# Learning like Machines

## OBJECTIVE

Students will explore the concept of machine learning as they prepare, test, and optimize their own data sort.

## MATERIALS

- Data Cards, one page (cut out in advance), enough for half the class
- Machine Learning handout, enough for half the class

## ENGAGE

- Begin by writing "Artificial Intelligence" on the board and encourage student pairs to brainstorm examples of artificial intelligence in their everyday lives. Encourage students to break the phrase into two words if they are unfamiliar with the term.

- Keep an eye on the clock and when two minutes are up, encourage students to share their ideas. Write the class' thoughts on the board as they share.

- Then, challenge pairs to construct their own definitions of artificial intelligence, using the examples on the board as a starting point.

- Eventually share that artificial intelligence (or AI) is the ability of computer systems to learn, understand, and deal with new situations. The field of artificial intelligence focuses on creating machines that can process information and produce results similar to those that humans are capable of.

## EXPLORE

- Tell students that there are many different capabilities within AI—and these areas are only continuing to grow! One of these capabilities is machine learning. Machines learn through sorting huge amounts of data. As they sort this data, they begin to recognize patterns and eventually learn how to use these patterns to make their own decisions.

  Other machine learning capabilities include speech recognition, translation, natural language processing, and object recognition.

- Ask the class to look at the list they just brainstormed and consider if recognizing patterns may help any of these AI examples. Once students have shared, explain that auto-populated forms, streaming video recommendations, spam filters, and language translation apps are just a few AI examples that rely on patterns.

- Pass out one set of Data Cards as well as one Machine Learning handout to each pair. Then, prepare students to complete the activity:

  ○ Ask each pair to find one of the Horse cards and explain that their challenge is to come up with a series of simple data sorts that will help a computer learn to recognize what a horse looks like.

  ○ Review the Machine Learning handout's *Overview* section, *Your Job* section, and Part 1. Explain that a computer would eventually learn how to process all of these data sorts simultaneously and identify a horse more quickly. But before it can do this, the sorting and processing must be broken down into smaller parts so it will learn.

  ○ Allow time for student questions and then give pairs about 10 minutes to complete Part 1. Encourage any pairs who finish early to consider how to make their data sorts more efficient.

## APPLY

- Pair partners together to form groups of four and review the handout's Part 2 and Part 3. Explain that groups will now work together to simulate machine learning and perform the data sorts, and then ultimately consider how the process could be optimized for the best possible results.

- Once student groups have completed the handout, conclude the activity by encouraging groups to share any key discussion points from Part 3's question: If a computer were to learn how to perfectly identify a horse, what other data (new images, sounds, etc.) should it be exposed to in order to be successful?

- Then wrap up the session by reminding the class that machine learning and the field of artificial intelligence is only just beginning. If students are interested in working in a field related to software or technology, there are many careers to consider—from machine learning engineers and data scientists to software engineers, developers, programmers, and more.

# DATA CARDS

*Instructor Notes:* Make enough copies of this handout for half the class and cut the cards out in advance. Be prepared to distribute one full set of cards to each pair of students.
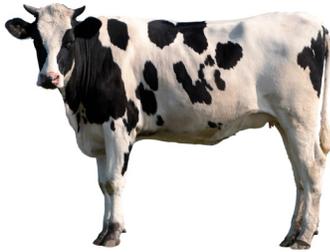
# MACHINE LEARNING

**Overview:** Machines learn through sorting data. If, for instance, a computer needs to learn how to recognize bird images, it may first be programmed to search for pictures with legs, then for pictures with only two legs, then for pictures with wings, and so on. After completing sorts for many different characteristics, the computer should eventually be left with only bird images.

**Your Job:** You will explore how to teach a computer how to recognize horse images by sorting through the cards provided. Each sort should focus on a single characteristic. After several sorts, the computer should have *only* horse cards remaining.

Record each characteristic that your computer will sort for below. Think about the order of your sorts and try to make the process as efficient as possible. Complete each sort as you record it and stop when only horse images remain!

**Part 1: Data Sort**

- Characteristic #1:

- Characteristic #2:

- Characteristic #3:

- Characteristic #4:

- Characteristic #5:

- Characteristic #6:

- Characteristic #7:

- Characteristic #8:

**Part 2: Machine Learning Simulation**

a) Pair with another group and simulate machine learning by completing each other's sorts. Be sure to sort *only* for the characteristics included in the instructions.

b) When the sorts are complete, provide feedback: Would these data sorts have successfully taught a computer to identify a horse? How could the sorting process become more effective or more efficient?

**Part 3: Optimize**
Discuss as a group: If a computer were to learn how to perfectly identify a horse, what other data (new images, sounds, etc.) should it be exposed to in order to be successful?