



FOUNDATION OF DATA SCIENCE (HIT140)

GROUP 29

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BACKGROUND

- Study: 7 months in semi-natural colony
- Video recordings annotated by zoologists
- Rats and bats competing on a shared food platform
- → *“Investigation A: Do Bats Perceive Rats as Predators?”*





OBJECTIVE & JUSTIFICATION

Objective:

Test whether bats see rats as competitors for food, or as predators that trigger avoidance/vigilance.

Justification:

Predator–prey interactions are fundamental in ecology.

Understanding these dynamics helps explain feeding behaviour, competition for food, and species coexistence.

If bats fear rats, their survival/foraging efficiency is affected → ecological significance.

DATASETS CLEANING (ANALYTICAL APPROACH)

- Dataset 1 (907 rows): Each bat landing with behavioural annotations.
- Dataset 2 (2123 rows): 30-min observation periods with bat & rat activity.

Cleaning Steps:

- Datetime consistency, remove negatives, fix missing values
- Binary recoding (risk, reward)

Engineered features needed for Investigation A:

- avoidance_behavior (>5s delay → avoidance)
- interaction_type (competition, predation_fear, no_rat)
- rat_present indicator

ANALYTICAL APPROACH (PART 2: HYPOTHESES & TESTS)

- We tested **three hypotheses**:
- **H1 – Avoidance**: Do bats delay feeding more when rats present?
 - Descriptive: Compare delays
 - Inferential: T-test & Mann-Whitney
- **H2 – Interaction**: Do bats compete or avoid rats?
 - Descriptive: Count categories
 - Inferential: Chi-square
- **H3 – Colony activity**: Do bats land less when rats are present?
 - Descriptive: Compare mean and median landings
 - Inferential: T-test & Mann-Whitney

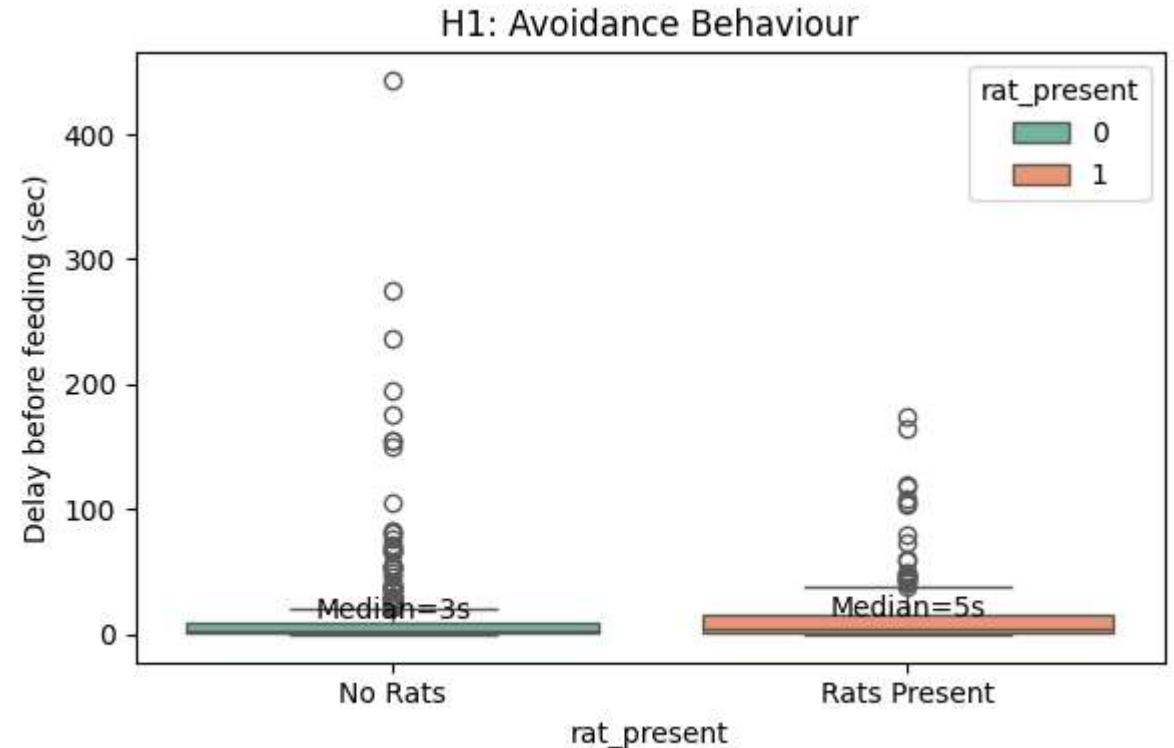
RESULTS: H1 (INDIVIDUAL AVOIDANCE)

- Median delays: 3s (no rats) vs 5s (rats present)

Inferential Analysis:

- T-test = NS ($p = 0.172$)
- Mann-Whitney = significant ($p = 0.0001$)

Bats wait significantly longer to feed when rats present → avoidance/vigilance



Mann-Whitney $p = 0.0001$, T-test $p = 0.172$

RESULTS: H2 (INTERACTION TYPING)

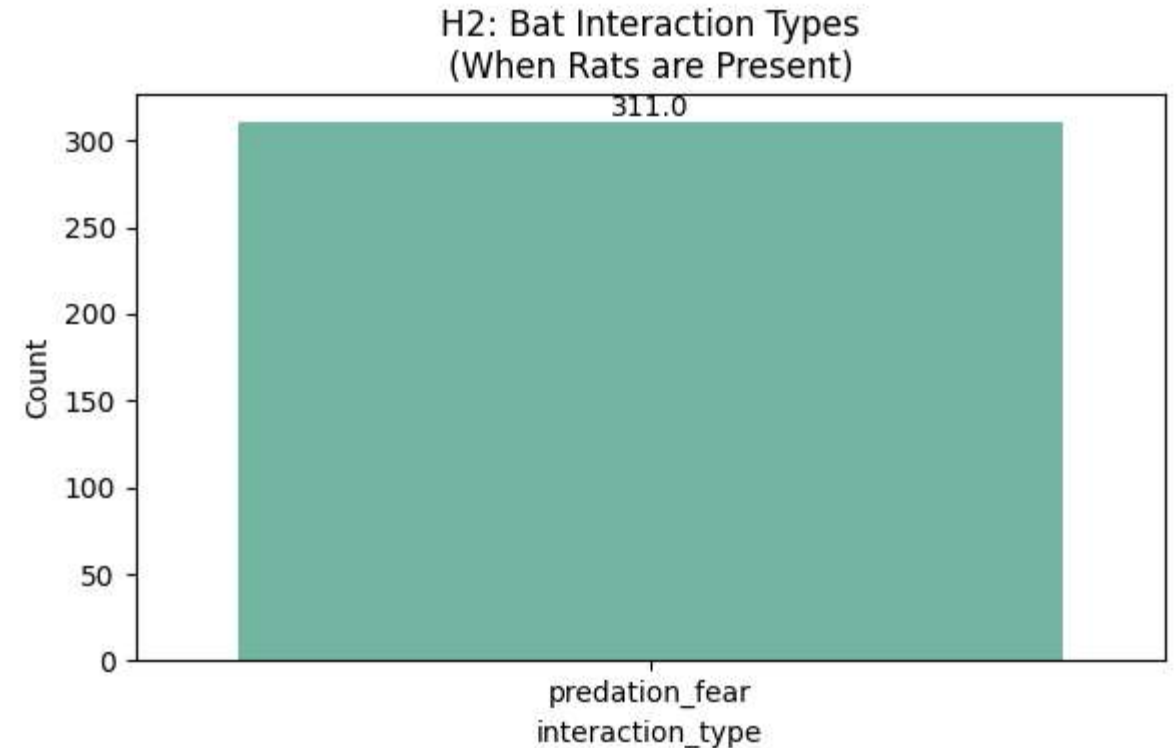
- Observation:

When rats present → 311 cases of predation_fear, 0 of competition

- Chi-square:

$\chi^2 = 902.6$, $p < 0.001$ → highly significant, not random distribution

Bats overwhelmingly perceive rats as threats (predation), not competitors



Chi-square $\chi^2=902.6$, $p < 0.001$

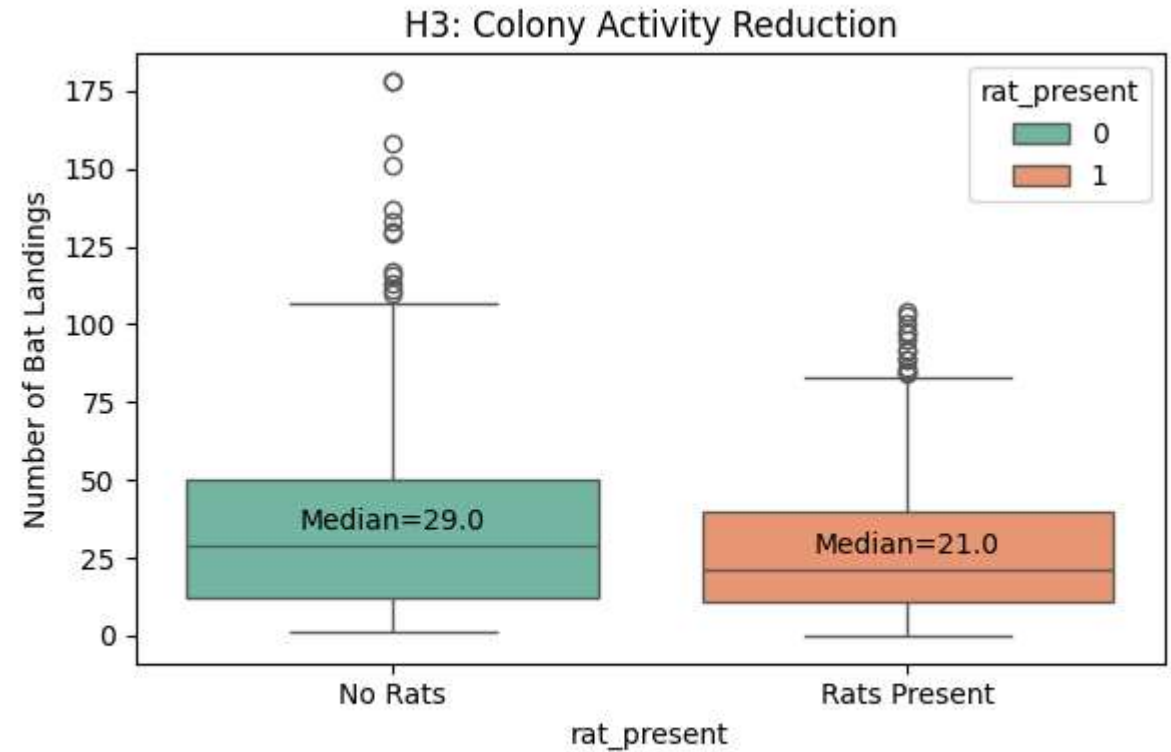
RESULTS: H3 (COLONY ACTIVITY)

- Means:
33.6 bat landings (no rats) vs 27.7 (rats present)

- Medians: 29 vs 21

- Inferential:
T-test & Mann-Whitney both $p < 0.001$

Colony activity significantly reduced when rats present



T-test $p < 0.001$, Mann-Whitney $p < 0.001$

RESULTS SUMMARY TABLE

Hypothesis	Descriptive	Inferential	Conclusion
H1	Delay Increases with rats presence	M-V U $p=0.0001$	Avoidance behaviour
H2	Predation-fear only	X^2 $p<0.001$	Rats as predators
H3	Colony landings decreases with rats	$P<0.001$	Reduced activity

DISCUSSION

Consistent evidence across datasets → predator perception

Why important:

- Predator avoidance reduces feeding efficiency
- Bats give up food to avoid risk: ecological trade-off

Limitations:

- Behavioural coding was manual : observer bias possible
- Short-term study : seasonal effects not fully tested

CONCLUSION & NEXT STEPS

Main conclusion: Rats = treated more like predators, not just competitors

Evidence: Avoidance delays, predation-fear dominance, colony-level reduction

Next steps (Investigation B):

Test seasonal effects: winter (scarce food → fewer rats, stronger bat activity) vs spring (more rats, abundant food)

Statistical modelling of predator-prey encounter

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THANK YOU

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