ARTIFICAL INTELLIGENCE

Cat, Pig, Rabbit: Machine Learning with Teachable Machines

Intended Audience:

Grades 3-5, 6-8, 9-12

Learning Standards

- MS-ETS1-4

Lesson Objectives

Participants will:

- Interact with a trained machine model that can differentiate between different objects
- Compare and contrast features in their drawing and the model

Time Needed

Tabling activity; Under 30 minutes

Equipment and Supplies

- Devices with camera (tablet, phone, computer)
- Internet access
- Notecard

Background

Artificial intelligence refers to the "general ability of computers to emulate human thoughts and perform tasks in real-world environments"[1]. More simply put, it's when we can interact with a computer/machine in a user-friendly environment as if we're talking to a human – such as through ChatGPT and or Google Gemini.

But the backbone of artificial intelligence is machine learning, which refers to "the technologies and algorithms that enable systems to identify patterns, make decisions and improve themselves through experience and data.[1]" People, such as programmers and developers, provide the structure and architecture and input data for computers to learn and solve problems by making best-fit predictions.

This activity will allow users to interact with a trained model and identify features that may explain the confidence interval and provide training suggestions for improvement.

If time allows, participants will be able to create and train their own model.

What to Do

In this activity, you will demonstrate a machine learning model that you have built using Google's Teachable Machines which can identify different animals. Youth will engage with the model to determine how the accuracy of the model can depend on data that was used to train the model. Then, if time allows, youth can engage in Teachable Machines to build their own models.

Visit go.osu.edu/4haianimal to test out an exported model. You can replace this activity with any animal, plants and/or other objects. Cat, Pig and Rabbit were chosen for ease of drawing for young audiences.

THE OHIO STATE UNIVERSITY EXTENSION

Ohio State University Extension is part of The Ohio State University College of Food, Agricultural and Environmental Sciences.

- Sharpie

Getting Ready

- Train one example of Teachable Machine for demonstration (extended instructions within the lesson plan template)

References

1. Columbia University. (n.d.). *Artificial intelligence (AI) vs. machine learning*. Columbia AI. https://ai.engineering.columbia.edu/ai-vs-machine-learning/
2. Google. (n.d.). *Teachable Machine*. https://teachablemachine.withgoogle.com/

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GETTING READY: TRAIN YOUR OWN MACHINE

On 3 separate notecards, draw the face of a cat, pig and rabbit using black sharpie.

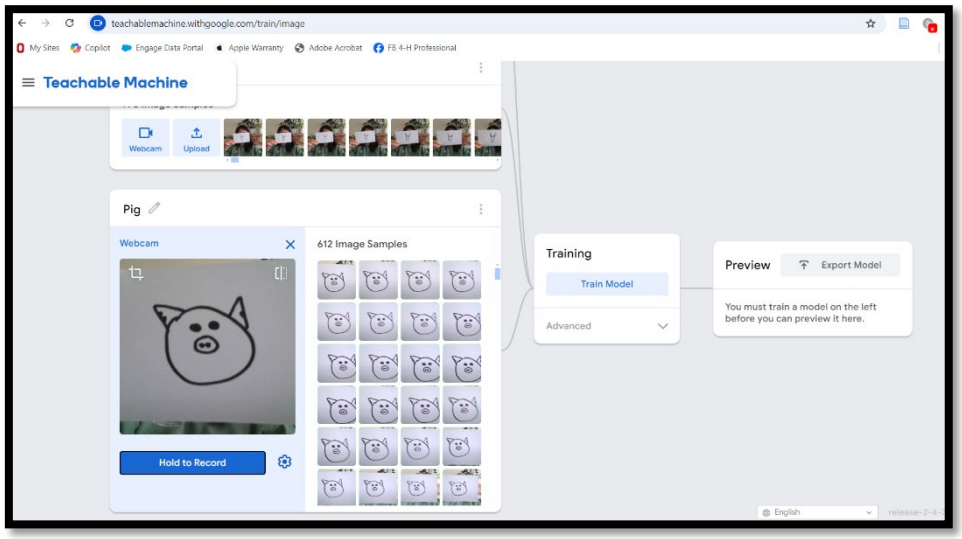
Go to Google's Teachable Machines: https://teachablemachine.withgoogle.com/ *

*This modeling website currently only works on laptop/computers and not tablet/phones

Select "Get Started" and select "Image Project".

For class 1, rename to "Cat". Select "webcam". *This should open up your webcam.* Hold the notecard of the cat drawing up to the webcam and hold down on the "Hold to Record" button to record images of your cat drawing. You should move the notecard in all different directions (closer to or further away from the camera, slightly tilting to the left and to the right, etc.). You should create 50 or more sample images from your drawing.

For class 2, rename to "Pig" and repeat the directions above to add images of your pig drawing to the sample.



Add a 3rd class and rename it "Rabbit". Repeat the process above.

Note: These images used to train your machine will be known as "reference images" below.

Once all three class has images of your drawing, select "train model". Once the model is trained, you can test out the accuracy of your model by asking a colleague to draw the face of a cat, pig and/or rabbit on notecards and hold it up to the webcam. The number indicates its percent confidence. The higher the number the more confident the machine thinks it knows the animal. *Note: the machine can be confidently wrong though* 😊

Note: To increase the accuracy of the machine, include other people's drawings so there are a variety of features of each animal for the machine to learn.

Export the trained model and use the exported URL as your interactive website.

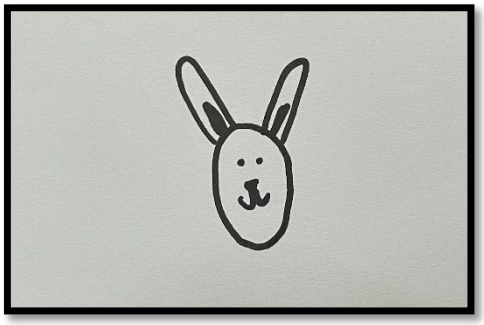
LESSON: INTRODUCING THE ACTIVITY

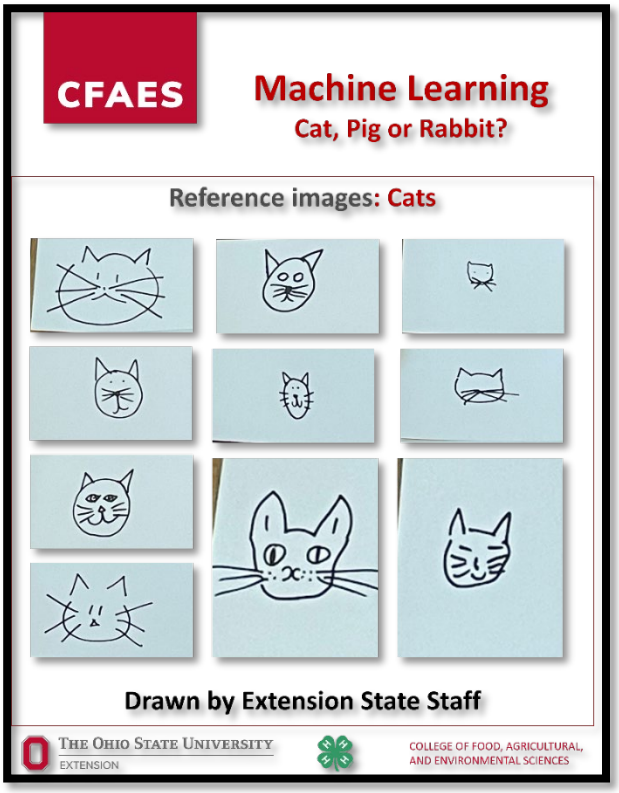
Has anyone used ChatGPT or Google Gemini or Adobe predictive photos? Do you know how these programs were created? They all started with something called machine learning.

LESSON: EXPLAINING THE CHALLENGE/ACTIVITY

On a notecard, have participant draw a picture of the face of a (insert animal: pig or cat or rabbit or if time allows, all 3).

Have participant hold their drawing to the camera of the testing website to see the confidence level of your machine's ability to identify the drawing





Share with participant the images that were used to train the machine (*Example reference image to the left).*

Questions to ask to engage the conversation:

- Do you see similarities and differences in features between your drawing, and the images used to train the machine?
- Why do you think the machine's confidence of your drawing was so high/low?
- If we need to add more images to train the machine, what additional features would you suggest we add so that it can better distinguish among pig, rabbit and cat?
- AI technology that can recognize the difference among different animals, plants and pests already exist, how do you think this technology helps in agriculture?

Digging Deeper

Provide participant books or photo images of the animals (pig, cat, rabbit, etc.) and ask them to list features that are similar and different between the animals. Ask participants to draw additional pictures so that you can add them to your machine. Go beyond just picture of animal faces and include additional features like animal outline, body features, etc.

Expand and Explore

Have participants explore Google's Teachable Machine and train their own machine short model to recognize images and/or body poses using the simplified GIF Experiment model: https://teachablemachine.withgoogle.com/v1/

Youth can follow the tutorial to train their own model, or you can facilitate the training by skipping the tutorial.

Talk it Over

SHARE

How well did the machine recognize your drawing? Why do you think that is?

PROCESS

Even when a computer is 100% confident on the type of animal you are drawing, it can still be wrong! Why is that?

GENERALIZE

How do you think ChatGPT was built using this process?

APPLY

We taught the machine to identify a bunch of drawings of animals, if it can easily identify real animals on the farm, how can this be a beneficial tool?

How else do you think identification of an object/image can be beneficial on a farm or in your life?

Career Connection

The following career area(s) connect to this activity:

- **Data scientist:** analyze and interpret data using statistical techniques to help build predictive models
- **AI research scientist:** Research and develop new algorithms for machine learning
- **Software developer:** Using developed AI models, build and develop software applications that can use the model to solve real world problems
- **Robotics Engineer:** Design and build robots that AI to interact with their environment to perform tasks

Learning More

1. Khan Academy. (n.d.). *Code.org: Computing*. Khan Academy. https://www.khanacademy.org/computing/code-org