

Ryan Smith

CAP 4630

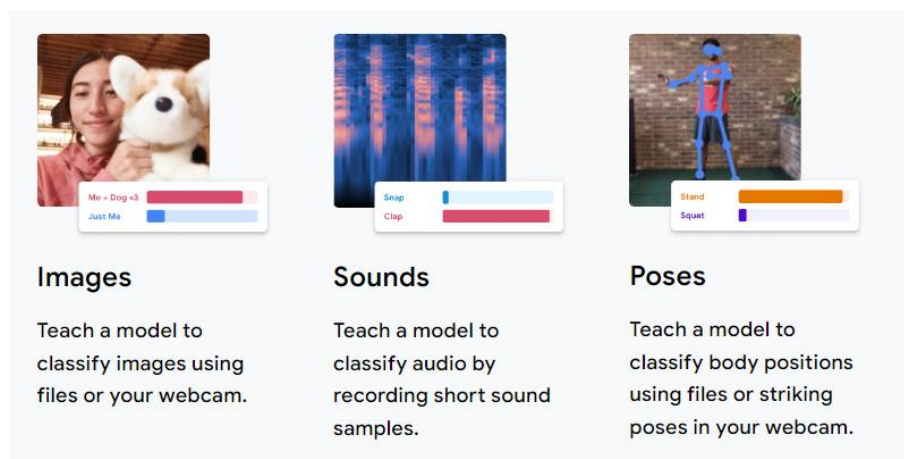
Dr. Marques

Project 4

Selected tool URL: <https://teachablemachine.withgoogle.com/>

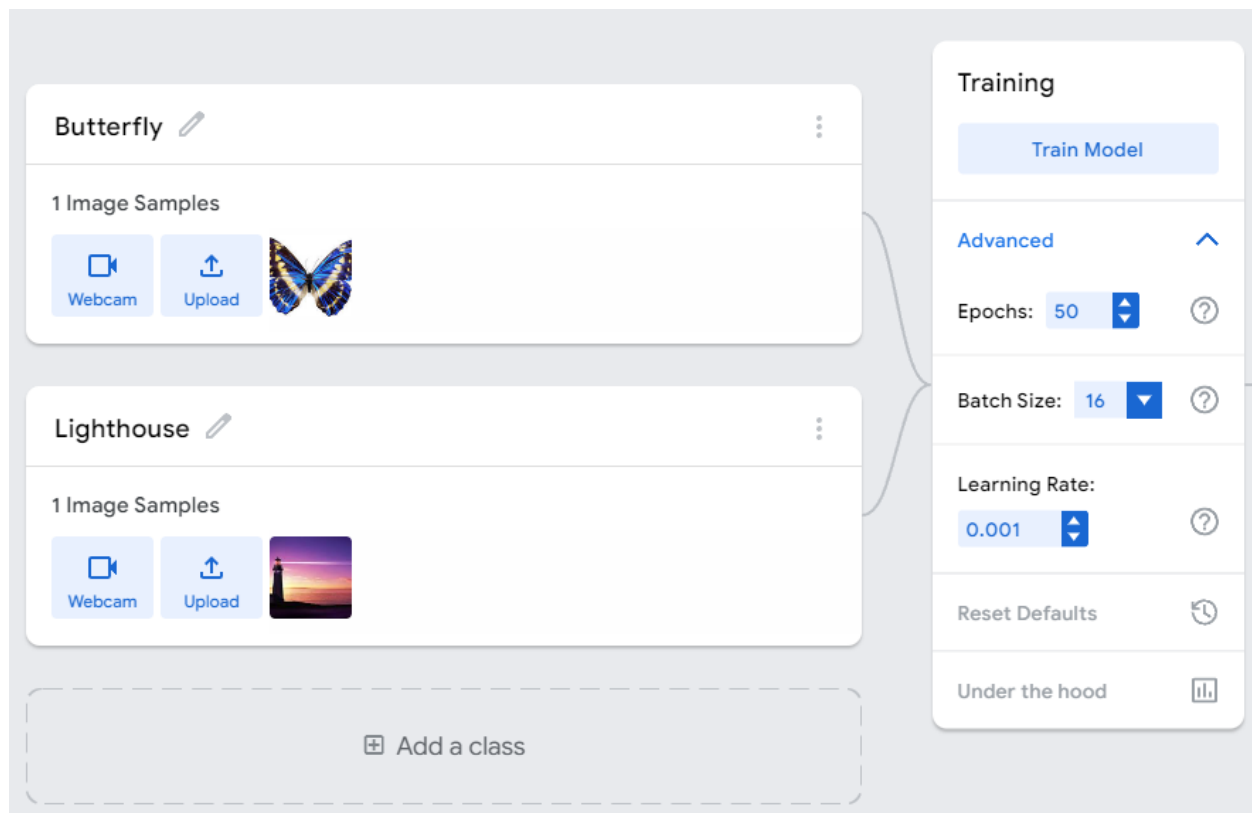
The tool I selected for project four of Intro to Artificial Intelligence is the Teachable Machine.

This website interested me the most as it utilizes machine learning and recognition models used by the computer. Teachable Machine is a web-based tool that can create machine learning models fast, easy, and accessible to every user. This website can gather information input by the user and group the examples into classes or categories for the computer to learn. After the examples have been gathered, the user is able to train the model and immediately test it to see if it can correctly classify new examples. Finally, Teachable Machine can export the model creates for projects, sites, apps, and download or host it online. Teachable Machine is extremely flexible about what can be taught to the computer. The user can use previously downloaded files or take live pictures for our model. The image below shows the types of files or images Teachable Machine can use.



Gathering the classes:

Teachable Machine allows the user to capture images via webcam or upload images downloaded on the local device and store them into two separate classes. The contents of these classes will be how we train our computer to recognize similar images. I can upload an image into each of the classes with class one being a picture of a butterfly and class two being a picture of a lighthouse. As previously stated, we will move onto the training model portion of the website, which will allow me to train the computer to recognize each of these pictures separately. As for training the model, I will be using the default settings first and adjust them accordingly to see the differences.



Training the classes:

Teachable Machine makes training the classes created very simple but doing this manually could prove to be a very time consuming and tedious process. Although, this website provides us with a “Train Model” button after inputting settings such as epochs, batch size and learning rate.

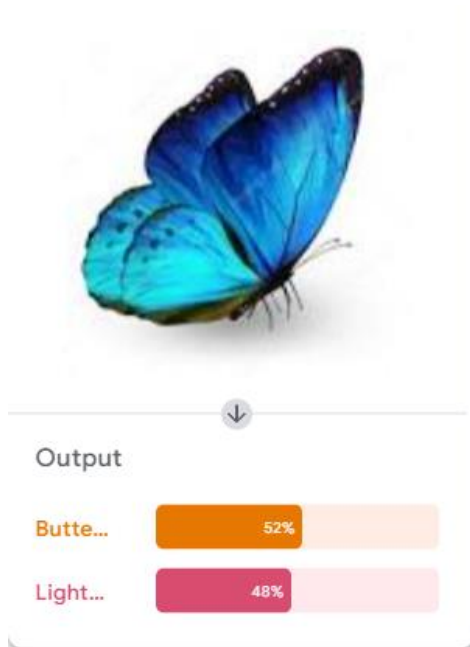
Epochs means that each of the classes have been put through the training model at least one time. For example, in the previous picture I had put the epochs to 50 (default), this means that the model will work through the training dataset 50 times. Increasing the epochs will generally help the model learn to predict the data and is a good idea to change the epochs until a desired result is accomplished. Another setting is batch size with the default being 16, and a batch is a set of samples used in a singular iteration of training. The website informs the user that if we provided 80 images the data would be split into $80 / 16 = 5$ batches and once 5 batches have been put through the model, one epoch will be completed. The website also informs the user that this number will typically not need to be modified to get good training results. Finally, we have learning rate and the website provides a note to be extremely careful when adjusting this number (0.001), as small differences can have huge effects on how the model will learn. After learning more about these advanced options I have increased my epochs to 1000 and kept both batch size and learning rate on their defaults.

Preview:

The final section of Teachable Machine is the preview part, and this allows the user to compare input pictures uploaded from a local device or taken through a webcam. In order to demonstrate this section, I found more images to see how training my model went. I gathered an additional butterfly and lighthouse image. When I upload the pictures, we will be able to see if the model is taught enough to see the difference between these two new images.

Image comparison:

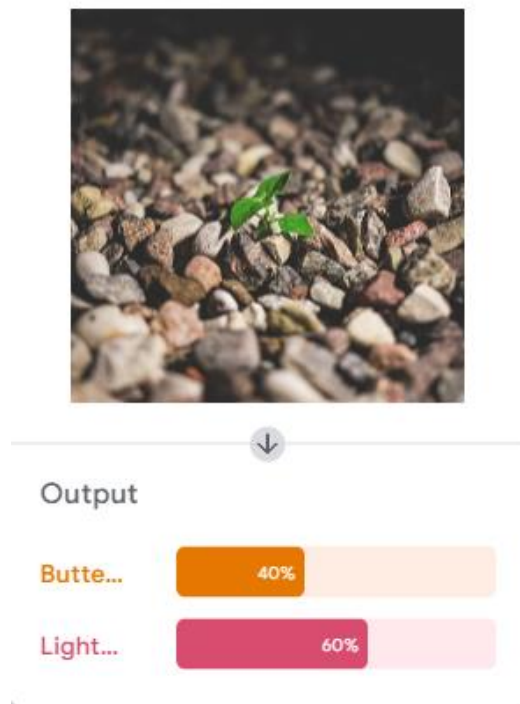
When I uploaded a different image of a butterfly, we can observe that the computer is able to distinguish that the image is more of a butterfly than a lighthouse, but not by a huge margin. Our trained model is saying that this new image chosen is 52% like the first class (butterfly). As this is a close margin, we can assume that the image input has a large influence of the percentage different such as the position of the butterfly in the picture, or the color of the butterfly.



Continuing onward we can test our lighthouse class in a similar fashion by choosing a different image. The following image displays a better percentage (57%), which is a decent result as this is close to $3/5^{\text{th}}$ but not by any means definite and that our model can be trained further for better results.



Lastly, I will be comparing an outlier image of pebbles with a small plant to see which the trained model will lean more towards. The results in the following image are very interesting as this image is closer to the initial lighthouse than the previously tested lighthouse image. I can understand how this image could be closer to lighthouse as some of the rocks could have a similar hue as the initial lighthouse picture, but for the butterfly I can not understand why the model is saying it is 40% similar. As I previously stated, this model can be trained more strictly in order to come out with better results and be more exact in the comparison.



Why is this tool relevant?

A more refined version of this tool would be used for government use, as it allows for a good facial recognition software. Another application for everyday commercial use would be a home security system. If a model is trained extremely efficiently, we could make a security system that when armed could detect if an unknown person enters the building. Although this seems very useful, it is extremely difficult as shown above where with some test training we input one type of butterfly and compared it with another and nearly did not get a 50%+ match. This type of artificial intelligence can prove extremely beneficial as it can provide our society with more security.

Interesting aspects:

Something interesting about Teachable Machine that I did not get around to attempting as adding additional classes to train a model with. From my understanding I can add many more classes which can help narrow down an input image when previewing. Furthermore, each of the classes allow for more than one image to be input, I assume adding additional images into the class will help train the model further and improve accuracy when comparing images. For instance, if I added my second butterfly picture to the butterfly class, I wonder if the computer would be able to more accurately differentiate between a third butterfly and the lighthouse. Another aspect of Teachable Machine is the audio project, since the website explains that is possible to teach the computer the difference between two genres. This feature is something I expect to test further in the future.