Dancing with AI Day 2 Teacher Script

Teacher Resources

**Slides**: <https://docs.google.com/presentation/d/1yUOYuGJSXAIsc-XmoPkpdkpiAML69wmQTaFvT8nV8h8/edit?usp=sharing>

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

**Learning Standards:** <https://docs.google.com/document/d/15ba3GB6g1GHxJ40YV0NFAYz__GG2kpIs2OBrZXbKgMw/edit?usp=sharing>

Schedule

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activity** | **Learning Goals** | **CSTA Standards** | **Links** | **Time** |
| **Learning Teachable Machines (Session 2)**  Students learn how to create and use a Teachable Machines classifier. | 1a | 2-DA-08  2-DA-09 |  | 20 min |
| **Image vs. Pose Recognition (Session 3)**  Students use Teachable Machine classifiers to understand the differences between images and poses as a form of representation. | 1b, 2a, 2b, 3a | 2-DA-07 | [Worksheet](https://docs.google.com/document/d/160IA8N-0KVGyE0jHXF2--EX4I_moZkxQxKAVCkrrafU/edit?usp=sharing) | 40 min |
| **Ethics of Data Representation**  Class discussion where students reflect on the ethics of different types of representation, learn about bias, and think about data privacy. | 5a, 5c, 5d | 2-IC-20  2-IC-21  2-IC-23 | [Video](https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms) | 30 min |
| **Brainstorming Session! (Session 3)**  Instructor goes through Scratch projects with students to help them generate ideas for their own project. Afterwards, students reflect in their journals about what type of project they would want to make. | 4b, 4c | 2-CS-01  2-AP-15 | [Coding cards](https://docs.google.com/presentation/d/1_sjXSAnniMUm8JoTT6LySKGfig9NB_OK1Hxns0aMX8c/edit?usp=sharing) | 45 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 2 of Dancing with AI! Today, we’ll be learning how to train our own AI models! We’ll also be talking about the ethics of the data that we use to train these models.*

**[open the Teachable Machines website, have students keep laptops closed]**

*Teachable Machine is a web-based machine learning tool that you can use to train a computer to recognize different types of data. Today, we’ll learn how to use Teachable Machine and discuss the importance of training data and representation in our very own machine learning models.*

*Yesterday, we learned about the three parts of an AI algorithm. Could somebody tell me what those are?*

**[prompt the students to answer ‘input’, ‘algorithm’, ‘output’, then switch to slide 4]**

*Cool! Now let’s try training some classifiers. We’re first going to train a classifier on images, and then we’re going to train a classifier on poses. Can somebody explain to me what they think the difference between an image and a pose is?*

**[have students discuss how images are usually pictures, while poses are a more abstract representation of a certain body position; explain this if students are unable to answer]**

*That’s right! Now let’s try giving some inputs to this Teachable Machine image classifier. Who remembers what ‘classes’ are for input?*

**[have students give examples, such as ‘happy’ or ‘sad’]**

*That’s right! For Class 1, I’m going to make a happy face, and for Class 2, I’m going to make a sad face. Then I’m going to train the model and see how it does!*

**[demonstrate this example using the Teachable Machines interface for ‘Images’]**

*Cool, the classifier recognizes when my face is happy and when my face is sad! Why don’t one of you come up and see if it recognizes your face?*

**[have a student volunteer to come up to look into the webcam; if model accuracy decreases, point that out to the class]**

*We might be able to confuse the model. Did anybody notice that all the pictures I took have the same background? What if we try changing the background?*

**[either rotate laptop to face different background, or have student hold up colored paper behind your head; model accuracy should decrease]**

*How do we know that the model is getting confused?*

**[have students answer that the percentages should go down from 100% if the model is less sure]**

*Alright, now let’s try training a classifier with poses. Who wants to come up and strike some poses for the model?*

**[have a student come up and strike two poses]**

*What do you guys think is different about the pose model? Do you think that it would get confused if we used a different background?*

**[have students discuss this - because the pose model only uses the position of the body for classification, changing the background should not confuse it; demonstrate this to students]**

**[ask a different student to come up and strike the poses to see if it gets confused]**

**[transition to the ‘Your turn’ slide]**

*It’s your turn to try these out! Everybody open up their laptops and go to the Teachable Machines website.*

*Come up with 2-3 body positions and train BOTH an image model and a pose model that can differentiate between them.*

**\*if students are partnered\***: *Have one partner train the image model on their laptop, and the other train the pose model. Try to train at least 30 samples for each class.*

*Now test it out! On your worksheet, evaluate your image and pose model performances. For each model, try them out in some of the different scenarios and see how they do!*

**[after students are finished with activity and have filled out their worksheets, have them close their laptops and return to their seats for class discussion]**

*Machine Learning models can be trained using different* ***Data Representations****. Images are one form of data representation, similar to pictures. Poses, which you may have noticed during your model training are represented as blue dots and lines, are a simplified form of data representation known as points (dots) and edges (lines). These points are calculated from your camera image using another machine learning model known as Posenet.*

**[switch to reflection slide and discuss pros and cons of each representation; make sure that students thoroughly understand the differences between images and poses]**

**\*transition to ethics discussion\*** *Artificial Intelligence gives us a world of possibilities -- we can train models to learn on numerous types of data and apply those models to help solve real human problems.*

*But what are some of the downsides of machine learning models? What might go wrong?*

**[switch to bias slide with angry teacher]**

*You see a picture of your new teacher you haven’t met. In the picture they look really upset, so you think they might be angry or strict! You might think, ‘Wow, they look really scary and I’m definitely not going to like them.’*

**[switch to bias slide with happy teacher]**

*But, when you meet them in person, you find out they’re really nice! It turns out that moments before the photo was taken, the teacher had just found out that his favorite ice cream flavor was discontinued at his local ice cream store.*

**[switch back to bias slide with angry teacher]**

*But let’s say that an AI classifier like the ones we just trained saw the angry picture of the teacher. How do you think it would classify this picture?*

**[wait for students to reply ‘angry’]**

*Just like us, AI systems only know as much as the images it sees. Now if we also give it pictures of the teacher looking happy, it will also be able to classify the teacher as happy. Which is why it’s important to build up and train on a good dataset.*

**[show TED talk video]**

*As you can see, a biased dataset can seriously affect the performance and fairness of an AI classifier. If we use models like this in police arrests or court cases, that could be pretty bad! It’s important to give your classifiers lots of different data so it’ll know how to classify lots of different types of things.*

**[switch to reflection slide and discuss how students would make systems less prone to bias]**

**\*transition to privacy\*** *Data can be a pretty powerful tool for computational systems, but it must be used in a responsible and ethical way. Privacy is important to think about in data use because we might not want our personal information to be shared at a large scale.*

*How many of you would be okay with hackers having access to your email username? Your phone number? Your TikTok username? A picture of your face? What if people not only had access to them but could trace what you post and what you do using those identifiers?*

**[discuss what students think is okay to share on the Internet]**

**\*transition to project brainstorming\* (OPTIONAL, as this can be done at the ends of Days 3 or 4 as well)**

**[Instructor shares out project examples available on the front page of the Dancing with AI website. Highlight at least one project that uses a Teachable Machine classifier and train the classifier for the class. Have students think about what kind of projects they’d like to make and have them reflect in their journals.]**

**[wrap-up]**

*See you tomorrow for Day 3, where we’ll learn more about how to use block-based programming with poses.*