

Happy or Sad, Can a Machine Tell the Difference?

Student worksheet

Name: _____

Date: _____

Word Bank:

Artificial intelligence (AI): a machine's ability to perform intelligent tasks.

Machine learning: a branch of AI that provides machines the ability to learn and improve from experience.

Learning data: data used in machine learning to train the machine to perform a desired task.

Test data: data used in machine learning to test how well a machine can execute the desired task.

Machine learning accuracy: the percentage of correct classifications a machine makes from test data.

Machine learning bias: systematic and repeatable errors made by a machine that favor a specific incorrect outcome.

Directions: Circle the answer that most closely fits your prediction.

You will give a machine drawings of happy and sad faces so it can learn to classify these types of drawings as "happy" or "sad."

1. How often do you think the machine will be wrong (i.e., classify a drawing of a sad face as happy or classify a drawing of a happy face as sad)?

Seldom

Sometimes

About half the time

Often

Always

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Directions: Circle the answer that most closely fits your prediction.

2. Complete each sentence by circling the choice you think best describes the ideal drawings to use when training your machine.

a. The examples of happy faces should _____.

all be identical

all look different

b. The examples of sad faces should _____.

all be identical

all look different

c. The examples of happy and sad faces **must** include features that _____ when a person is happy or sad.

do not change

change

d. The examples of happy and sad faces **can** have **but do not have to** have features that _____ when a person is happy or sad.

do not change

change

Directions: Follow your teacher's instructions or step 3 in the slides to create learning data.

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Directions: Follow steps 3-6 to train your machine. More details for each step are available from your teacher or in the slides.

3. Navigate to <https://teachablemachine.withgoogle.com/train/image>.
4. Rename class 1 to “happy” and class 2 to “sad.”
5. Upload your learning data.
6. Click “Train Model.”

Directions: After discussing machine learning and bias with your class, answer questions 7-8 to prepare for testing your machine

7. How does machine learning work? Explain in your own words.

8. Do you think your machine will be biased?
If yes, what bias do you expect your machine to have?

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Directions: Follow steps 9-12 to test and improve the machine. You can find more details in the slides that go with steps 9-12.

9. Test a few drawings of happy and sad faces picked from your learning data.
 - a. Does the machine correctly classify these drawings if you present them with the background the same way you did when you trained your machine?
Observations:

 - b. Can the machine correctly classify these drawings when you hold them closer to or further away from the lens?
Observations:

 - c. Does your machine show a bias?
If yes, how can you change the learning data to make your machine more accurate?
10. If you can, make your teachable machine better by changing the learning data, retraining the model, and observing the results.
11. Use a data set drawn by other groups to test your machine. Collect your results in the table below. Do not forget to fill in the distance at which you hold the drawings.

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<i>Table 1</i> The machine's classification of happy or sad drawings held at _____ cm from the lens.		
Classification by Machine	<i>Number of</i>	
	<i>Happy Drawings</i>	<i>Sad drawings</i>
Happy		
Sad		
Unclear		
Total tested		

Observations:

- Do you notice a pattern in the cases where the machine does not know or misclassifies the drawing? If so, describe the pattern.
- Is your machine biased? Does it have a harder time accurately classifying certain types of faces? If so, describe the bias.

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12. Draw or color more faces, but make sure these look different from the learning data you have used so far to train your machine: add more detail, change the background, color the face, etc. Use the new data to test your machine.

Observations:

- a. Do you notice a pattern in the drawings where the machine misclassifies or is not sure which class to assign? If so, describe the pattern.

- b. Is your machine biased; does it have a harder time accurately classifying certain types of faces? If so, describe the bias.

- c. How could you improve the accuracy?

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Directions: Reflect on your experience and answer questions 13 and 14.

13. What were some things the machine did easily? What were some difficulties you encountered?

14. Did the machine show the bias you had predicted in step 8? Yes / No

a. Why do you think this is the case?

b. Did the machine show bias you did not expect?

c. Do you think it is easy or difficult to make an unbiased learning machine?
Why?