit flies are used. three of those flies are starved, and the other three are fed before releasing in their containers.

METHOD OF ANALYSIS

Boxplot is produced for each feeding and resting period for the six flies to compare their lengths of time. Then, a cumulative frequency graph is produced for each group of fed and group of starved flies.