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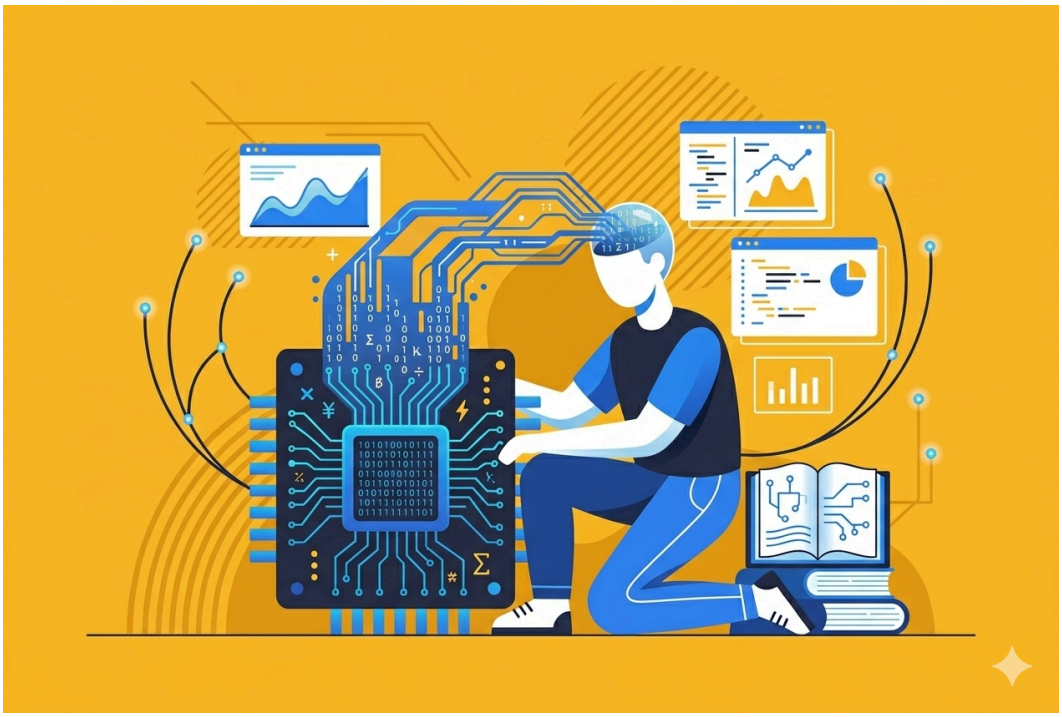
Learn Like A Computer



- Grade Level: 1-3, 4-6, 7-8
- Duration: 30 minutes
- Subject: Science and Technology
- Interdisciplinary Connection: Dramatic Arts
- Platform: Other

Want to help kids understand the magic of machine learning? In this lesson, learners will explore how machine learning algorithms work, and their uses in day-to-day life!

Curricular Connections

Ontario

Overall

A2. Digital Learning Platform Porting: use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life

Specific
A2.2 identify and describe impacts of coding and of emerging technologies on everyday life

Quebec
F.1 Terminology related to an understanding of the material world
F.1.a Appropriately uses terminology related to the material world
F.1.b Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g. source, matter, body, energy, machine)

Objectives

Learning Goals
Students will be able to...

- Explain how computers learn through machine learning by identifying patterns in data or receiving feedback from their environment.
- Distinguish between supervised learning (learning from examples/data) and reinforcement learning (learning from trial-and-error feedback).
- Identify real-world applications of machine learning and describe how these technologies impact everyday life.

Success Criteria

I can...

- I can explain how computers learn using machine learning.
- I can explain the general idea behind supervised learning.
- I can explain the general idea behind reinforcement learning.
- I can learn programming concepts without a computer.

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Material

Required Materials

Ensure there is enough space in the classroom for learners to move around.

Optional Materials

None

Lesson

Activity	Description
Prior Knowledge	Ensure there is enough space in the classroom for learners to move around.
Minds On	(5 Minutes) Let's Go on a Picnic We are going to play a game! We are going to learn what we can and cannot take on a picnic. Arrange learners into a circle, about 10 people each. Choose 1 learner to be the picnic organizer. Have this learner choose a rule that all objects being brought on the picnic must follow. An example rule could be that the object must be yellow. Make sure no one else in the circle knows what the rule is! The trainer should return to the circle and start by saying "I am bringing on my picnic." The blank should be filled by an object that follows the rule they created. Go around the circle, one learner at a time. Each learner says "Can I bring _ on your picnic?". The picnic organizer should respond with "yes" or "no". The game should continue until all learners have discovered the rule. Remind learners who have discovered the rule that they shouldn't reveal it.

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Model	(5 minutes) Let's talk a little bit about learning! Ask: What are some ways you like to learn? Computers also have a favourite method of learning too: it's trial and error! Computers love to learn from their mistakes! Draw a number on a board or piece of paper and show learners. Ask: What number is this? Follow up by asking how do you know that? (A: Because you have seen this number a thousand times). Ask: Who has heard the term machine learning or artificial intelligence? Ask: What is machine learning? (A: See terminology) Additionally you can show learners this short video: AI 101 What is Machine Learning. The process of learning based on data and human feedback is called supervised learning. Ask: How did you make your first guess? (A: It was random!) Machine learning algorithms do the same thing, their initial guesses are completely random. This is because they don't have enough information to make an educated guess. Ask: What patterns were you looking for when deciding what to bring on the picnic? (A: Noticing a trend in the items that were allowed on the picnic). It was almost like connecting the dots, after you made enough connections in your head you could figure out the theme. This is exactly how machine learning algorithms such as neural network learns. Supervised learning is the process of an algorithm learning by seeing many examples (data). The algorithm then looks for patterns in the data to learn about what it is seeing.

Practice	(10 minutes)"Hot or Cold" In this next game, we are going to experience how machines learn to find the best solutions to problems. Ask: In what ways are we seeing machines working to find ways to solve today's problems? Select an object from the classroom and a learner who will be the 'machine' that will learn. Ask the learner to cover their eyes while the other learners hide the object. Once the object is hidden, the ‘machine’ will open their eyes and will start searching for the hidden item. The other learners will guide the ‘machine’ by saying 'colder' when they move farther or 'hotter' when they move closer to the hidden object. The game ends when the learner finds the hidden object.

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Consolidation	(5 minutes) Reflection Ask: How did the learner start the search? Initially, we can start randomly if we have little idea about where the object is, but after several games, we probably have already some intuition where to search first. Computers learn very similarly; if they are unfamiliar with the environment they will initially just guess. However, if they have seen the same room before, they may have better guesses and find the object much faster! Playing the game many times in different rooms will help computers solve this problem faster and faster. This type of learning is very typical for example with robots that need to navigate and act in real environments. Ask: How did our 'machine' find the object? (A: By following our hints of getting 'warmer' or closer) Ask: When we told them that they were 'cold,' why didn't they keep looking in that area? Notice that once a direction gets too much 'cold', the player will rule out that part of the room and will not go back. This means that the part of the room they need to search gets smaller and smaller. Over time, it will become so small that the player will eventually find the object. This game is an example of how a machine can learn from feedback based on its actions. This is called reinforcement learning, which is very similar to how we train our pets; we reward them when they perform well so they become better behaved over time. In this game, we gave hints and encouragement as a 'reward' until our 'machine' found the hidden object. Reinforcement learning differs from supervised learning, because reinforcement learning interacts with the environment and not with existing data. Reinforcement learning focuses on maximizing the possible reward!

Modifications & Accommodations	Provide printed vocabulary or definition cards that students can sort, match, or display in the classroom to support understanding before participating in the games.

Extension

Cross Curricular Connections

Dramatic Arts: This lesson can be extended by having learners take on the roles of the computer, the trainer, and the environment, using movement and simple improvisation to model how machines learn through feedback and pattern recognition. Students can also practice dramatic play by acting out reactions such as being confused, curious, or confident as they receive clues or uncover hidden rules, strengthening understanding through expressive performance.

Extend Your Thinking

Practice training a computer using the Teachable Machine platform.