Dancing with AI Day 3 Teacher Script

Teacher Resource

**Slides**:

<https://drive.google.com/open?id=1sGvP9pR571TgyIOdfW889REXZ0wvL8dRuQCTWvMMvgM>

**Journal**: <https://docs.google.com/presentation/d/1ILgv4ImxyDEvrME0M3CViTqjApBKO4nLvuy0VV02XWg/edit?usp=sharing>

**Learning Standards:**

[Standards](https://docs.google.com/document/d/15ba3GB6g1GHxJ40YV0NFAYz__GG2kpIs2OBrZXbKgMw/edit?usp=sharing)

Schedule

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activity** | **Learning Goals** | **CSTA Standards** | **Links** | **Time** |
| **Introduction to Natural Interaction and AI**Students learn about the different ways in which humans interact with each other, and reflect on how we can interact with AI systems. | 1a, 1b, 4a |  |  | 45 min |
| **Coding Interactive AI Systems (Session 4)**Students are introduced to the body/hand/face sensing Poseblocks, and create their own mini-projects. | 4b, 4c | 2-AP-15 | [Warm-up](https://docs.google.com/document/d/1E6O_xsr5oJYEey0VYlJtNE1suj0CvFvevO2IbSypoU4/edit?usp=sharing)[Tutorial](https://mitmedialab.github.io/prg-extension-boilerplate/create/?tutorial=getStarted)[Scaffolding](https://docs.google.com/presentation/d/1_sjXSAnniMUm8JoTT6LySKGfig9NB_OK1Hxns0aMX8c/edit?usp=sharing) | 75 min |
| **Wrap-up**Summarize and preview tomorrow’s lesson. |  |  |  | 10 min |

Teacher Guide

**Materials required**:

* Slides
* Journal
* Individual laptops for each student

**[before starting the class, make sure that every student has their own laptop at their desk]**

*Welcome to day 3 of Dancing with AI! Today, we’ll be learning about how AI understands and evaluates our movements.*

**[switch to ‘Natural Interaction’ slide]**

*The interaction between humans and AI is a two-way street -- we respond to the outputs and behaviors of AI systems in robots and computers, and AI responds to various forms of human behavior. In this class, we’ll look at AI systems that understand human movement, facial expressions, and other motion-based interactions.*

**[switch to next slide, with the two gifs]**

*What do you think is happening in these two gifs?*

**[wait for students to come up with answers along the lines of ‘the humans are doing the robot and the robot is walking like a human’, before proceeding through the answer slides]**

*Now that we’ve seen those two gifs, let’s think carefully...what do we as humans use motion for on a day to day basis?*

**[let students brainstorm a range of answers]**

*Those are all good answers! Let’s go through a few of the main things we use motion for.*

**[switch to ‘moving around’ slide]**

*An obvious one -- we move in order to get places! Whether it’s by walking, driving, riding a bike, swimming, wheeling, etc we put in effort to get ourselves from one place to another. That could be for travel, to reach for a dropped pen, or to dodge a sign, but motion is an integral part of our daily lives.*

**[switch to ‘playing sports’ slide]**

*We also move a whole lot when we’re playing sports. Who can name and describe some of the movements you carry out when you’re playing a sport?*

**[let students brainstorm a range of answers]**

*All good answers!*

**[switch to ‘creating art’ slide]**

*Let’s not forget the role of motion and movement in the creative arts! Let’s think about the ways we move when we’re making art, making music, or performing theater.*

*Creative processes take many forms -- some involve movement, and others don’t. PIeces of art that do use movement are quite powerful -- think of a moving art piece like a hanging mobile swinging in the wind, or the synchrony of an orchestra or ballet troupe moving flawlessly to draw out the melody of an opera.*

**[switch to ‘communication’ slide]**

*Sometimes we express ourselves visually without even thinking about it. When I’m talking to you, my hands may move in nuanced ways to describe what I’m saying -- maybe I’m waving them in circles to describe a sheep, or spreading them wide to describe a big heavy blanket. We also constantly use our facial expressions as markers for how we’re feeling -- and others can read those expressions and understand my emotions or intentions.*

*Motion, and movement, are really powerful means of communication and signalling to one another. They help deliver messages and carry an idea across from one person to another, or to hundreds of people. In this way, movement is one key medium through which people interact with one another and understand one another.*

**[switch to next slide]**

*We’ve thought about a lot of the ways in which humans use movement, so let’s flip it around for a second. Can AI move? How is it different from the way we move?*

**[let students reflect and brainstorm on this before showing them the videos of robots dancing]**

*It looks like AI entities are able to move if they are programmed to do so. But can AI understand our own human movements? What do you guys think?*

**[give students a minute to think about this before switching to next slide]**

*AI doesn’t “understand” motion like you or I do, but it can be trained to extract specific patterns about movement and respond to it. The images and poses that we used on Teachable Machines are cues that a computer uses to extract meaning from movement -- they represent the visual components of a movement or the position of your body during a movement, but they don’t actually encode motion itself.*

*What’s awesome is that we can build tools that will look for particular features, like the position of your eyes or the direction your finger is moving. These tools are designed and used by people - people like us decide how a computer behaves in response to human motion, meaning that people are in control of what an AI system does. Pretty neat!*

**[transition into Scratch tutorial session, have students open up their laptops and navigate to the page linked in the lesson plan under ‘Tutorial]**

*Who here has experience working with Scratch?*

**\*follow up to students who answer that they do have experience\*** *What sorts of things have you made with Scratch?*

*Scratch is a tool for creating. We can use Scratch to make stories, games, animations, art, music, and interactive AI systems like those we saw on Day 1. We’ll be using a special version of Scratch that adds special AI features as Extensions. Let’s go through the first Scratch tutorial that will show us how to use blocks to make sprites that move!*

**[give students a minute to watch the tutorial video]**

*In that short tutorial, we saw how to move sprites around the stage, and how to use the Green Flag to start our project running. There are many useful tutorials to explore at the top of the screen under “Scratch Tutorials”, for now let’s look at making sprites move! These blocks make your sprite move to a random location on the screen every 1 second. It starts when you click the green flag, and stops when you hit the stop button.*

**[switch to next slide, have students examine the blocks in the picture]**

*In this example, instead of going to a random location, the sprite travels to where your mouse pointer is every 1 second.*

**[switch to next slide, have students examine the blocks in the picture]**

*In that example, we are using the position of the mouse cursor on the screen as “user input”. Software makers use mouse and finger touch input as a way to let people using their games, apps, and programs interact with their code.*

**[switch to next slide, intro to pose blocks]**

*Yesterday we learned about the difference between Teachable Machine models trained with Image and Pose data. Image models were trained on the entire images from the camera, while Pose models looked only at the dots and lines that it recognized as a body pose.*

*To translate images to poses, Teachable Machine uses a pre-trained model known as “Posenet”, which is a machine learning model that has been trained on many many examples of images and their corresponding pose skeletons.*

*PoseNet takes the camera image (in this case, the 3 people in a room) and converts it to the blue dots and lines. These dots are known as “keypoints”.*

*While we used this keypoint as input to our Teachable Machine models yesterday, we can use these same keypoints as parts of our Scratch projects!*

**[switch to next slide]**

*To use PoseNet in our projects, we just need to bring in some extra blocks! We click on the “Add Blocks” blue button on the bottom of the screen. And then we select the “body sensing” extension.*

**[walk around and ensure that all students have done this before continuing]**

*Once we add this, notice that our camera has turned on on the right side of the screen. The green checkmark next to “Body Pose Sensing” means the PoseNet model has a prediction of where the keypoints are in the camera image! If it has an orange question mark, it may mean: there is a problem with the camera or web app, or the model does not have a confident prediction. If you try covering the camera with your hand, for example, it will blink between the checkmark and yellow indicator.*

**[switch to next slide]**

*Let’s try this new block, “go to \_\_\_\_\_”*

*If we stop the project, and we click that block, our sprite moves to where the model thinks it sees a left shoulder pose keypoint in the camera scene.*

*If we put that block within a forever loop like we did before, we can see that it follows our shoulder.*

**[walk around and ensure that all students have done this before continuing]**

**[switch to next slide, intro to hand blocks]**

*Now we can try the same thing with Hand blocks!*

*The hand blocks use a different pose model that is similar to PoseNet, from Google’s MediaPipe team.*

*This model, instead of being trained on body images, has been trained on images of hands. The red dots in these examples are the keypoints, just like keypoints we get out of the PoseNet model.*

**[switch to next slide]**

*Let’s bring these blocks in to Scratch. Since each model you add to your project means your computer has to run every model many times per second (known as frames per second, or framerate of the model), you might want to save any work and refresh the browser page to un-load the body model first.*

**[walk around and ensure that all students have done this before continuing]**

*After importing the hand sensing model, you’ll notice we have a new block:*

*Note that unless your hands are visible from your camera, the indicator is orange, since it only shows green when it predicts that there is a hand in view of the camera.*

**[walk around and ensure that all students have done this before continuing]**

**[switch to next slide, intro to face blocks]**

*The Face model is from an emotional AI company known as Affectiva. Similar to PoseNet and MediaPipe’s Hand Model, Affectiva’s model gives you keypoints on the face (like eyebrow, mouth, nose, etc.), but it also goes a step further and gives us “expressions”, like “mouth open”, “eyebrows raised”, “blinking”, etc.*

*We can use the facial keypoints just like hand and body pose data. We can use facial expressions like “mouth open” as Events in our Scratch projects, just like how the “when Green Flag” block makes our code run.*

**[switch to next slide]**

*Let’s try changing costumes when we smile and furrow our eyebrows.*

**[walk around and ensure that all students have done this before continuing]**

*Since this model is more complex, and some of the output classes are more subjective, we may not expect the higher level insights about facial expressions, and especially emotions, to be as high confidence predictions as the various keypoints in the different models.*

**[transition to mini-project creation time]**

**[ensure that students are aware of the resources available to assist them if they are stuck]**

*As you build, reflect on what your project understands about its users?*

**[after time is up, have students transition into walk-arounds]**

*Open up your journals to the feedback page and go around to see what your classmates have come up with! Remember to leave constructive feedback in their journal.*

**[after time has elapsed, have students take their seats and save their projects before closing their laptops]**

*That’s it for Day 3!*

*See you tomorrow, when we will learn more about designing and evaluating interactive AI systems!*