# ERASMUS+ ARTIE
ARTIFICIAL INTELLIGENCE IN EDUCATION

Co-funded by the
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ARTIE: Artificial Intelligence in Education - challenges and opportunities of the new era:
development of a new curriculum, guide for educators and online course for students
Project co-funded by European Union under Erasmus+ Programme, 2020-1-HR01-KA201-077800

## TITLE: How do machine learning systems recognize what they see?

| LEARNING SCENARIO | | |
|---|---|---|
| *School:* | *Duration (minutes):* | 90 |
| *Teacher:* | *Students age:* | 10+ |

| *Essential Idea:* | **Train a computer to recognize your images and sounds.** |
|---|---|

*Topics:*

- artificial intelligence, machine learning,

*Aims:*

- get to know and understand the concept of machine learning and neural networks
- experimenting with AI: training, testing, improving models

*Outcomes:*

- the ability to test models related to image recognition
- create their own projects using online AI platform
- developing algorithmic thinking: understanding, analysing and problem solving

*Work forms:*

- individual work, work in pairs, group work

*Methods:*

- presentation, talk, interactive exercise

| ARTICULATION |
|---|
| **The course of action (duration, minutes)** |
| **INTRODUCTION** |

The purpose of this course is to understand how computers and other smart devices perceive and identify events from their surroundings.

How do smart devices see the world around them?

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How do smart devices decide what to do?
How do machine learning systems recognize what they see?
Think about smart cars, web search, music and video recommendations.
Can devices learn?

**Announcement of the goal of the lesson:**
Today we'll be learning how to train our own AI models!

## MAIN PART

Machine learning is a technique to train computer systems to recognize images and motion. To train a machine learning model, we feed it a bunch of examples to learn from. This is like when you learn a new word, you have to see a bunch of examples of it to understand what it means.

Imagine we want to create an app that cheers you up when you are sad. To detect whether you are happy or sad, we could train a machine learning model to look at photos of you and recognize your smiles vs. frowns. We would feed in many photos of you smiling, and many photos of you frowning, and let the learning algorithm learn from that. In the end, we can have a machine learning system for our app that can tell us whether you are smiling or frowning!



How do machine learning systems recognize what they see?
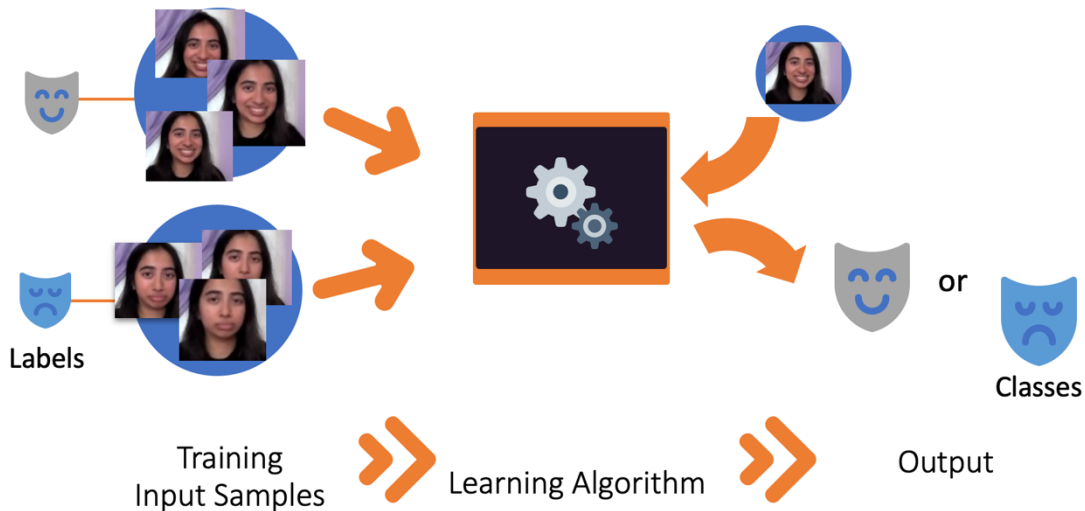
In this example, the input examples (also known as input data) are photos of you smiling or frowning, each with a label of whether the photo is a smile or frown.

The learning algorithm takes these input examples and learns how to predict whether a given photo is a smile or frown. This is like recognizing patterns in a set of examples.

When the learning algorithm is trained, we can use it to classify or predict what label any photo has. So we can take a new photo, put it into the system, and it will tell us whether it thinks it's a smile or frown.

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Teachable Machine (https://teachablemachine.withgoogle.com) is a web-based machine learning tool that you can use to train a computer to recognize different types of data. We'll learn how to use Teachable Machine and discuss the importance of training data and representation in our very own machine learning models. This is like recognizing patterns in a set of examples.

**Topics for discussion:**
What might the training input data be for a machine learning model?
What would the labels be that the training data is tied to?
How does a computer know what it sees?
Let's think about the learning step where the machine learning algorithm finds patterns between the labeled input data. Ultimately it comes up with a way to differentiate between the two sets of pictures.
What are some features (or characteristics) of these two groups of photos that help a computer recognize the difference?
Hint: All of these are going to be visual characteristics since the computer can't feel or taste the cereal (since we've only given it photos of the bits). More: size, color, texture, shape, background
What are the sorter's output classes?
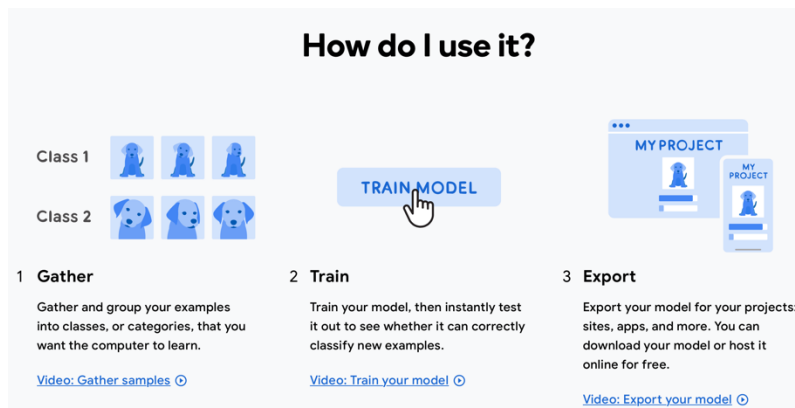What can the fully-trained machine learning model tell us about new images of cereal bits?
When the model has been trained, we can ask the model what categories it thinks new images are.
What might these categories (or output classes) be?
Hint: Output classes tend to correspond with the input labels.

**Interactive exercise:**
- Teach a model to classify images using files or your webcam.
- Go to: https://teachablemachine.withgoogle.com
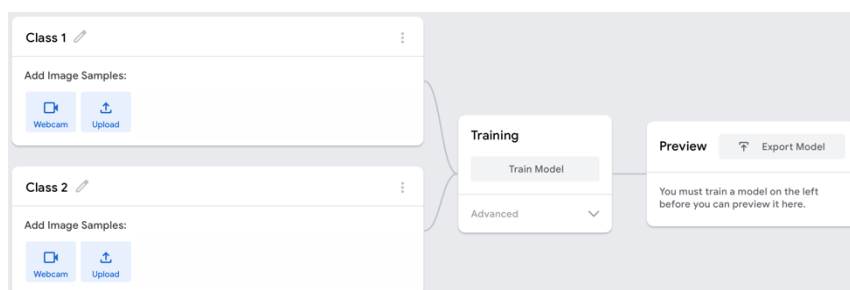


- Get Started – New Project– Image Project

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- Video tutorial
  Gather
  - https://www.youtube.com/watch?v=DFBbSTvtpy4

  Train
  - https://www.youtube.com/watch?v=CO67EQ0ZWgA

  Export
  - https://www.youtube.com/watch?v=n-zeeRLBgd0

- Present your model to the students in the class. Discuss. Save your work to the class e-portfolio.

**Topics for discussion:**
We might be able to confuse the model.
Did anybody notice that all the pictures I took have the same background?
What if we try changing the background?
How do we know that the model is getting confused?

**Interactive exercise:**
- Teach a model to classify audio by recording short sound samples.
- Present your model to the students in the class. Discuss. Save your work to the class e-portfolio.

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**CONCLUSION**

Artificial Intelligence gives us a world of possibilities: we can train models to learn on numerous types of data and apply those models to help solve real human problems.

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| Methods | | Work forms |
|---|---|---|
| *presentation* | *interview* | *individual work* |
| *talk/discussion* | *demonstration* | *work in pairs* |
| *work on the text* | *role playing* | *group work* |
| *graphic work* | | *frontal work* |
| *interactive exercise /simulation on the computer* | | |

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*Material*

- https://www.technologyreview.com/2016/11/03/6485/machines-can-now-recognize-something-after-seeing-it-once/

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*Literature*

- https://www.idtech.com/blog/intro-to-machine-learning-kids-teens

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- https://teachablemachine.withgoogle.com

| PERSONAL OBSERVATIONS, COMMENTS AND NOTES |
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