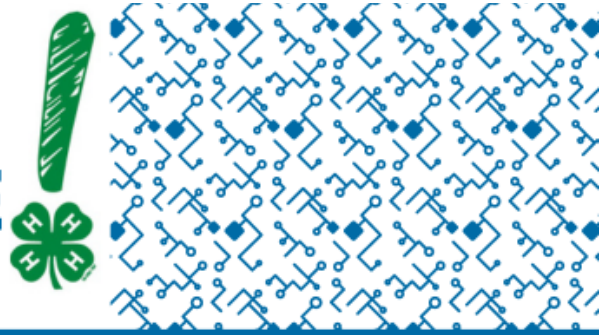


ARTIFICIAL INTELLIGENCE



Machine Learning & Image Recognition: A Powerful Duo, Part 1

Intended Audience: Grades 4-7

Lesson Objectives

- Teach students how AI recognizes patterns and learns from data.
- Help students understand the basics of machine learning and image classification.
- Engage students in a hands-on activity where they classify images of poison ivy and Virginia creeper.

Standards

NGSS Science & Engineering Practices.

- Analyzing and Interpreting Data (Grade 3-5)
- Engaging in Argument from Evidence (Grade 6-8)

Time Needed: 45 minutes

Equipment and Supplies

1 Plant Identification sheet per group

1 set of Unlabeled Cards per group

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Background

Artificial Intelligence (AI) is transforming the way we interact with the world, from recognizing faces in photos to recommending videos online. Two of the key components of AI are *image recognition* and *machine learning*. In this lesson, students will explore how these types of AI are used in plant identification, specifically for distinguishing between poison ivy and Virginia creeper, by recognizing patterns in images.

What to Do

Students will simulate how AI works by classifying images of two plants, analyzing features like shape, color, and texture. They will mirror how AI uses image recognition and machine learning to improve its ability to make accurate predictions based on patterns and data.

LESSON: INTRODUCING THE ACTIVITY

Today, we're going to explore how computers learn to recognize images.

Discussion Starter:

- *How do we tell plants apart?* (Encourage answers like "by leaf shape," "color," "size," etc.)
- *What if a computer had to do this? How would it "know" what it's looking at?*

Explain AI's Role:

- Computers and apps that identify plants use **artificial intelligence (AI)** to analyze pictures.
- We'll see how AI can tell the difference between two plants by looking at their features. Today, you'll act as AI by classifying plants just like the technology does—getting smarter with practice!

Part 1 – How does AI Learn?

AI learns by analyzing large amounts of data, identifying patterns, and refining its predictions over time. The more examples it encounters, the more accurately it can perform specific tasks. AI is only as accurate as the data it's given. If the information is incorrect or incomplete, the AI's results might be, too.



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Part 1 – Continued

Two types of artificial intelligence work together to power identification apps and websites.

- **Image Recognition** is the process where the app analyzes an image, looking for patterns, shapes, colors, and textures to identify what's in the picture.
- **Machine Learning** allows the app to improve over time by learning from labeled images. It gets better as it sees more examples and refines its ability to classify new images.

Together, these technologies allow the app to break down the plant image (via image recognition) and improve its accuracy over time (via machine learning).

Part 2 – Give AI a Try

Preparation

Divide the group into small groups of 2-4 youth. Print and cut a set of unlabeled photos for each group. Also, print one plant identification sheet for each group.

Step 1: Provide Image Sets

- Give each group a set of **unlabeled** image cards.
- Tell students: *“Your job is to find patterns and decide how to group these plants”*

Step 2: Let Students Identify Classification Methods

Instead of giving them sorting rules, ask: *“What patterns or similarities do you see?”*

- Have students examine the images and come up with **their own ways** to classify them.
- They should discuss their observations with their group.

Possible student discoveries (don't share these yet!)

- **Leaf Number** – Some plants have 3 leaflets, others have 5.
- **Leaf Shape & Edge** – Some leaves are smooth, others are toothed.
- **Color & Texture** – Some are glossy, some are matte, some have red stems.

Ask youth:

- What patterns did you find?
- Did every method lead to the same classification?
- Were there any “tricky” images that were hard to classify?

Step 4: What are these plants?

Now share the plant identification sheet (or project on a screen), which provides photos and additional information. Explain the following

Explain: Distinguishing between Virginia Creeper and Poison Ivy is crucial for safety, as Poison Ivy can cause an itchy, uncomfortable rash when its oils come into contact with skin. Knowing the differences helps people avoid exposure to Poison Ivy while appreciating the beauty and benefits of Virginia Creeper, a non-toxic plant often used in landscaping.

- *Poison Ivy: 3 leaflets, can have smooth or slightly toothed edges, shiny leaves.*
- *Virginia Creeper: 5 leaflets, saw-toothed (or jagged) edges, matte leaves.*

Final Sorting: Now ask students to apply the clues and sort the images into the two categories using this new information.

Explain: Like you, AI uses pattern recognition to sort and identify things. As you practiced, you learned from new information and improved your accuracy. Similarly, AI gets better over time by analyzing more data

Wrap-Up Discussion (10 minutes)

Review of the Activity: Today, you all simulated how AI works by classifying plant images, much like how AI systems identify objects in photos. Just like you analyzed the shapes, sizes, and colors of the leaves, AI uses image recognition to identify patterns in pictures. And just like how you got better at sorting as you learned more, AI uses machine learning to improve its accuracy by learning from more examples.

Key Points to Remember:

- Image recognition helps computers "see" and understand what's in an image by looking for patterns, shapes, and textures.
- Machine learning allows computers to get better over time by learning from past examples, just like how you improved as you practiced sorting the plants.
- The more data (or plant images) the AI gets, the smarter it becomes at recognizing new things!

Talk it Over

SHARE

- What did you notice about the plants when you first looked at them? Did anything stand out?
- How did you decide which plants went together? What features (like leaves or color) helped you sort them?

PROCESS

- What did you do first when you started sorting the plants? How did you figure out how to group them?
- Did your way of sorting the plants change as you went along? What did you learn that helped you improve?
- Were there any plants that were hard to classify? How did you handle that?

GENERALIZE

- How does the process of sorting these plants connect to how AI systems like plant identification apps work? Can you explain this in your own words?
- Why do you think it's important for AI systems to learn from large datasets? How does that relate to your own process of refining your plant classification?
- In what other areas of life or work do you think recognizing patterns could be helpful? Can you think of any other tasks where identifying patterns is important?

APPLY

- How might AI help solve real-world problems in fields like agriculture, healthcare, or the environment? Can you think of a way you could apply AI to solve a problem you're passionate about?

- Can you think of a career where the skills you practiced today?
- After this activity, how do you feel about the potential of AI and machine learning? What other things would you like to learn about these technologies?

Career Connection

- 1) AI Engineer – Designs and trains AI systems to recognize patterns and make decisions.
- 2) Data Scientist – Analyzes large amounts of data to improve AI learning and predictions.
- 3) Precision Agriculture Specialist - Uses AI and technology to improve farming practices and crop yields.
- 4) Ag-Tech Entrepreneur – Creates AI-powered solutions and applications to solve agricultural problems.