

HypotheX User Study

Study Overview

Welcome, and thank you for participating in this study!

This experiment is divided into **two parts**, each focused on understanding how users explore and interpret machine learning models through **interactive, scenario-based tools**.

What You Will Do

You will complete a series of **exploration tasks** using two different tools and two fictional datasets.

In each part, you'll be asked to:

- **Interact** with an AI model using a visual tool
- **Modify** data points and explore how predictions change
- **Describe your reasoning**, exploration strategy, and observations
- Reflect on what **patterns** you discover

Part 1: Animal Hobbies (What-If Tool)

In the first part, you will explore a **Random Forest classifier** trained to recognize different **pets** (e.g., Duck, Cat, Dog) based on how much time they spend on various **hobbies**.

You'll use the **What-If Tool**, a well-known interactive tool for hypothetical scenario-based (HS) exploration.

Your goal is to understand **how the model makes decisions**, not whether those decisions are “correct.”

We will guide you through several short tasks and ask you to answer a few questions along the way.

Part 2: Alien Hobbies (HypotheX Tool)

In the second part, you'll work with a **fictional alien species dataset** and explore how a similar model classifies them based on alien-specific hobbies.

This time, you'll use our new tool — **HypotheX** — which extends the

scenario-based approach with enhanced visual feedback and interaction options.

The tasks will be similar in structure to Part 1, allowing you to compare and reflect on your experience across tools.

Your Thoughts Matter!

This study is not a test — we are not evaluating your performance or trying to trick you.

Instead, we are deeply interested in **how you explore**, what you find helpful or confusing, and what kinds of reasoning you use along the way.

Please:

- **Think aloud** as you go
- Be honest — we're here to learn from how you think, not just what you click
- Share your **ideas, difficulties, expectations, and surprises**

Reminder: We're Not Evaluating the AI Model

You don't need to assess whether the model is accurate or good — your job is simply to explore, reflect, and try to understand the **principles** behind its classification behavior.

When you're ready, click **Next** to begin with Part 1.

Thank you for helping us better understand interactive reasoning with AI systems!

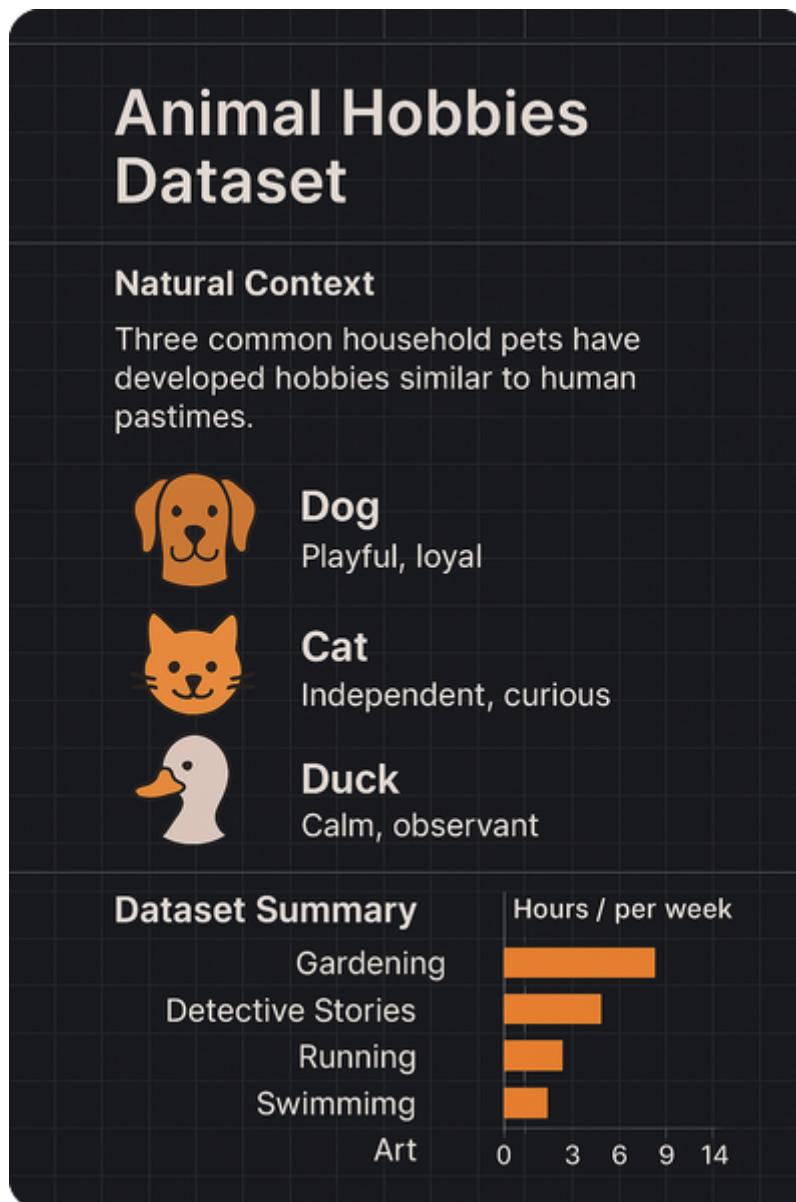
- Explore how data points are distributed across feature dimensions
- Select and inspect data points
- Modify hobby values
- Observe how changes affect the model's predictions

PART 1

In this part you will now work with the **Animal Hobbies Dataset**.

You will explore how the **Random Forest model** classifies different animals based on how much time they spend on various hobbies.

Focus on understanding the **model's behavior** and forming hypotheses about how it makes decisions.



[Watch the tutorial video here] [What if Tool Exploration](#)

Task #1: Explore What Defines a Duck

You can use **any strategy** you find helpful to understand how the model classifies **Ducks**.

 *Tips on what you could do:*

Identify typical Duck hobbies

- Select several Duck points
- Use the scatterplot to find which features are usually high
- Form a hypothesis: which hobbies are most Duck-like?

Test your Hypothesis

- Take a point from another class
- Increase Duck-like hobby values
- See if the prediction switches to Duck

Analyze weak Ducks

- Find Ducks with low values in those hobbies
- Increase those values
- Does model confidence in Duck increase?

Try with rare Duck hobbies

- Pick a hobby Ducks rarely score high in
- Increase it and see how prediction changes

Create edge cases

- Modify multiple features to build a borderline Duck
- What combination confuses the model?

Focus on how your changes affect the prediction — not if they're correct, but what they reveal about the model's decision logic.

1. **Based on your exploration, how would you describe the typical hobby pattern of a Duck?**

Please write a clear rule or pattern that someone else could use to recognize a Duck in this dataset.

For example:

"If X feature is above 10 (or high) and Y feature is above 5(low), it is likely a Duck. Feature Z and ... "

Try to include specific feature names and value ranges if possible.

2. Task #2: Test the Hypothesis

Hypothesis: "If *Detective Stories* is high, it must be a *Cat*."

Please confirm or refute this hypothesis and describe how you went about testing it.

 *Tips on what you could do:*

- Find examples with high *Detective Stories* values and check their predicted class
- Select points from other classes and increase *Detective Stories* — does the prediction change to Cat?
- Compare how different classes respond when this feature is manipulated

 **Write down whether the hypothesis holds and what your observations were that led you to this conclusion.**

3. 🐕 Task #3: Create and Test Your Own (First!!!) Hypothesis About Dogs

Formulate your own hypothesis about what hobby patterns define a **Dog** in this dataset.

Then test it using the What-If Tool.

Example: "If *Feature X* is high and *Feature Y* is low, it must be a Dog."

Please confirm or refute your hypothesis and describe how you tested it.

💡 *Tips on what you could do:*

- Select Dogs and look for common feature patterns
- Try changing features in non-Dog examples to match your hypothesis
- Observe how the model's prediction changes as you manipulate values

✍ **Write down your hypothesis, whether it was confirmed or disproven, and what your observations were that led to this conclusion.**

4. How well do you think you understand how the model decides which class to assign to a data point?

Mark only one oval.

1 2 3 4 5

Low High

5. Based on what you've learned, try to **classify a data point** the way you think the model would.

- 4 Running
- 2 Gardening
- 11 Swimming
- 5 Art
- 14 Detective stories

 Dropdown

Mark only one oval.

- Cat
- Duck
- Dog

The model would classify the previous data point as: Dog

6. Based on what you've learned, try to **classify another data point** the way you think the model would.

- 5 Running
- 4 Gardening
- 13 Swimming
- 7 Art
- 5 Detective stories

 Dropdown

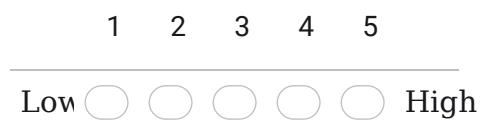
Mark only one oval.

- Cat
- Duck
- Dog

The model would classify the previous data point as: Duck

7. How well do you think you understand how the model decides which class to assign to a data point?

Mark only one oval.



- #### 8. Task #4: Explore an Underexplored Feature Combination

Choose a pair of features (hobbies) that you haven't explored much yet.

Focus on how these features relate to the **Duck** class

Try to form a new hypothesis and see if it helps you better understand how Ducks are classified

Select some relevant data points and test your hypothesis

Please describe:

Which two features you chose

What your hypothesis was

What you observed and whether your understanding of Duck classification changed

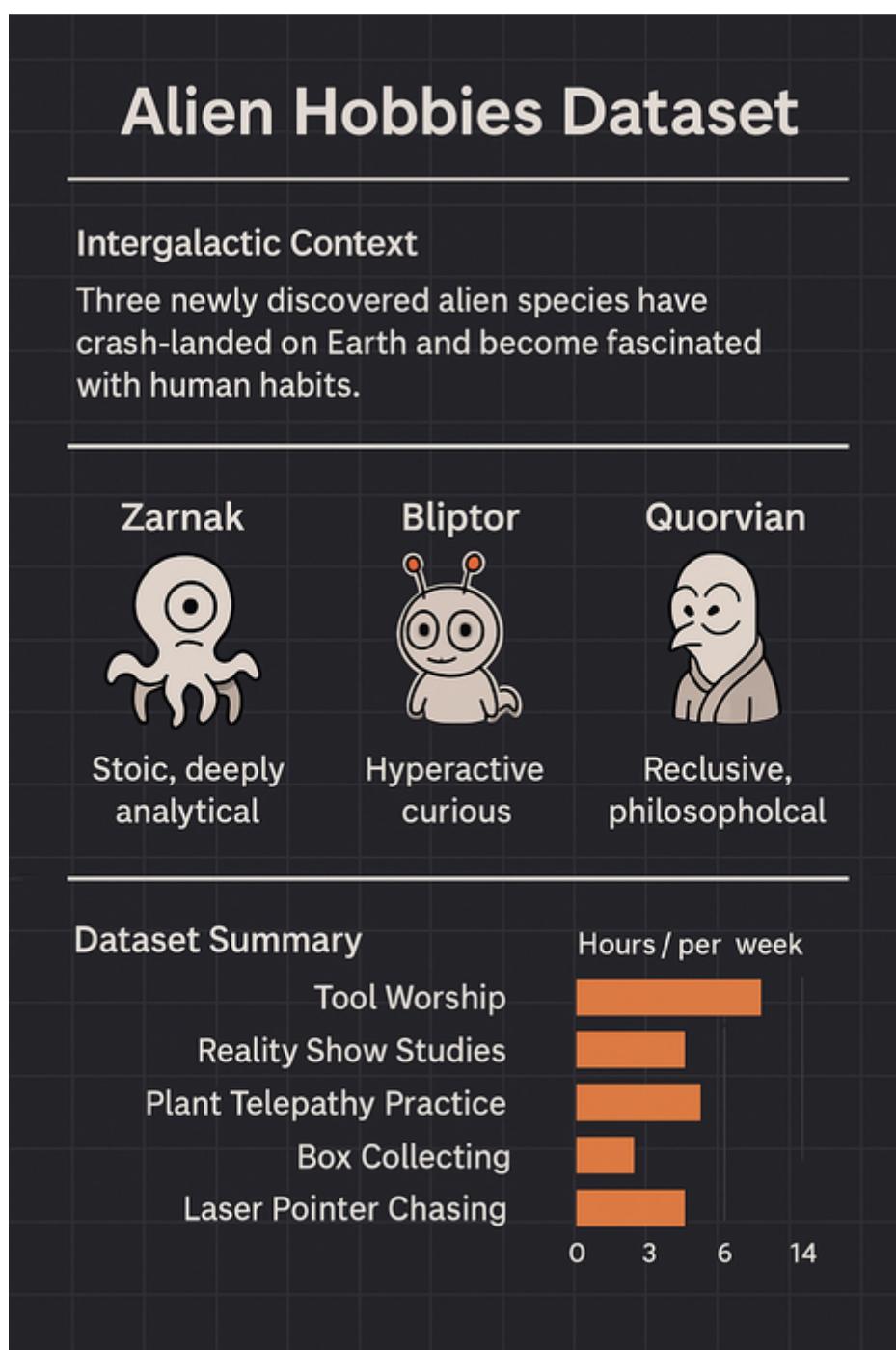
PART 2

In this part, you will work with the **Alien Hobbies Dataset** using the **HypotheX** tool.

Each alien belongs to one of three species: **Zarnak**, **Bliptor**, or **Quorvian**.

The model was trained to classify these aliens based on how much time they spend on fictional hobbies like **Tool Worship**, **Box Collecting**, and **Laser Pointer Chasing**.

Explore how the **Random Forest model** makes its predictions.



 [Watch the tutorial video here] [HypotheX Exploration](#)

⌚ Task #1: What Defines a Zarnak?

Use HypotheX to explore the behavior of the **Zarnak** class.

 You can try the following:

- Select several Zarnak points and observe which hobbies are commonly high or low
- Form a hypothesis: What hobby patterns make an alien likely to be a Zarnak?
- Test your hypothesis by modifying other species' values and seeing if they flip to Zarnak
- Try reducing Zarnak-typical values — does the prediction change?

9.  **Based on your exploration, describe a clear pattern or rule that would help someone else recognize a Zarnak in this dataset.**

For example:

“If X feature is above 10 (or high) and Y feature is above 5 (low), it is likely a Zarnak. Feature Z and ...”

Try to include specific features and value ranges if possible.

10. Task 2: #Test the Hypothesis

Hypothesis: "If *Laser Pointer Chasing* is high, it must be a *Bliptor*."

Please test this hypothesis and describe your process.

 **Tips:**

- Look for examples with high Laser Pointer Chasing values and check their predicted class
- Try increasing this feature in other classes — does it flip to Bliptor?
- See if Bliptors can have low values in this hobby

 **Write down whether the hypothesis holds and what observations led you to that conclusion.**

11.  **Task #3: Create and Test Your Own Hypothesis About Quorvians**

Come up with your own hypothesis about what hobby traits define a **Quorvian**.

Then test it using HypotheX.

Example: "If Box Collecting is low and Reality Show Studies is high, it must be a Quorvian."

 *Tips:*

- Start by examining multiple Quorvians and note shared patterns
- Apply those values to other aliens and observe changes
- Try modifying Quorvians to see if reducing certain features changes their predicted class

 **Write down your hypothesis, whether it was confirmed or disproven, and what your observations were.**

12. How well do you think you understand how the model decides which class to assign to a data point?

Mark only one oval.

1 2 3 4 5

Low High

13. Based on what you've learned, try to **classify a data point** the way you think the model would.

2 Tool Worship
0 Reality Show Studies
13 Plant Telepathy
2 Box Collecting
6 Laser Pointer

 Dropdown

Mark only one oval.

- Zarnak
 Quorvian
 Bliptor

The model would classify the previous data point as: Zarnak

14. Based on what you've learned, try to **classify another data point** the way you think the model would.

0 Tool Worship
11 Reality Show Studies
0 Plant Telepathy
6 Box Collecting
14 Laser Pointer

 Dropdown

Mark only one oval.

- Zarnak
 Quorian
 Bliptor

The model would classify the previous data point as: Bliptor

15. How well do you think you understand how the model decides which class to assign to a data point?

Mark only one oval.

1 2 3 4 5

Low High

16.  **Task #4: Explore an Underexplored Feature Combination**

Choose two features (hobbies) you haven't focused on much so far.

Then:

- Explore how those features relate to the **Zarnak** class
- Form a new hypothesis and test it by modifying relevant points
- Observe whether this gives you new insights into how Zarnaks are classified

 *Tips:*

- Use the feature controls or scatterplot view to find underexplored combinations
- Focus on edge cases or ambiguous regions
- Try both increasing and decreasing feature values to see if predictions shift

 **Please describe:**

Which two features you explored

What your hypothesis was

What you observed and whether your understanding of Zarnak classification changed

Tool Experience Feedback

Now that you've completed your exploration tasks, we would like to hear about your experience with each of the tools.

Please share your impressions freely — your feedback helps us understand what supported your exploration and where things could be improved.

You'll answer a few questions about:

- How easy each tool was to use
- Your overall experience using both tools

There are no right or wrong answers — we're interested in your honest perspective.

17. How easy was it to work with the What-If Tool?

Mark only one oval.

1 2 3 4 5

Very Very easy

18. Please describe your overall experience working with the What-If Tool.

You can mention anything you found helpful, confusing, enjoyable, or frustrating.

19. How easy was it to work with HypotheX?

Mark only one oval.

1 2 3 4 5

Very easy

20. **Please describe your overall experience working with HypotheX.**

Feel free to comment on clarity, interaction flow, features you liked, or anything that made exploration easier or harder.



Thank you for your time, your thoughtful exploration, and your feedback.

Your input is incredibly valuable and helps us improve interactive tools for explainable AI.

Please do not forget click submit button!

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