Middle School Visual AI Lesson: PoseBlocks from MIT

Day	Lesson
Day One: Intro, Training Images and Poses	Movement and Visual AI, Training Images and Pose Models with Teachable Machine
Day Two: Projects with PoseBlocks	Body, Hand, and Face with PoseBlocks
Day Three: Projects with PoseBlocks + Free Projects	Finish up PoseBlocks projects and start making your own!

Extra Resources:

https://dancingwithai.media.mit.edu/curriculum - Curriculum page
https://mitmedialab.github.io/prg-extension-boilerplate/create/ - PoseBlocks template
https://www.media.mit.edu/posts/ai-blocks/ - More MIT Scratch systems outside of PoseBlocks

Day One:

I.   <u>Presentation on Movement and Visual AI:</u>

    A. Follow the slideshow link below to reach the presentation. Go through its slides to introduce the concepts of motion, movement, and visual AI/computer vision.

    B. The speaker notes on each slide contain intended talking points for certain parts of the lesson, and examples of what you might say to students to encourage their input or teach the slide concepts in a digestible manner.

    C. The presentation will also cover Teachable Machine with Google! Stop and move to the next section when you reach the Teachable Machine portion of the presentation.

    D. 🟨 ModelAI Assignment, Movement and AI - Day 1 (with Quick Draw)

II.   Instructions for Teachable Machine:

  A. You will demonstrate an image model and a pose model via Teachable Machine. Both are very quick. Follow the link below to reach the training area: https://teachablemachine.withgoogle.com/train

 B. You will first be brought to this screen that shows you the model options for Teachable Machine.
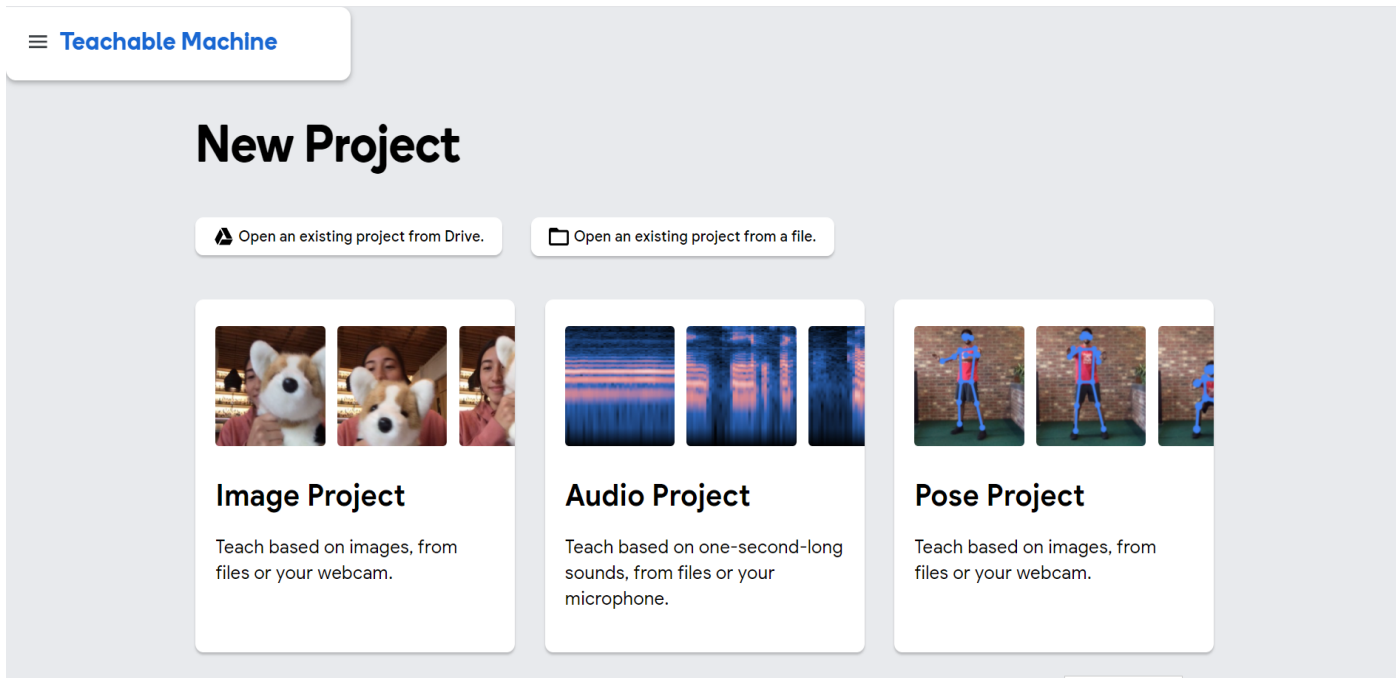
  C. Select Image Project for an Image Model first, and then select Standard Image model from the small pop-up that appears. You will see this screen:
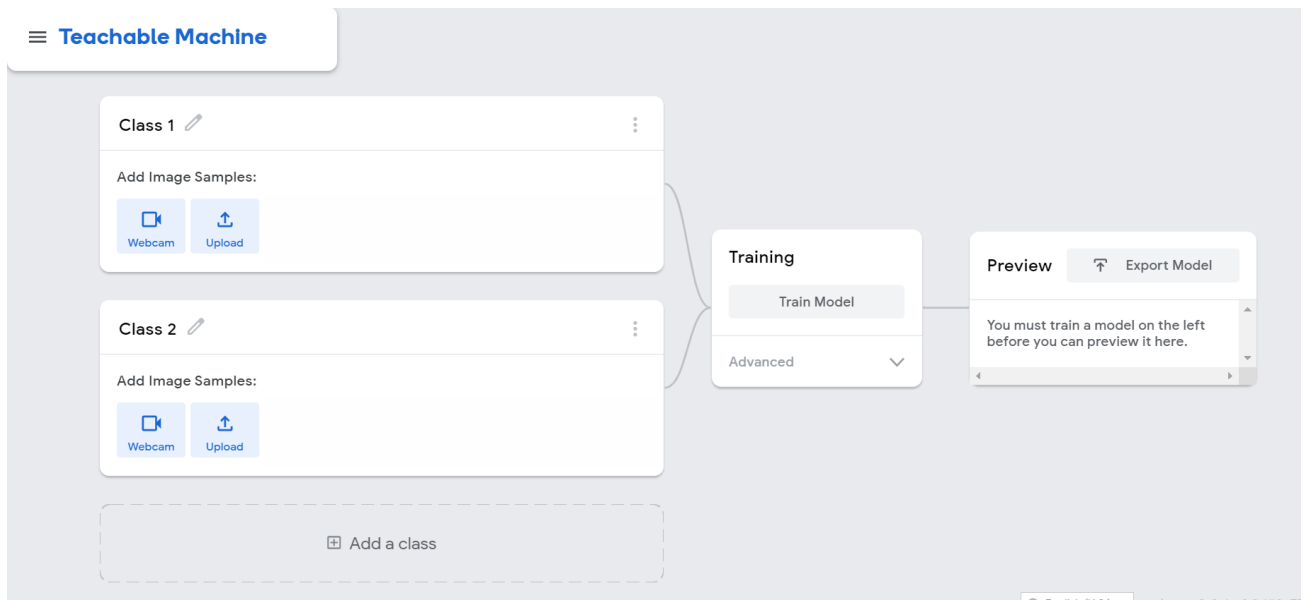
D. Rename "Class 1" to "Wearing Glasses" and Class 2 to "Not Wearing Glasses" by clicking on the small pencil icon by each of their names.

E. If you or your students don't have glasses, you can do an alternate version of the project with the classes "Covering Mouth" and "Not Covering Mouth". In this case, instead of putting on and taking off glasses, you will cover your mouth with one hand or take it off. All following steps will be the same for this project, except you will be gathering different images and will have different class names.

F. Under "Wearing Glasses", turn on your Webcam and click "Hold to Record" to capture images of yourself while glasses are on your face. It captures images very quickly, so move your head around to get different angles. ***Get at least 30 image samples for both classes!***
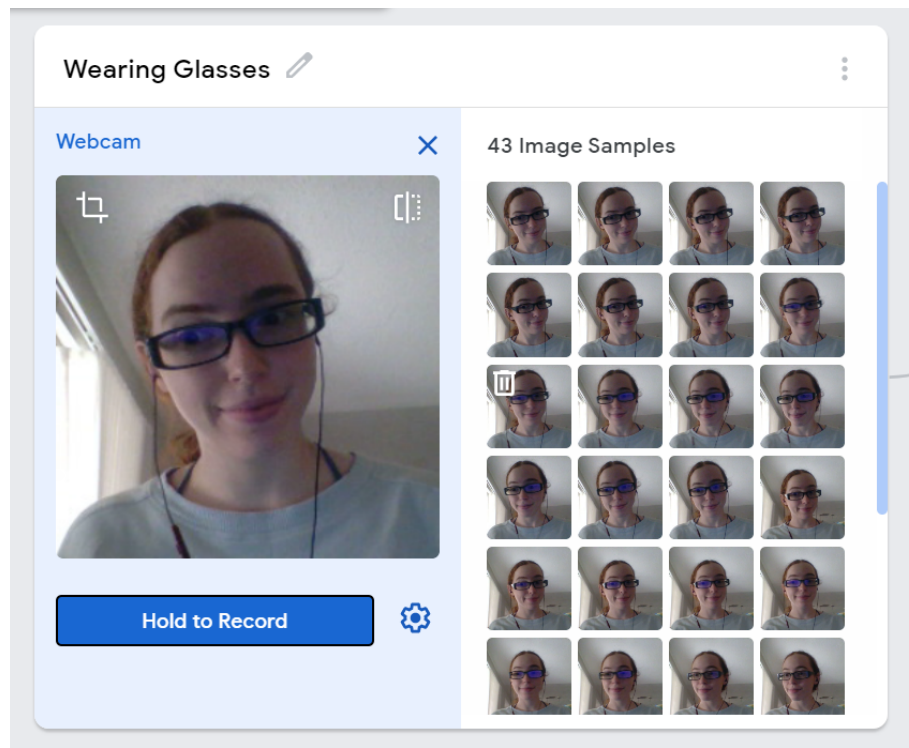

G. Under "Not Wearing Glasses", repeat the process, but this time when you have no glasses on your face AND while you're taking them off. In the case of the alternate project, record when you have no hand on your mouth AND while you're removing it.
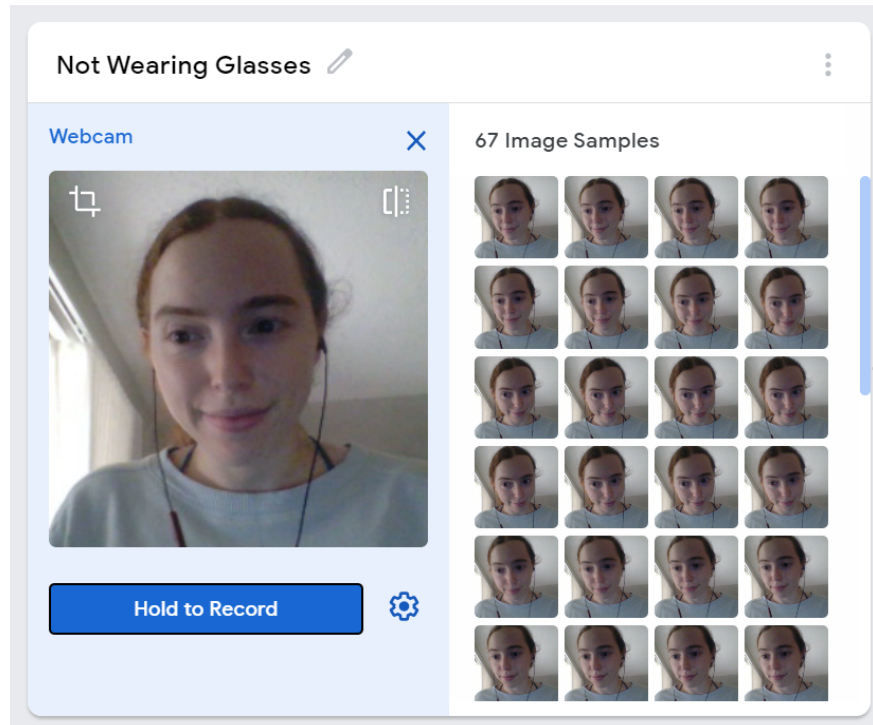
H. Hit "Train Model" to let Teachable Machine's algorithm begin training the model. It won't take very long for it to run through your images if you didn't record a huge amount.

I. If you want to introduce more advanced concepts of the machine learning process here, you can discuss how one or two common AI algorithms work, and how they might be working in the context of the project the students are training. For example, discuss genetic algorithms used to train neural networks, and the concept of picking the "strongest" candidates to move on to the next level. You can also even just discuss the differences between training and testing data, and how the AI algorithm will utilize both to come up with its best model.
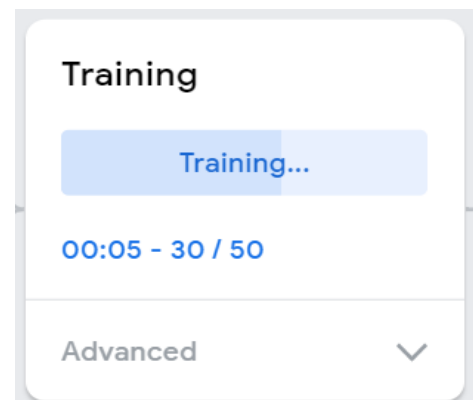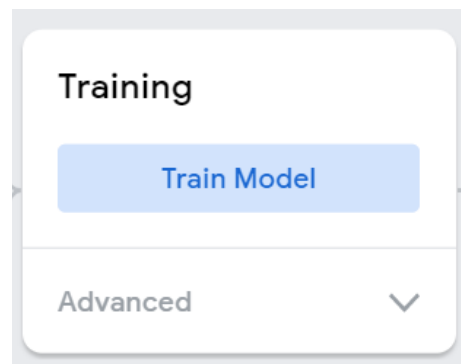
J. There will be a Preview of your model on the side of the webpage when training is done. It will show a live confidence score and prediction of the model.
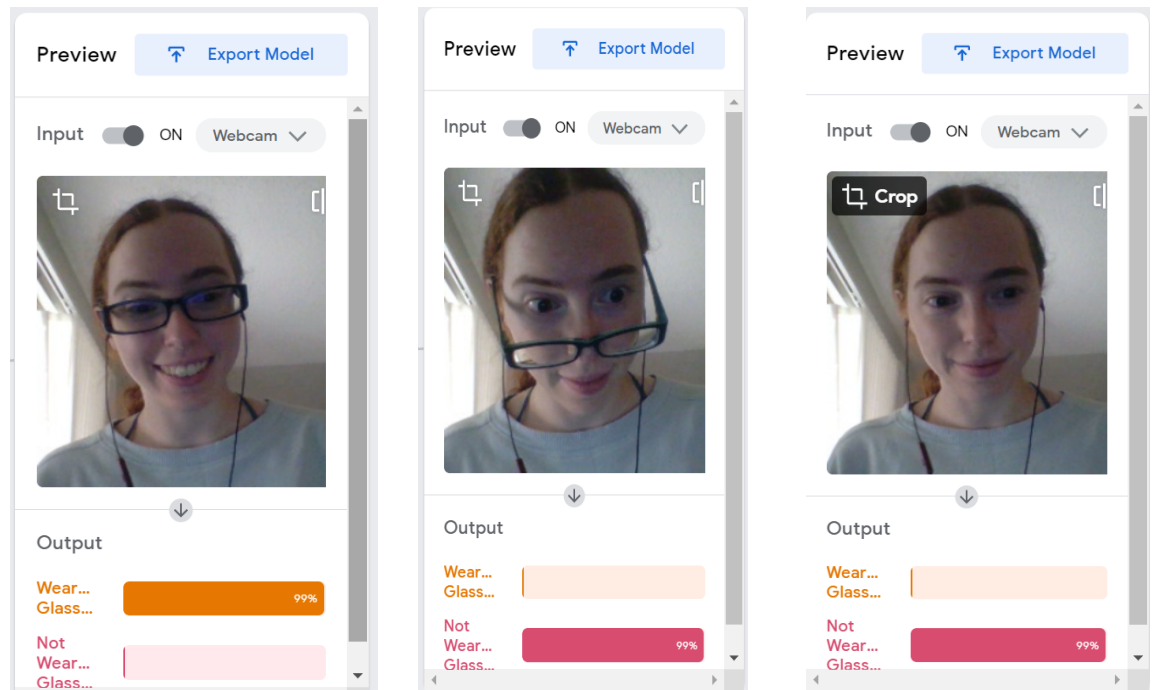
K. The process will be the same for the Pose Model, just with the "Pose Project" option. The model should have a much tougher time distinguishing with glasses or no glasses in the Pose version because the facial/head pose is the same. It should also have difficulties distinguishing "Covering Mouth" and "Not Covering Mouth" for the same reason, although it may do slightly better if it can catch the hand mesh over your face each time.

L. Return to the presentation and lead the AI weaknesses and ethics activity at its end. You will first help the students brainstorm weaknesses involving their Teachable Machine models, then lead them through a hypothetical AI situation called "Crazy Cake Caper". When the activity is finished, discuss adversarial data and malicious intent with AI to wrap up the day.

Day Two:

Middle schoolers will use the pre-trained extensions inside of Scratch to build their own projects and mini-Pose projects.

I. Presentation on Movement and Visual AI:

    A. Follow the link below to reach the presentation. Go through its slides to further discuss motion, introduce Scratch, and the different motion recognition models we will incorporate into Scratch.

    B. Stop and move to the next section when you reach the Shake Break portion.

    C. ▢ ModelAI Assignment, Movement and AI - Day 2 (MS)

II. Scratch AI with PoseBlocks

    A. Follow the link below to reach the empty template for Scratch. Try to make it through a project that uses each of the three Scratch PoseBlocks functions in the presentation: body, hand, and face.

    B. https://mitmedialab.github.io/prg-extension-boilerplate/create/

    C. Add the PoseBlocks you are going to be using according to the instructions in the Presentation. Start with Hand Sensing. Refer to this link for the full project if needed:

    https://mitmedialab.github.io/prg-extension-boilerplate/create/?project=https://dancingwithai.media.mit.edu/projects/FingerPuppetShow.sb3

    D. Drop into the Stage area (lower right corner of the Scratch interface) and select the "Backdrops" icon. Choose a nice backdrop from the backdrop gallery - you can use the search bar at the top of the screen to search for a particular one..
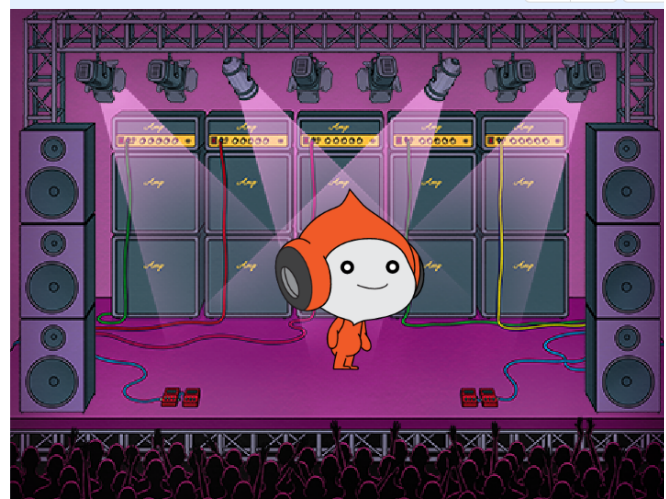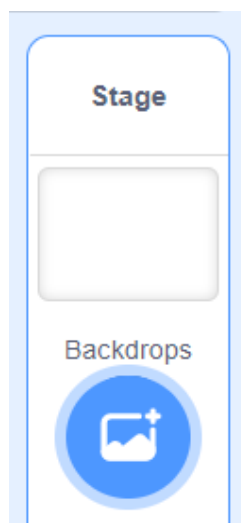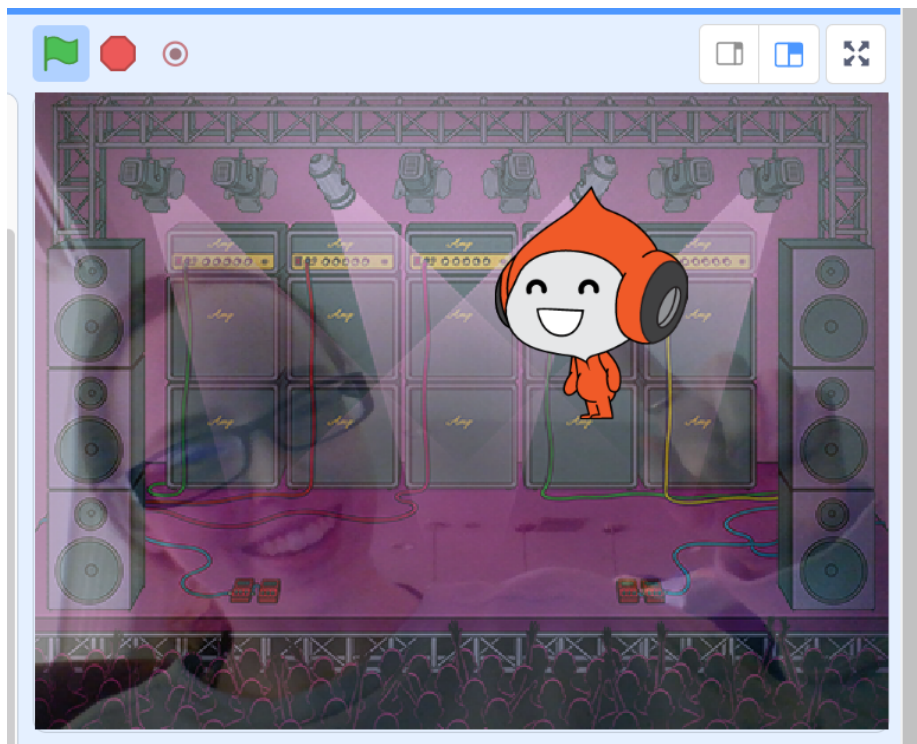
E. Switch to the Costumes tab (highlighted at the top of the picture below) and alter the costumes of your Sprite so that you have a "Facing Right" and "Facing Left" Costume as shown. This can be done by renaming the existing costume "happy" to "Facing Right" (change the text inside the box next to the word Costume). Then right click on the "Facing Right" Sprite's image in the left column to duplicate it. Inside the duplicate Sprite, flip it horizontally (button highlighted in blue in the picture below) and rename it "Facing Left".
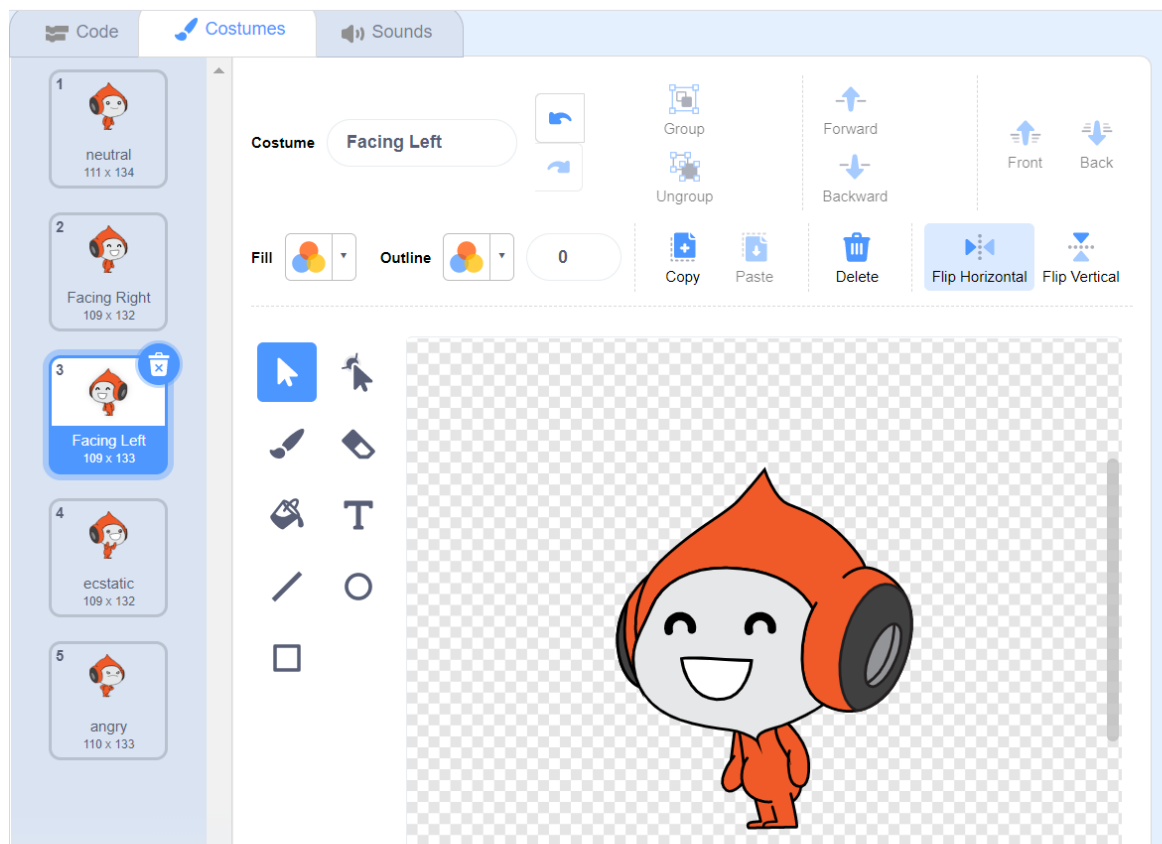
F. Add the following blocks, at whatever pace you feel is right. You will find these blocks back in the Code tab of the Scratch area, under the categories whose colors match the blocks. **If you don't see a category for Hand Sensing, you will need to add these blocks to your Scratch template by following the instructions from the presentation, slide 12.**
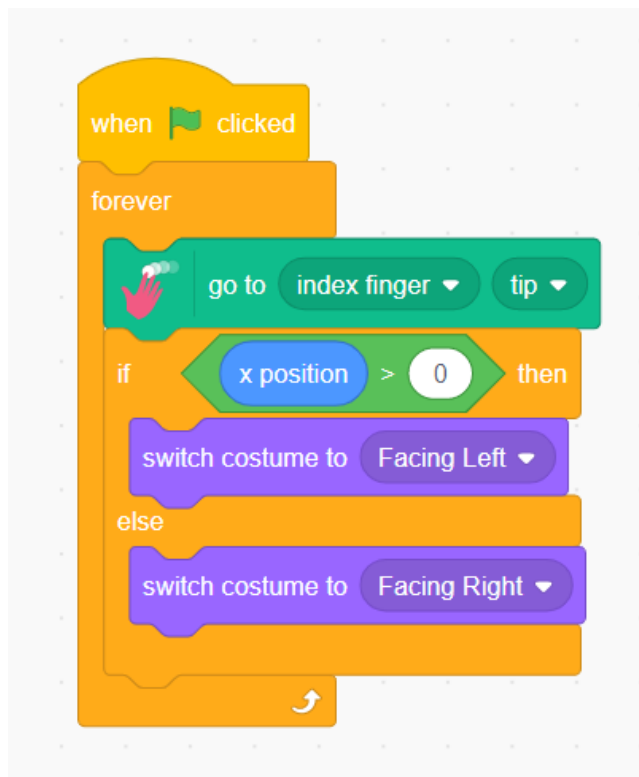
G. Click the Green Flag on the testing area from the Scratch screen's right side to test your project out. Your Sprite should follow the tip of your index finger.

H. Now try Face Sensing. Refer to this link for the full project if needed: https://mitmedialab.github.io/prg-extension-boilerplate/create/?project=https://dancingwithai.media.mit.edu/projects/EmotionJellyfish.sb3

I. Go to the Stage area in the lower right as before and select the stage "Underwater 1" for your backdrop. Use the search bar to find this.
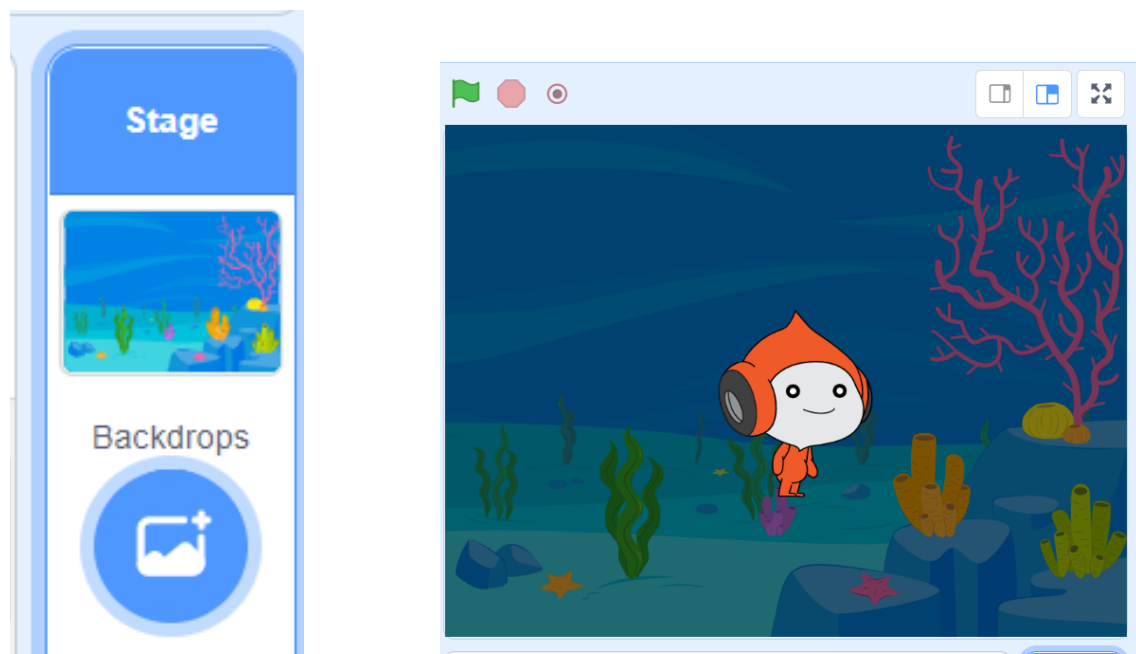

J. In the Sprite section just below the testing area, choose a new Sprite by clicking on the Sprite icon highlighting in green below. Choose the Jellyfish for your new Sprite. Delete the original Sprite by clicking on it and selecting the blue trash can.
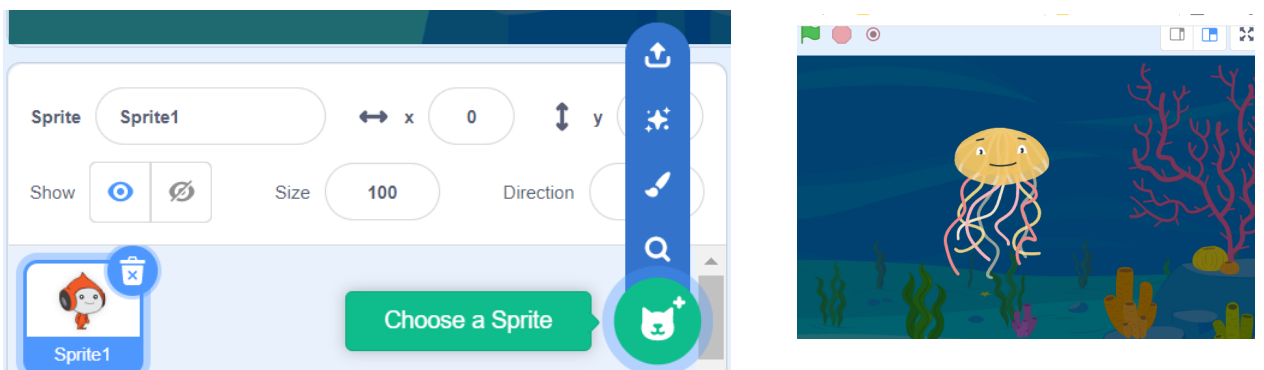
K. Your code will start with the basic "Green Flag" event block and a forever loop. Four conditionals for different emotions will be inside of it, and will alternate between the Jellyfish's costumes (already included with the Jellyfish). Note: "disgusted" works as the neutral face here. **Again, add the face sensing blocks to your template if you don't have them - these steps are on slide 15.**

L. Click the green flag to test it out. This one might work better without glasses.
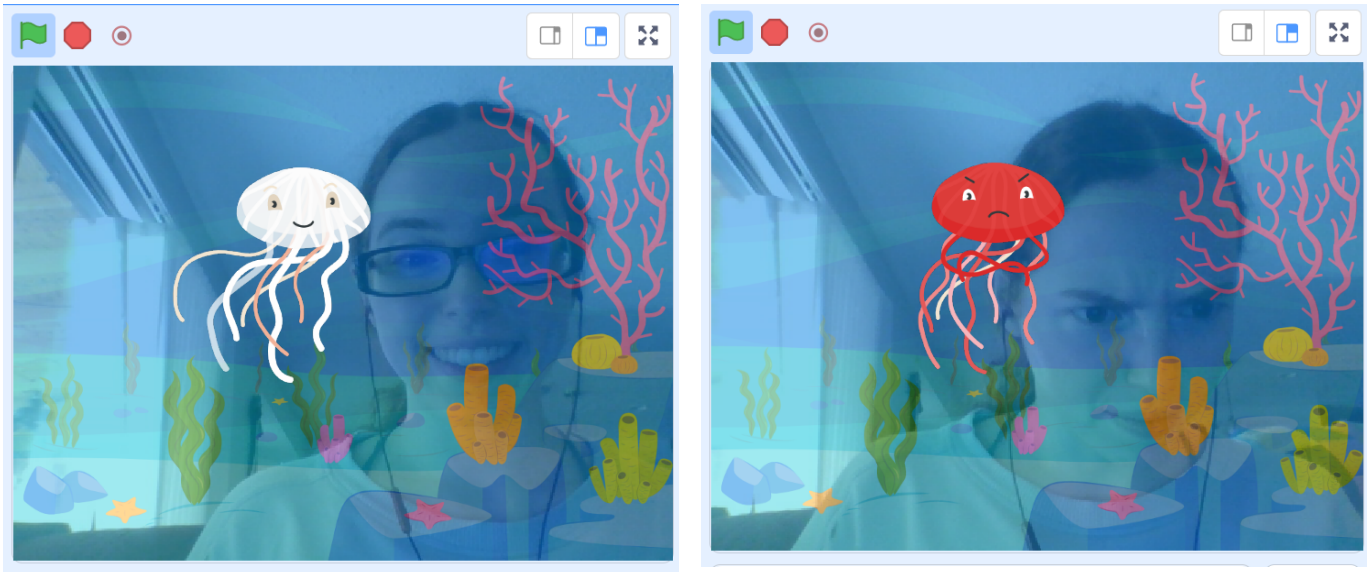
M. If you have time, move to Body Sensing. Refer to this link for a project that has something similar, but won't have all the same Sprites: https://mitmedialab.github.io/prg-extension-boilerplate/create/?project=https://dancingwithai.media.mit.edu/projects/ShoulderFriend.sb3

N. Change the backdrop by going into the lower right Stage area and choosing "Jurassic". You can use the search bar at the top of the gallery to find it.
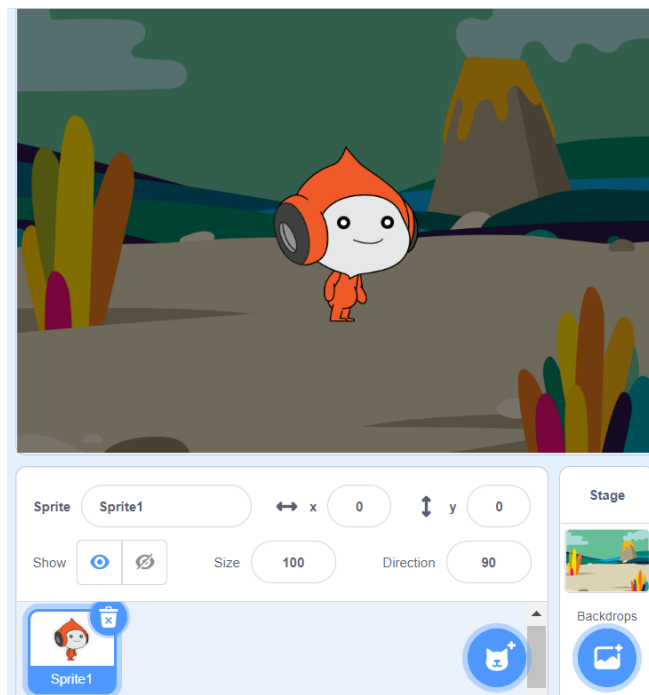
O. Choose and add four Sprites of dinosaurs to your Sprite area. Move them around by clicking and dragging on them in the testing screen so they aren't cluttered.
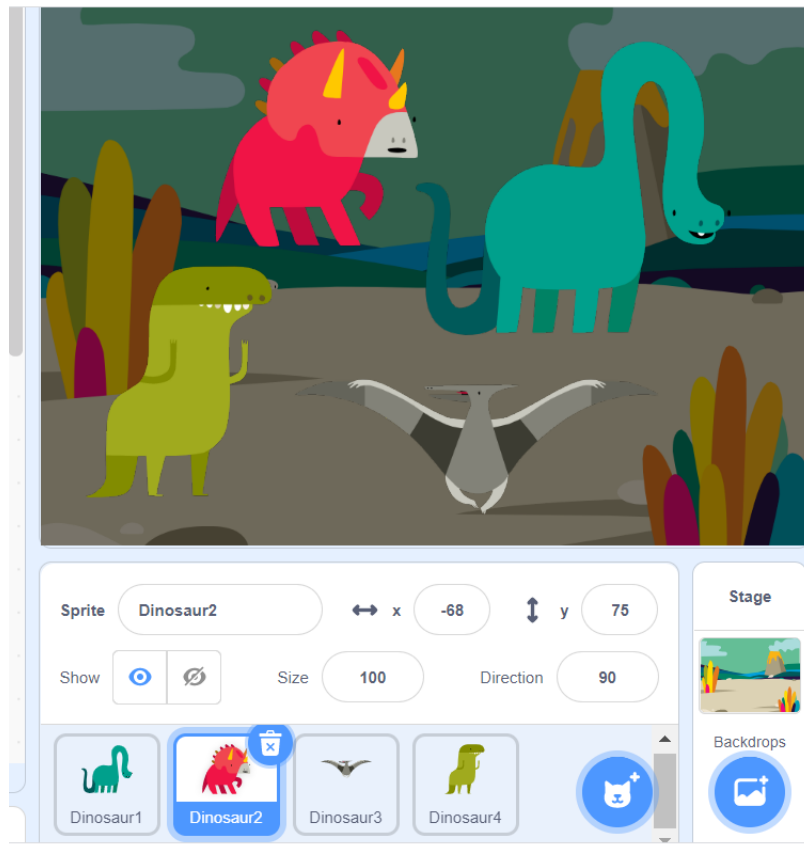
P. Inside each Sprite, add the following code, choosing whichever ones you want for each body part. Choose different body parts for each Sprite! **If you don't have the body sensing blocks, add them according to the steps on slide 9.**
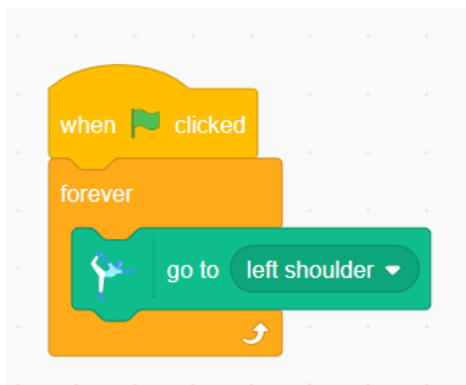
Q. Click the green flag to test it out. You may want to resize some Sprites after testing.

R. Return to the presentation and lead the AI weaknesses and ethics activity at its end. You will first help the students brainstorm weaknesses involving their Scratch projects and pre-created ML models, then lead them through a hypothetical AI situation called "I'm So Happy to See You...Maybe?". When the activity is finished, discuss AI bias and the concept of AI ethics to wrap up the day.

Day Three:

Help students who haven't finished projects from previous days finish, and allow time for free builds of their own projects.