

# ARTIFICIAL INTELLIGENCE



## Catch the Clover: 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 recognize body movements
- Interact with a trained model inside of a block coding game

### Time Needed

Tabling activity; Under 30 minutes

### Equipment and Supplies

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

### Background

Artificial intelligence refers to the “general ability of computers to emulate human thoughts and perform tasks in real-world environments”<sup>1</sup>. 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.”<sup>1</sup> 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 exported into a Scratch Coding game. Users will be able to play the game allowing for conversation around machine learning and artificial intelligence.

### What to Do

In this activity, you will demonstrate a machine learning model that has been built to recognize different body poses. Youth will first engage with the model to get comfortable with how the machine was trained to recognize leaning/tilting their body to the left and leaning/tilting their body to the right. Once the youth is confident in how the machine recognize each lean, have participant play the Catch the Clover game on Scratch playground where their body poses will direct a character to catch as many clovers as they can in 20 seconds.

Then, if time allows, youth can engage in Teachable Machines to build their own models.



## Getting Ready

- Prepare model and game (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/>
3. Clickschool [YouTube]. Create a 'catch the fruit' game using Scratch and Teachable Machine v2 <https://www.youtube.com/watch?v=A7TXRVR5Of0>
- 4.

Prepared by: (Authors)

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## GETTING READY

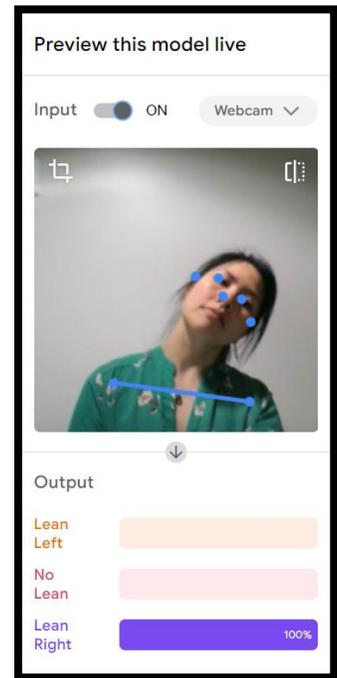
### Step 1: Prepare Teachable Machine Model

Open the Teachable Machine Model that contains the Lean Left, No Lean, and Lean Right model, which can be accessed at [go.osu.edu/4HAITilt](https://go.osu.edu/4HAITilt)

Switch the camera to the correct webcam and test out leaning to the left and right to make sure the model can recognize your body movements.

### Step 2: Prepare Catch the Clover Scratch Game

Download the prebuilt Scratch game that can read the Teachable Machine model titled "Ohio 4-H AI Catch the Clover". This can be accessed at [go.osu.edu/4haiscratch](https://go.osu.edu/4haiscratch)

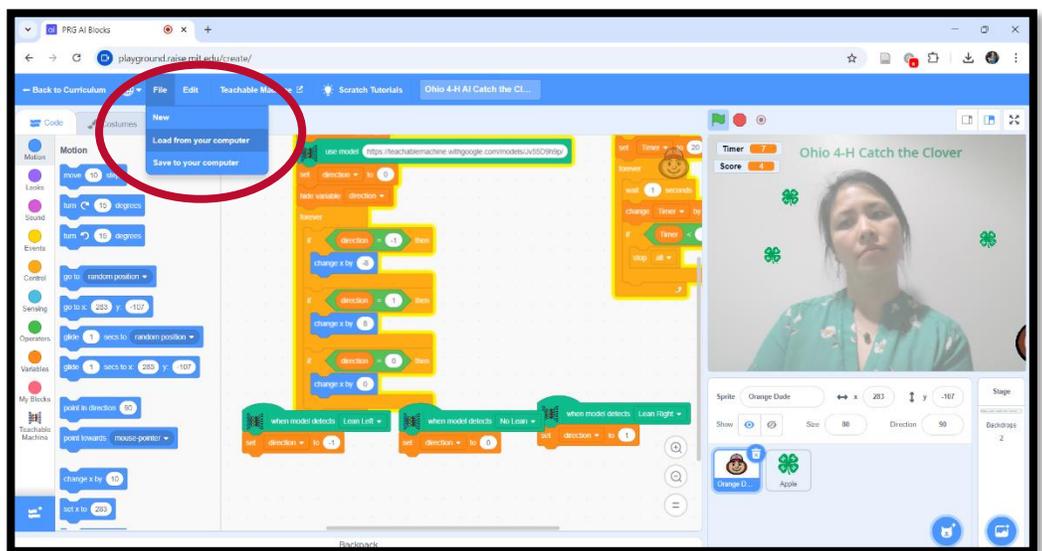


Open the Scratch Webpage that allows the Teachable Machine Extension at <https://playground.raise.mit.edu/create/>

In Scratch, select "File", and "Load from your computer" to upload the "Ohio 4-H AI Catch the Clover" sb3 file

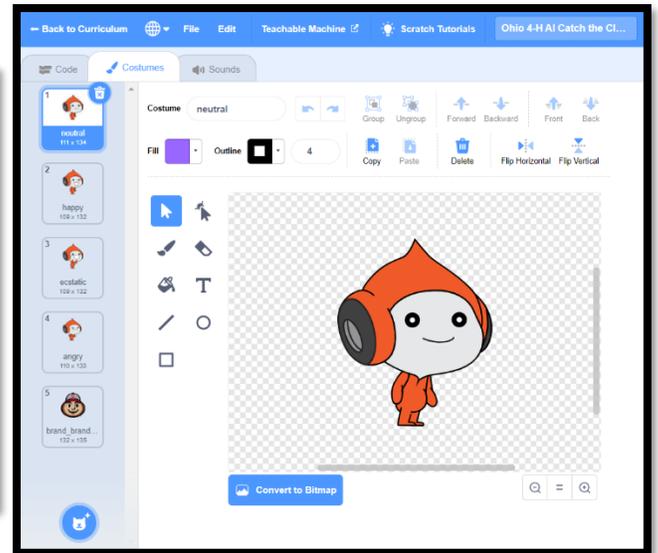
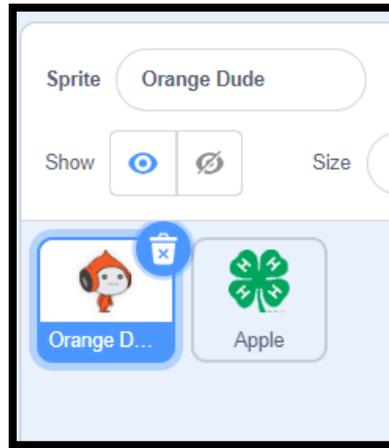
After the model is loaded, your webcam should turn on automatically, if it doesn't make sure no other webpages are using your camera and you have given scratch webpage permission to use your camera.

*Note: the camera will only open on one webpage, so use two different devices (2 iPads, etc) to demonstrate the model and play the Scratch game.*



### Step 3: Modify Scratch Model

Easily modify character, clover or background text, by selecting on its icon on the bottom right of the page and selecting “costumes” or “backdrops” on the top left side of the page. Add new costumes and change the background text best suited for your event and audience.



If comfortable, modify the code to change the speed and/or direction of your character.

### Step 4: Test Scratch Model

Push the green flag  button to start the game. The first time running the model after upload, the program will “freeze” as it links out to Teachable Machine - this is normal. Once the game unfreezes, restart the game to make sure the “Orange Dude” follows your movements as you lean to the left and to the right.

#### LESSON: INTRODUCING THE ACTIVITY

Hi! Would you like to play a game? I built this game using artificial Intelligence or AI technology (point to the scratch game) to recognize my body movements. But first, we have to make sure the technology will be able to recognize your movements. Do you see this camera here? (point to the trained model webpage). I trained this machine to recognize me leaning to the left and leaning to the right. Let’s see how well it can recognize you!

Great! Now, that we’re confident that my machine can recognize you tilting to the left and right, let’s play the “Catch the Clover” Game.

#### LESSON: EXPLAINING THE CHALLENGE/ACTIVITY

Once I push the green flag, the game will start and as you lean, the character on the bottom of the screen will follow the direction that you lean. You are trying to move the character so that it can catch as many of the following clover as possible. You have 20 seconds, and the high score currently is \_\_\_\_.

Want to see how I trained my machine?

Have participants explore Google’s Teachable Machine and train their own 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.

Note: I've found the easiest to have the first model be participant raising and waving with one hand, and second model raising and waiving with both hands. Then I have participants switch between waving with one hand and waiving with two hands.

Have participants step closer/further or shift their body to the left and right or wave at a different angle to see how that alters the confidence of the model.

Questions to engage youth

- Why does the model not recognize your hand waving (confidence decreases) when you \_\_\_\_\_ (move away, have another person in the screen, wave at a different angle, etc)?
- Why do you think the Scratch Game only recognize tilting, and not pointing to the left and right?

Take away message:

- This is the bases of how I built my game and how other motion sensor video games are built (think Mario Kart on switch). And this is the basis of how AI such as ChatGPT is built, someone gave the machine a bunch of information (we used poses) and taught the machine what that information means and how to use the information to predict and answer questions. So, AI is built by people!
- Because AI technology is built by people, like me and you, and we can make mistakes. It is important to know that AI technology can make mistakes as well. That's why if you use AI like ChatGPT or Google Gemini, it's important to always double check the answers since it's not always correct.

## Digging Deeper

Have participants explore Google's Teachable Machine and train their own machine to recognize images, sounds and/or body poses. Access the webpage for Google's Teachable Machines:

<https://teachablemachine.withgoogle.com/> \*

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

## Expand and Explore

To expand the activity, have participants create their own model and export the model's URL. Use the URL and the Scratch playground webpage to build their own game.

## Talk it Over

### SHARE

How well did the machine recognize your lean to the left and right? Were there poses that the machine was able to recognize better than others?

### PROCESS

Why does the confidence of the machine change as you move and change poses? Why do you think some poses are more accurate than others?

### GENERALIZE

How do you think ChatGPT was built using this process?

## APPLY

Do you think you use anything that has this AI technology? What about your phone and its ability to recognize your face? What else?

## 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>