



# Actua's AI Activities Series

Activity 1

## Introduction: What is AI?

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**If you're accessing this activity directly, did you know there are eight other activities in this series up on our website? If you find yourself unfamiliar with any of the AI concepts and terminology introduced in these activities, please refer to our [AI Glossary](#). These activities also follow a space exploration narrative when done in order. It is recommended to complete the activities in order but they can also be done on their own.**

*You and your group-mates are astronauts and scientists aboard the Actua Orbital Station. Unfortunately, your station just got bombarded by magnetic rays and your electronics have begun to shut down! The only one who can save you is the station's AI, DANN. DANN stands for Dedicated Actua Neural Network, and it's gone a little loopy. Brush up on your technical skills, learn about AI, and save yourself and your crewmates!*

*Welcome to the Actua Orbital Station! We need to get started on fixing DANN as soon as possible, but first, we need to understand what makes DANN tick. That is, we need to understand different kinds of artificial intelligence and how they work. This activity will guide you through some fun examples of AI from earth, and then you'll be prepared to take on the challenge of fixing DANN in the next activity, ["Decision Trees: Classifying Space Objects"](#)!*

## Activity Summary

In this activity, participants will develop a baseline understanding of artificial intelligence (AI). Using videos and online activities to explore all the various forms of AI, they will participate in discussions about different applications of AI, as well as the potential benefits and dangers that AI presents. Participants will use tools like Google Quickdraw to experience how AI works, and develop a further understanding of how AI operates and the layers that go into the functioning of artificial intelligence.

Developed by Actua, 2022.



Delivery Environment	Activity Duration	Intended Audience
Classroom with computer access	1 hour	Grades 9-12 (Ages 13-18)

## Achievement Goals

### Learning Goals

**Learning goals** are statements referring to the understanding, knowledge, skills or application participants acquire during the activity. **Following this activity, participants will:**

- **Explore** the fundamentals of AI.
- **Understand** the code and logic behind intelligent programs.
- **Discuss** the potential future of AI technology and its impacts.

## Logistics (Timing, Group Size, Materials)

Section Title	Time	Group Size	Materials
<b>Opening Hook</b>	5 minutes	<i>Whole group</i>	<b>Whole Group</b> <ul style="list-style-type: none"> <li>• Computers or Internet-ready device (e.g., tablet, phone); minimum 1 per group of 3 participants</li> </ul>
<b>Activity 1: Google Quickdraw</b>	15 minutes	<i>Small groups (1-3)</i>	<b>Small Group</b> <ul style="list-style-type: none"> <li>• Computers</li> <li>• <a href="#">Google Quickdraw</a></li> <li>• <a href="#">Sketch-rnn</a></li> </ul>
<b>Activity 2:</b>	15	<i>Small groups (1-3)</i>	<b>Small Group</b>



Section Title	Time	Group Size	Materials
<b>Semantris</b>	minutes		<ul style="list-style-type: none"> <li>• Computers</li> <li>• <a href="#">Semantris</a></li> </ul>
<b>Activity 3: Eternal Jukebox</b>	15 minutes	<i>Small groups (1-3)</i>	<b>Small Group</b> <ul style="list-style-type: none"> <li>• Computers</li> <li>• <a href="#">Infinite Jukebox</a></li> </ul>
<b>Reflection &amp; Debrief</b>	5 minutes	<i>Whole group</i>	

### Safety Considerations

Safety considerations have been provided below to support safety during this activity, however they are not necessarily comprehensive. It is important that you review the activity and your delivery environment to determine any additional safety considerations that you should be implementing for the delivery of these activities.

#### Online Safety

Some components of this activity require the use of devices connected to the internet.

- Facilitators should review the provided videos and read/explore provided websites and materials to determine if they are suitable for their participants.
- Where applicable, facilitators should remind participants to stay on task and only use links provided within this activity.



## Activity Procedure

**Educators note:** This activity is structured in a linear fashion. Each of the three activities can be done in any order, or can be established as separate stations that participants can rotate through.

### Opening Hook

1. Begin by watching this video: [Introducing Spot \(previously SpotMini\)](#)
  - a. The video centers around Spot Mini, an artificially intelligent robot made by a company called Boston Dynamics.
2. Follow the video up with a reflection to begin establishing an understanding of AI.
  - a. **Q: What is AI? What does it stand for?**
    - i. **A:** AI stands for artificial intelligence. An artificial intelligence program is one that is designed to mimic one or more aspects of human intelligence. This could be mimicking senses, like Spot Mini, or more complex things like decision-making.
  - b. **Q: When have any of us ever interacted with artificial intelligence? What was it? What impact did it have?**
    - i. **A:** There are a variety of answers here, including self-driving cars, captchas, Siri/Google Home, targeted social media ads, Google search prediction, or Netflix recommendations. Impacts can be both positive and negative, e.g. “Netflix helps me find more things to watch which is nice”, or “Facebook keeps showing me ads for things I talk about with my friends which is creepy”.
  - c. **Q: Why is AI so important in our lives? What can we use it for?**
    - i. **A:** Again, there are many answers. AI is important because it can help us in almost every area of work, improving efficiency and helping take over dangerous or repetitive tasks. AI could be used for almost any imaginable tasks, but there are still areas where humans are better. Any job where you need to improvise and think on your feet is usually better suited to a human than an AI.



## Section 1: Google Quickdraw

**Summary:** Use Google Quickdraw to introduce visual recognition AI and talk about datasets.

1. Introduce [Google Quickdraw](#). Play around with it for five minutes and learn how it works. Quickdraw is a game where you are given a prompt, and you have to try and draw it while a neural network (Which is a type of AI!) guesses what you are drawing.
2. After you have used Google Quickdraw, reflect on how it might work.
  - a. **Q: How does it work?**
    - i. **A:** Artificial intelligences like Google Quickdraw use datasets, which are huge banks of information that help to train it. [This is Google Quickdraw's dataset](#). It uses millions of drawings from other people who have used this website, and it learns from those images and begins to predict what other people's drawings of each object will look like based on the past ones.
3. Take a little more time to explore Google Quickdraw's dataset. Explore how you can also "flag" parts of the dataset by clicking on one of the images. This is so that people can report false positives, otherwise known as drawings that look nothing like what they are supposed to be.
4. Next, it's time to explore a different program that uses the same dataset! Google made the Quickdraw dataset open source, which means anybody can download and use it for their own projects!
  - a. [Sketch-rnn](#) is a very cool project that takes advantage of the Quickdraw dataset in a very different way! Pick a model from the top bar, and start drawing! The AI will try to complete your drawing in as many ways as it can.
  - b. Take a few minutes to play around with the program, and see what wild drawings the AI comes up with!



## Section 2: Semantris

**Summary:** Play with a program called Semantris to begin understanding types of AI that can process word association.

1. [Semantris](#) is a very fun word-association game where you cooperate with an AI to try and clear blocks as fast as you can!
  - a. Semantris will explain itself as it is played. Start with the “Block” mode, since it’s more relaxed. The goal is to come up with words related to the blocks you want to get rid of, without using the actual words on the block. Aim for big clusters of blocks that are all the same colour for more points!
2. Once you have had time to play around with Semantris (around 10 minutes), quickly write down any thoughts you have about the program. How is it different from Google Quickdraw? How is it the same?
3. Before moving on, take a moment to explore how Semantris might work.
  - a. **Q: Based on what you know about Quickdraw, how do you think Semantris works?**
    - i. **A:** Almost exactly the same! Semantris uses a dataset of words that people associate with each other. The strongest connections are synonyms- Semantris definitely knows that “cat” and “feline” are the same! Also just like Quickdraw, any time someone plays Semantris, their answers are added into the dataset, meaning each participant just helped Semantris get a little bit smarter.

## Section 3: The Eternal Jukebox

**Summary:** Explore audio processing AI with a program that creates infinite loops in songs!

1. [The Eternal Jukebox can be found here.](#)
  - a. Educators note: If participants have headphones, have them each explore the Eternal Jukebox on their own. If not, have the whole group decide on a few songs to use, and play with them on one computer together, with the instructor guiding it.



- b. The Eternal Jukebox is a program that can be given a song, and tries to create a smooth infinite loop. The bars around the outside indicate each beat. The taller the bar is, the more that beat has been repeated. The arches indicate links between similar or identical beats- That is, places that the song can jump between that you (hopefully) won't hear!
2. Explore it with a few (appropriate) songs and see how well the program works! Are there any noticeable skips or jumps?
3. Click on the "Tune" button and change some of the settings around. How does this change the composition of the song? Do the jumps become smoother or more obvious? What do each of the settings do?
4. End the activity with a reflection on how Eternal Jukebox works.

  - a. **Q: How does this program work?**

    - i. **A:** Eternal Jukebox takes a song and breaks the entire thing down into "beats" that it can measure- moments of a song. It then tries to figure out which beats are the most similar to each other, and links between them. As the song is running, each time the Jukebox hits a beat that links to another beat, it randomly decides to either keep going or jump across the link to the new beat. It works better with songs that repeat themselves more, because there are more similar beats!
    - ii. Eternal Jukebox is different from Quickdraw and Semantris in one big way, though: It is done learning. This program is known as an offline machine learning program, which means that it has a static dataset. No matter how much we use this program, it won't get better. If you loaded the same song over and over again, it would give you the same results.





## Reflection & Debrief

1. What is artificial intelligence?
  - a. A form of computer science, where computers are programmed to mimic humans and try to think like them.
2. What are some real-world applications of AI?
  - a. Home assistants like Siri or Alexa, Self-driving cars, Captchas, Chatbots, targeted advertisements, and lots more!
3. What did you learn about data?
  - a. Datasets are the base of how most AI works. They use it to learn from and make associations. Some programs keep updating and evolving their datasets. Those are called online programs.
4. What are some things you learned about Quickdraw, Semantris, and Eternal Jukebox? How are they the same? How are they different?
  - a. This question is more open, and has many possible answers. They are all forms of AI meant to mimic different parts of the human brain. Quickdraw tries to mimic visual interaction, Semantris tries to mimic word processing, and Eternal Jukebox tries to mimic audio processing. Quickdraw and Semantris are online programs, and their datasets grow and evolve as we use them. External Jukebox is offline, and is done learning.
5. What is something you now know about AI that you didn't know this morning?
  - a. Any answers are great!
6. What is something you want to learn about AI going forward?
  - a. See above.



## Delivery Adaptations

How might you adapt the time, space, materials, group sizes, or instructions to make this activity more approachable or more challenging? **Modifications** are ways to make the activity more accessible, **extensions** are ways to make the activity last longer or more challenging.

### Modifications

#### SECTIONS 1-3

- Activities can be run by individual participants as long as each one has their own device. In this case, allow more time for the wrap-up discussion so that each participant has a chance to share their thoughts on the activities.
- These activities can also be run through a virtual group. Using Zoom Breakout rooms, or a similar tool, separate the participants into grouped video calls. From there, one participant in each group can follow the links and share their screen with the other participants, allowing the group to engage in the activities together.
- If participants are having difficulty understanding the concepts of AI, attempt to frame it using pop culture references they might understand. For example, C-3PO from Star Wars is an AI that can recognize audio- that is to say, the six million languages that he speaks!

### Extensions

- If you find yourself needing to extend the learning, have participants explore this website: <https://experiments.withgoogle.com/collection/ai>. It has a collection of AI projects and activities developed from all around the world! Have participants explore one or more of the activities and try to understand how they work. How are they different from Quickdraw and the other programs? How are they the same?



## Terms of Use

Prior to using this activity or parts thereof, you agree and understand that:

- It is your responsibility to review all aspects of this activity and ensure safety measures are in place for the protection of all involved parties.
- Any safety precautions contained in the “Safety Considerations” section of this write-up are not intended as a complete list or to replace your own safety review process.
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## About Actua

Actua is Canada’s leading science, technology, engineering and mathematics (STEM) youth outreach network, representing a growing network of over 40 universities and colleges across the country. Each year 350,000 young Canadians in over 500 communities nationwide are inspired through hands-on educational workshops, camps and community outreach initiatives. Actua focuses on the engagement of underrepresented youth through specialized programs for Indigenous youth, girls and young women, at-risk youth and youth living in Northern and remote communities. For more information, please visit us online at [www.actua.ca](http://www.actua.ca) and on social media: [Twitter](#), [Facebook](#), [Instagram](#) and [YouTube](#)!



## Appendices

### Appendix A: Career & Mentor Connections

- Machine learning researcher
- Computer Programmer
- Data Analyst
- Statistician

