Let's Get Intelligent About Artificial Intelligence!

AI Sorting Challenge: How AI Recognizes Patterns

Student Instructions

Objective:
Today, you will act like an Artificial Intelligence (AI) sorting system. AI helps computers recognize patterns and organize data. You'll use sorting rules (algorithms) to classify different objects, just like AI does when recognizing faces, filtering spam emails, or recommending movies.

Step 1: Get Ready

- You and your partner will receive a set of object cards. Each card has a word, picture or drawing (e.g., "toothbrush," "Blue Circle," "dog").
- Your goal is to sort these objects based on a rule, just like AI would.

Here are the objects you will sort:

Car
Tricycle
Sponges
Jingle bell
Tomato
Toy truck
Coin
Lamb
Table
Toy giraffe
Tooth brush
Dog

Step 2: First Sorting Round

- The teacher will show a Sorting Rule Card (e.g., "Sort by color").
- Work with your partner to group the objects that match the rule.

- Once finished, check if your sorting matches others in the class.

Step 3: Change the Algorithm

- The teacher will give you a new sorting rule (e.g., "Sort by number of legs").
- Rearrange your objects to follow the new rule.
- Notice how changing the sorting rule completely changes how objects are grouped—just like AI adapting to new data!

Step 4: Another Rule Change!

- The teacher will switch the sorting rule one more time (e.g., "Sort by size").
- Sort the objects again based on the new rule.

Step 5: Discuss & Reflect

- Answer the following questions with your partner:
    1. Did every object fit perfectly into a category? Why or why not?
    2. Was it easy or hard to switch sorting rules? What made it challenging?
    3. How do you think AI systems learn to sort objects?
    4. What happens if an object doesn't fit into just one category? How do AI systems deal with this problem?
    5. Why will we still need humans as watchdogs over the AI systems?

Teacher Notes

Objective:

Students will understand how AI uses algorithms to recognize patterns and classify data,

Preparation:

- Prepare object cards with different categories (animals, colors, shapes, etc., use words, pictures or drawings). See examples at the end of the document. Use these or create your own.
- Prepare Sorting Rule Cards (e.g., “Sort by shape,” “Sort by size,” “Sort by number of legs”). Cut out those provided, or make your own.

Some Examples of Sorting Outcomes:

Sorting by Color:

- Red: table
- Yellow: one of the sponges, part of the giraffe, etc. (or none if we are looking for all yellow)
- Gray: car (however some may put this in varied colors)
- Varied Colors: sponges, jingle bell, toothbrush, giraffe toy, lamb, etc.

🎾 **AI Connection:** AI recognizes and categorizes objects by color, like how your phone can identify green trees in photos.

Sorting by Number of Legs:

- 0 Legs: car, sponges, coin, tricycle, tomato, toy truck
- 2 Legs: 0
- 4 Legs: dog, lamb (student could argue that we can’t see the dog’s legs)
- 6+ Legs: 0

🎾 **AI Connection:** AI uses this type of classification when identifying animals or predicting movement patterns in self-driving cars.

Sorting by Size:

- Small: coin, toy giraffe, sponges, tomato, toothbrush, (maybe jingle bell, toy truck)
- Medium: dog, lamb, tricycle
- Large: Car (maybe the table)

🎾 **AI Connection:** AI compares object sizes to recognize patterns, such as detecting small objects like coins or large ones like cars in images.

Sorting by Living vs. Non-Living:

- Living: lamb, dog (maybe the tomato)
- Non-Living: car, toys, toothbrush, etc.

🔎 **AI Connection:** AI in medical and environmental science can distinguish living organisms from non-living things to help with research.

During the Activity: Informal Assessment

✅ Are students sorting objects **quickly and correctly**?
✅ Are they **adapting to new sorting rules** easily or struggling?
✅ Do they notice **ambiguous cases** (e.g., "Is a tomato living or non-living?")?

Wrap-Up Questions & Answers

1. **Did every object fit neatly into a category?**
    - **No!** Some objects could belong in multiple categories (e.g., "" sponges are both yellow and multiple colors). AI faces similar challenges when sorting real-world data.
2. **Was it easy or hard to switch sorting rules?**
    - **It depended on the rule!** Some sorting methods made sense, but others forced students to think differently—just like AI adjusting to new patterns in data.
3. **How does AI learn to sort objects?**
    - AI learns by being trained on **large amounts of data** and recognizing patterns. For example, a facial recognition system looks at thousands of faces to learn what makes a face unique.
4. **What happens if an object doesn't fit into just one category?**
    - AI tries to make the **best guess**, but sometimes it gets confused. That's why recommendations (like movie suggestions) aren't always perfect!

Extensions & Connections

🔹 **Advanced Challenge:**

- Have students **create their own sorting rule** and challenge other groups to guess the rule.
- Example student-created rules:
    - **"Sort by things that can move vs. things that cannot."** Dog and lamb; however, tricycle can move with human power, as can the toys.
    - **"Sort by objects that people use every day vs. objects found in nature."**
    - **“Sort by toys vs. not toys.”**

      Discussion: This mimics how AI scientists define sorting criteria for machine learning models. If the sorting rule is unclear, AI (and humans) may make mistakes!

🔹 **Real-World Connection:**

- **How does Netflix recommend shows?**
    - Netflix uses **past viewing habits** and **categories (genre, actors, similar shows)** to predict what a person might like.
    - If you watch a lot of action movies, the AI **sorts and suggests** more action films.
- **How does Google sort search results?**
    - Google uses an AI **ranking algorithm** that looks at **keywords, popularity, and relevance**.
    - A search for “best laptops” will return different results than “cheapest laptops” because the AI understands different sorting priorities.
- **How does AI detect spam emails?**
    - AI looks for **patterns in spam emails**, such as certain words (e.g., “free money”), too many links, or if the sender is unknown.
    - If an email matches the spam pattern, the AI **sorts it into the spam folder**.

Discussion: AI needs lots of data to recognize these patterns. What happens if a spam email doesn’t look like spam? Sometimes, AI gets it wrong!

🔹 **Ethical Question:**

What if AI makes a wrong decision? How can we improve AI?

- **Example: AI in Facial Recognition**
    - If an AI security system **incorrectly identifies** someone, it could lead to false arrests.
    - AI learns from **training data**—if the data is **biased** (e.g., trained on only one type of face), the AI may be inaccurate.
- **Example: AI in Hiring**
    - Some companies use AI to **review job applications**, but if AI is trained on past hires who were mostly men, it may **unfairly favor** male applicants.
- **Example: AI has replaced people in their jobs.**

Discussion:

- **How do we fix this?** AI needs **more diverse training data and human oversight** to correct biases.
- **Who should be responsible when AI makes mistakes?** Engineers, companies, and governments all play a role in ensuring AI is fair and accurate.
- **Is using AI cheating?**