



Overview

In this assignment, you will explore AI foundational topics including machine learning, neural networks, computer vision, and bias. You will complete interactive tutorials and respond to question prompts to demonstrate how AI and machine learning works.

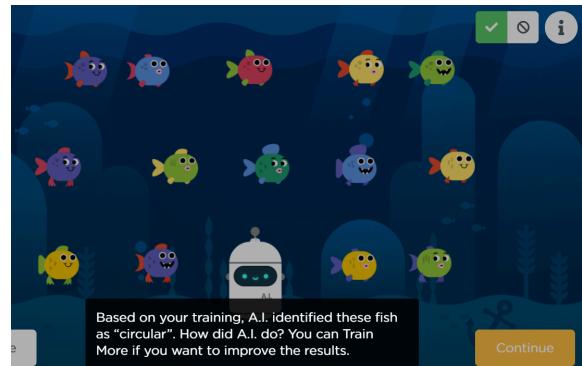
Assignment Preparation

Make a copy of this document to record your answers. Rename your copy of the document to **lastname_ai-foundations**, where **lastname** is your last name. You will **place all answers and screenshots** in this Google Document. The steps below will tell you what to put in your answer document - use the spaces provided to insert your answers accordingly.

Part 1: AI For Oceans

Computer science is about so much more than coding! In this part of the assignment, you are going to supply the data to train your own machine learning model.

Imagine an ocean that contains creatures like fish, but also contains trash dumped by humans. What if we could train a computer to tell the difference and then use that technology to help clean the ocean?



DO THE FOLLOWING:

- Complete the tutorial on [AI For Oceans](#) (steps 1 through 6 only)
- [Provide a screenshot showing that Step 6 of the tutorial was completed (it should look similar to the image above):

[Insert screenshot here]

- A. Name two weaknesses in the training that could cause errors in the final classifications of “fish or not fish”, “belongs in the water”, and “kinds of fish”. That is, why might some things that are not really fish be classified as fish?

Example 1	
Example 2	

- B. In 1-3 sentences, describe how AI is used in Computer Vision?

Part 2: Teachable Machine

You will learn more about training data sets and digging deeper into the learning algorithm of AI. Specifically, we are focusing on supervised machine learning, where a computer learns by example. There are a few simple examples of classification technology to demonstrate this form of AI including:

- Face detection - is it a face or not
- Spam detection - is it spam or not
- Handwriting detection (for mobile deposit) - is it one of 26 characters or 10 numbers

You will complete a tutorial for Teachable Machine, which is a web-based tool that makes creating machine learning models fast, easy, and accessible to everyone. Within this tutorial, you will make a machine learning model to detect different types of poses in frames to display different outputs.

DO THE FOLLOWING:

- ➔ Open the [Teachable Machine Tutorial](#)
- ➔ Click the “Let’s go!” button and follow all steps in the tutorial.
- ➔ Experiment with the other outputs and teach the machine what you want it to learn.

After completing this tutorial, **answer these questions in your answer document:**

A. What happens if you only train one class?

B. What happens as you increase your dataset? Make sure both classes have at least ten images.

C. If you've mainly been training with one hand up, try using the other hand. What happens when your test dataset is different from your training dataset?

Now that you have familiarized yourself with Teachable Machine, you will now build your own classifier to detect cats and dogs using images. You will build your classifier with the *Initial Training Dataset* - the images used to “teach” your machine learning model which image is a cat and which image is a dog.

DO THE FOLLOWING:

- Open the [Initial Training Dataset](#)
- Click the *Download* button () to download the zipped folder with all the images in this data set.
- Unzip the folder you just downloaded on your computer.
 - Refer to the [How to Unzip a File tutorial](#) for your respective operating system if necessary.
- Open the [Teachable Machine](#)
- Click on *Image Project*.
- In the *New Image Project* pop-up menu, click the *Standard image model* option.
- Under *Class 1*, click the *Upload* button () and click the *Choose images from your files, or drag and drop here* button.

- Inside your unzipped folder for the *Initial Training Dataset*, click on the *Dogs* folder and select all images to upload.
- Click the *Edit* button () to rename *Class 1* to *Dog*.
- Under *Class 2*, click the *Upload* button () and click the *Choose images from your files, or drag and drop here* button.
- Inside your unzipped folder for the *Initial Training Dataset*, click on the *Cats* folder and select all images to upload.
- Click the *Edit* button () to rename *Class 2* to *Cat*.
- In the *Training* box, click the *Train Model* button and wait for it to finish training your model.

After completing the above, **answer these questions in your answer document:**

- D. For the dog training dataset, record the following:

How many images are included?	
How are the images similar?	
How are the images different?	

- E. For the cat training dataset, record the following:

How many images are included?	
How are the images similar?	
How are the images different?	

You will now train your classifier on the training data set. You will train your classifier using the *Test Dataset*—the images used to test your classifier after training to see if your classifier predicts if the image is of a dog or a cat.

- Open the [Test Dataset](#)

- Click the *Download* button () to download the zipped folder with all the images in this data set.
- Unzip the folder you just downloaded on your computer.
- In the *Preview* box of the Teachable Machine, click on *Webcam* and change it to *File*.
- In the *Preview* box, click the *Choose images from your files, or drag and drop here* button and navigate to your Test Dataset - select each image one at a time. **For each test image in the Test Dataset, record the following information.** Copy and paste the table provided below into your answer document to record your information.
 - Filename (i.e. test1.png)
 - Classification (i.e., did the model classify the test image as a *Dog* or *Cat*?)
 - Confidence Score (i.e., what percentage did the model classify the test image as a *Dog* and *Cat*?)
 - Correct (i.e., was the model correct in its classification?)

Filename	Classification (Cat/Dog)	Confidence Score (%)	Correct? (Y/N)
test1.png			
test2.png			
test3.png			
test4.png			
test5.png			
test6.png			
test7.png			

After completing the above, **answer these questions in your answer document:**

- F. Which class did your classifier work better on? Why do you think that is?

G. How could you make it better with your training data?

You will now train your classifier on a recurred data set. You will rebuild your classifier with the *Recurated Training Dataset*—a large assortment of images used to make your training dataset of cats and dogs larger and more diverse.

- Open the [Recurated Dataset](#)
- Click the *Download* button () to download the zipped folder with all the images in this data set.
- Unzip the folder you just downloaded on your computer.
- Under *Dog*, click the ellipsis button () and click the *Remove All Samples* option from the dropdown menu.
- Under *Dog*, click the *Upload* button ( Upload) and click the *Choose images from your files, or drag and drop here* button.
- Inside your unzipped folder for the *Recurated Dataset*, click on the *Dogs* folder and select all images to upload.
- Under *Cat*, click the ellipsis button () and click the *Remove All Samples* option from the dropdown menu.
- Under *Cat*, click the *Upload* button ( Upload) and click the *Choose images from your files, or drag and drop here* button.
- Inside your unzipped folder for the *Recurated Dataset*, click on the *Cats* folder and select all images to upload.
- In the *Training* box, click the *Train Model* button and wait for it to finish training your model.

After completing the above, **answer these questions in your answer document:**

H. For the dog training dataset, record the following:

How many images are included?	
How are the images similar?	
How are the images different?	

- I. For the cat training dataset, record the following:

How many images are included?	
How are the images similar?	
How are the images different?	

You will now train your classifier on the training data set. You will train your classifier using the *Test Dataset*—the images used to test your classifier after training to see if your classifier predicts if the image is of a dog or a cat.

- In the *Preview* box of the Teachable Machine, click on *Webcam* and change it to *File*.
- In the *Preview* box, click the *Choose images from your files, or drag and drop here* button and select each image one at a time. **For each test image in the Test Dataset, record the following information.** Copy and paste the table provided below into your answer document to record your information.

Filename	Classification (Cat/Dog)	Confidence Score (%)	Correct? (Y/N)
test1.png			
test2.png			
test3.png			
test4.png			
test5.png			
test6.png			
test7.png			

After completing the above, **answer these questions in your answer document:**

- J. Did your classifier work better for one class? Or, did it work the same for both classes?

- K. What did you do to make it work better?

- L. How might you find images to better curate your dataset?

Part 3: Quick, Draw!

Can a neural network learn to recognize doodling? You can use *Quick, Draw!* to help teach a neural network by adding your drawings to the world's largest doodling data set that is shared publicly to help with machine learning research.

DO THE FOLLOWING:

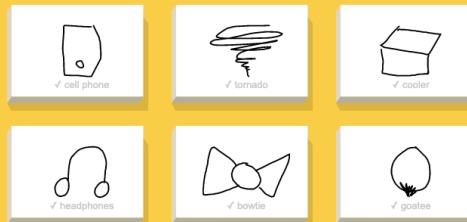
- Complete the [Quick, Draw! interactive tutorial](#)
- Click the yellow *Let's Draw!* button to start and follow the instructions to complete the tutorial.
- After completing all six drawings, you should be brought to a summary page with all your drawings and how many that the neural net correctly figured out.
- Click on one of your drawings to see what the neural net saw, and how it learned by looking at examples drawn by other real people on the Internet.

Example: 6 drawing summary

Example: One drawing

Well drawn!

Our neural net figured out 6 of your doodles.
Select one to see how it figured it out, and visit the data to see 50 million drawings made by other real people on the internet.



You were asked to draw cell phone

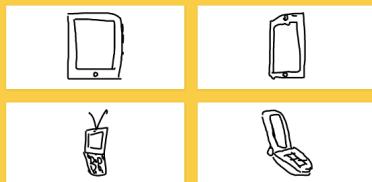
You drew this, and the neural net recognized it.



It also thought your drawing looked like these:



How does it know what cell phone looks like?
It learned by looking at these examples drawn by other people.



Provide a screenshot showing a summary of what the neural net saw for your 6 completed drawings.

[Insert screenshot here]



Provide a screenshot showing what the neural net saw for one of your drawings.

[Insert screenshot here]

A. What is a neural network?

B. How many of your doodles did the neural net figure out?

- C. How did the AI detect your drawings? Use terminology from the videos (i.e., AI, neural network, training, etc.).

- D. You doing the doodle exercise made the AI better for the next person who tries it. Why?

Part 4: Understanding Bias

Analyze where AI bias might originate and how it gets reinforced.

- Review the lesson video on [Training Data & Bias](#) [2:40]

DO THE FOLLOWING:

- Training Data Bias: If an AI is trained on historical hiring data where 90% of executives were men, how might this affect its career recommendations?

Your Analysis:	
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- Language Bias: If an AI is primarily trained on English text from certain regions or cultures, how might this affect its responses to global questions?

Your Analysis:	
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- Selection Bias: If an AI's training data comes mainly from certain websites or publications, how might this create blind spots?

Your Analysis:	
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Real-World Example:

Research one real example of AI bias that has been documented in the news or academic literature.

Example you found:	
Source:	
Type of bias:	
Impact:	
How it was addressed (if at all):	