



A simple application of artificial intelligence in waste classification

STEM4inclusive schools

WP2 – Toolbox



Inovatif ve Girişimci Toplum Derneği

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Structure of the activity

A Introduction

about the topic

What is Waste?

Requirements for a simple AI application for waste classification

B Training phase

about the training

Develop your own AI model for waste classification





A: About the topic

What's waste?

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Definition!



What is waste?

Waste can be defined as the remaining materials after use and no longer functional. There are different types such as household waste, industrial waste, electronic waste.

Improper management of waste can lead to environmental pollution, depletion of natural resources and health problems..



Let's have a look at this
youtube video!



The Waste materials: What happens to our 2.2 billion tons of trash?



<https://www.youtube.com/watch?v=AJVky2FzI54>

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Waste Management

Waste management is the process of collecting, transporting, processing and disposing of waste. This process aims to manage waste without harming the environment and to recycle and reuse as much as possible.

Methods used in waste management include recycling, composting, incineration and landfilling.



<https://www.youtube.com/watch?v=4JDGFNoY-rQ>





Waste Classification and Recycling

Waste can be classified according to its source and type. Common classifications include:

Organic waste: Food scraps, garden waste

Inorganic waste: Glass, metal, plastic, paper

Hazardous waste: Chemicals, batteries, medical waste

Recycling is the process of reprocessing waste materials into new products. This process helps preserve natural resources, save energy, and reduce waste.



https://www.youtube.com/watch?v=0ZiD_Lb3Tm0





Recycling Methods

Manual Sorting: Manual separation of waste.

Magnetic Separation: Separation of metal waste using a magnetic field.

Optical Separation: Separation of different materials using optical sensors.

Robotic Techniques: Automatic separation of waste using artificial intelligence and robotic systems.



<https://www.youtube.com/watch?v=4JDGFNoY-rQ>





Manual waste separation



https://www.youtube.com/watch?v=wd8AEY_VD-0

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Optical Separation



https://www.youtube.com/watch?v=BXPxtT_1MyM



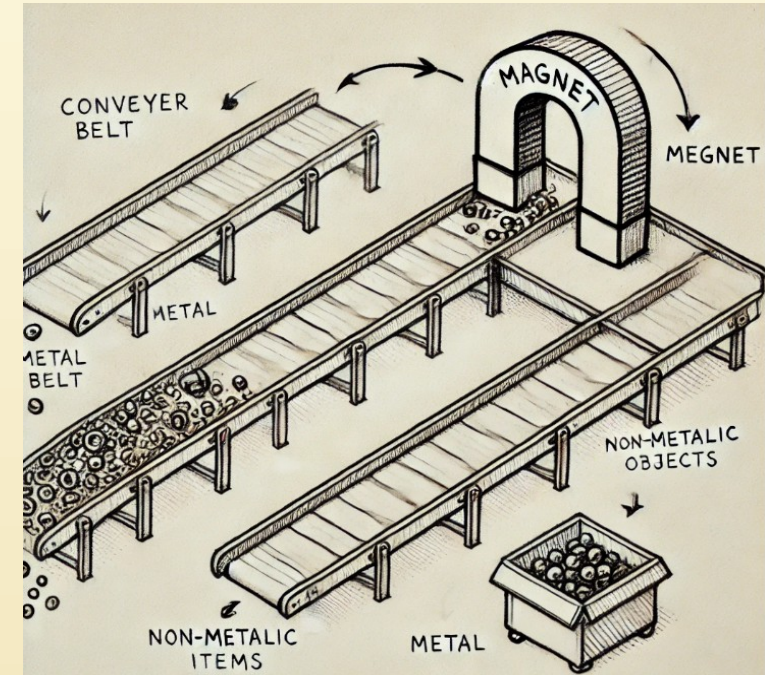
Generated by AI



Magnetic Separation



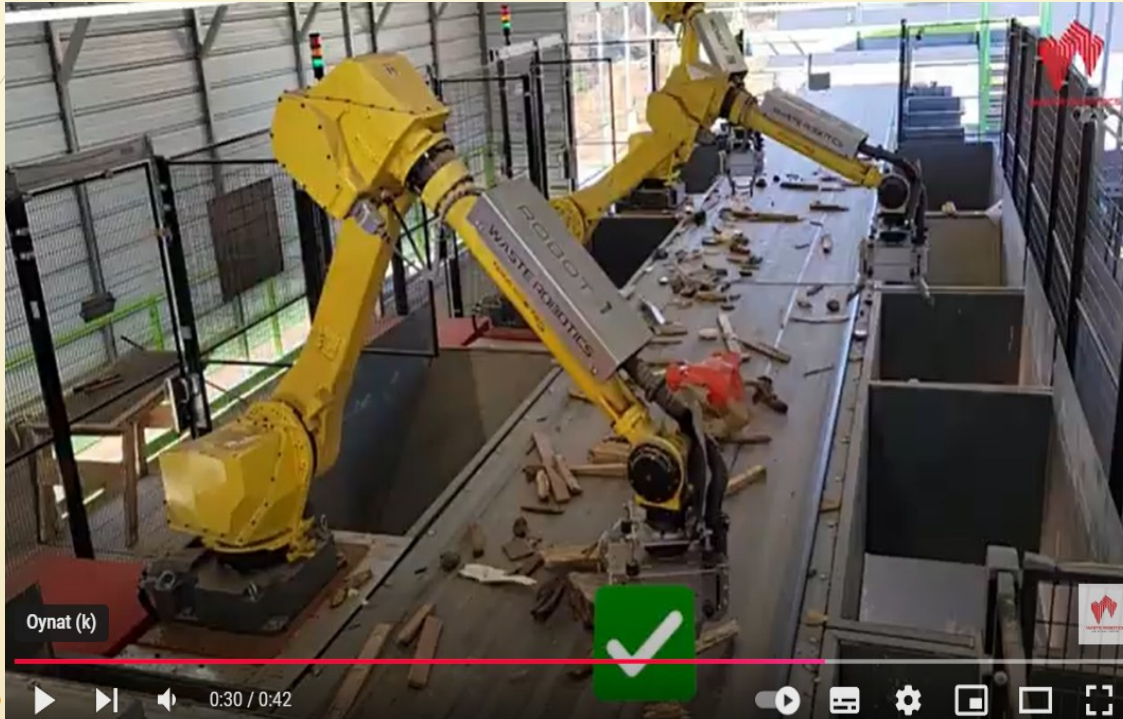
<https://www.youtube.com/watch?v=STuvRGBjTJs>



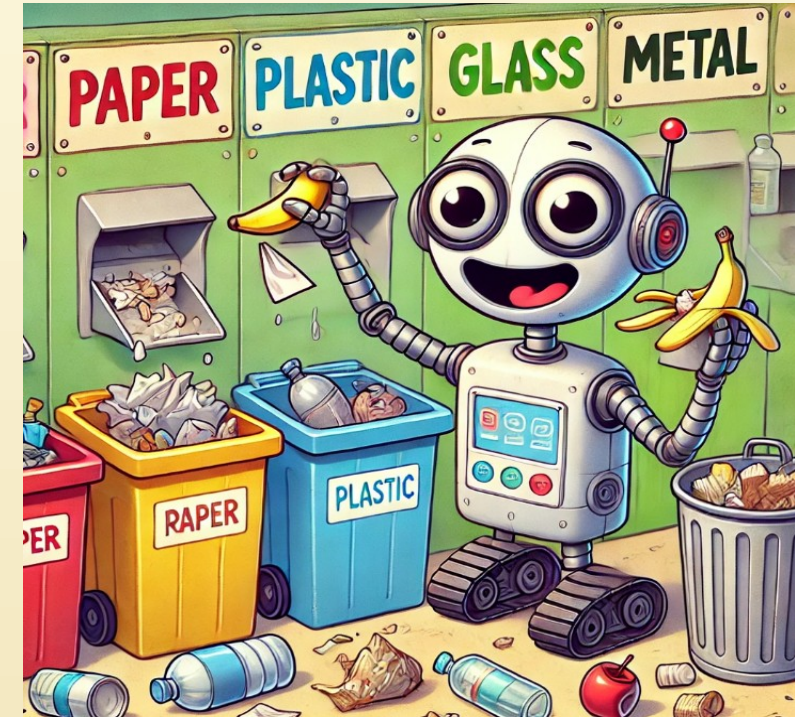
AI Generated photo



Robotic Separation



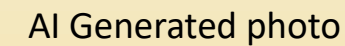
<https://www.youtube.com/watch?v=QbKA9uNgzYQ>



AI Generated photo



Change Proper management and recycling of waste plays an important role in combating global warming and climate change by reducing greenhouse gas emissions. It also contributes to the protection of natural resources by ensuring sustainable resource and energy use.



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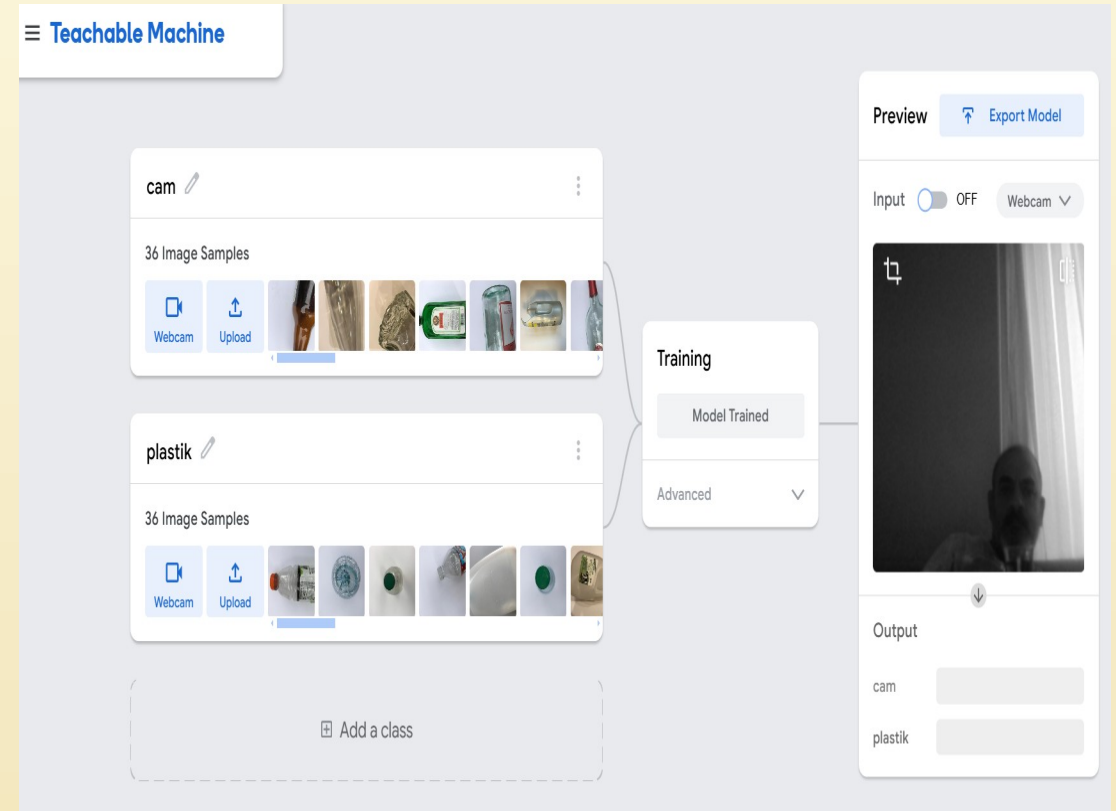


Our Time:

Waste Separation with Teachable Machine

Teachable Machine is a platform offered by Google and is used to perform certain tasks by creating machine learning models.

At the end of this activity, we will create a simple artificial intelligence model that separates waste into glass and plastic. This model will be trained to recognize and classify the two types of waste.



A screen shot from my AI work





Requirements for Waste Separation with Teachable Machine

Device Type	Tasks
Computer and internet connection	Teachable machine platform will run online in the browser on the computer
Webcam or camera hardware	AI Model will make predictions for images taken from camera
Access to Teachable Machine platform	The model will be trained online on this platform
Waste material dataset(At least 10 different glass and plastic waste pictures)	Will be used for training the model

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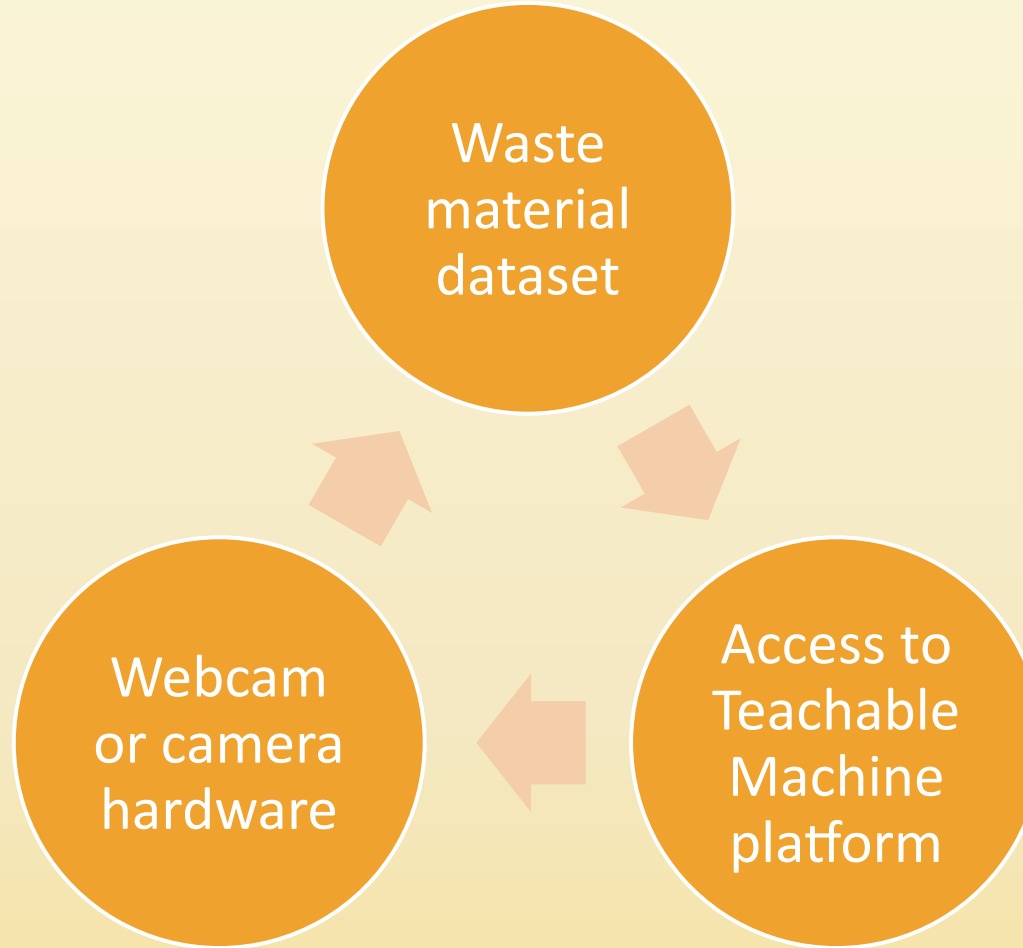
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3 main parts of a simple AI waste material separator



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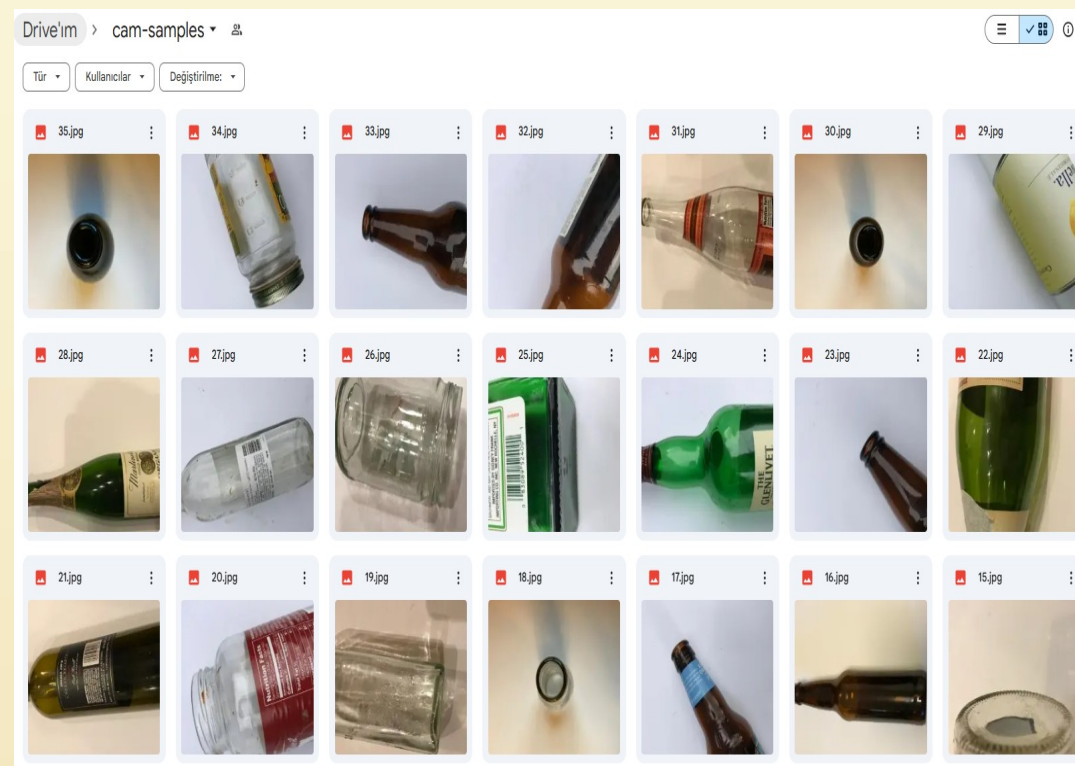


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What is dataset?

A dataset is a collection of data collected and combined for a specific analysis, research, or model training. A dataset usually consists of data points that contain one or more variables (or features). Datasets can be obtained from a variety of sources and can be in different formats. For example, a dataset can contain text, numbers, images, audio, or video data.

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An image contains of glass samples from my own project



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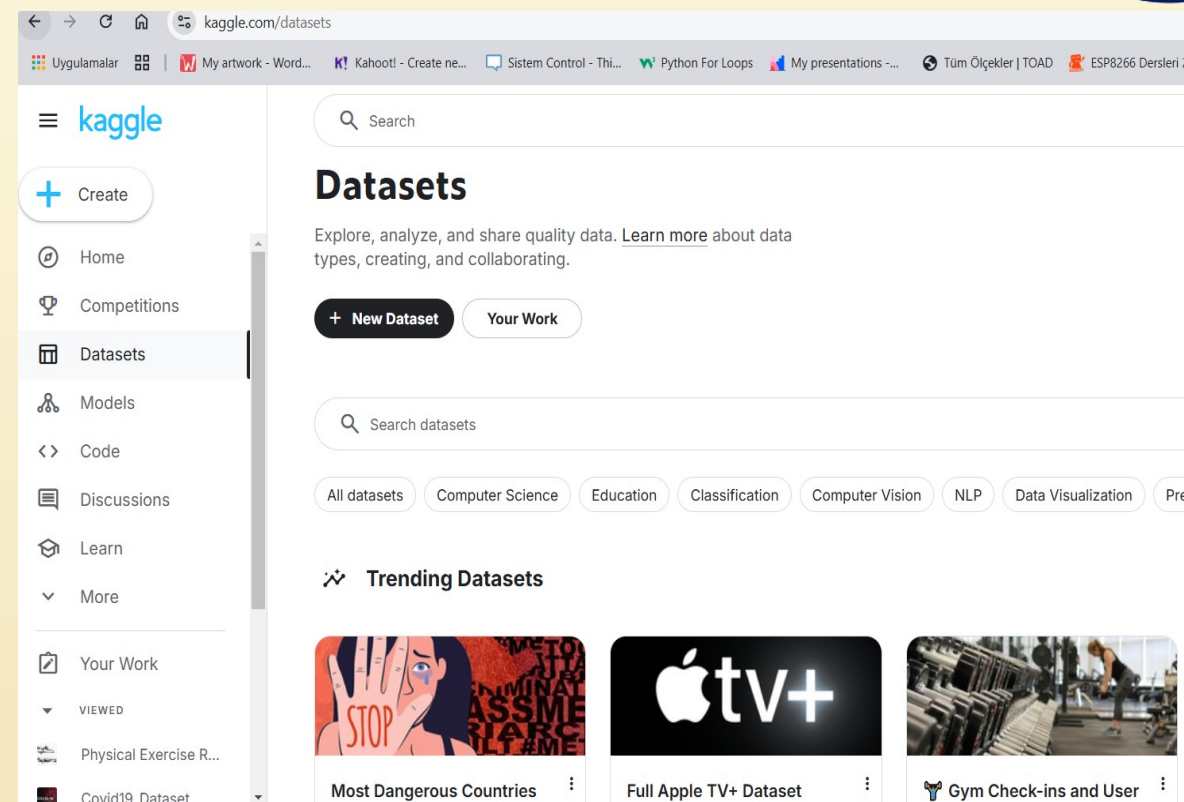


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How to prepare your own dataset

Download photos of glass and plastic waste from open sources (kaggle.com) or take your own. Make sure you have enough photos for both classes (for example, 10). You can make the model work more accurately by taking photos from different angles, in different lighting conditions, and on different backgrounds.



<https://www.kaggle.com/datasets>





Why Teachable Machine (TM) platform?

Teachable Machine is a web-based platform developed by Google that allows users to easily create their own machine learning models.

This platform is designed specifically for users with no experience in machine learning and artificial intelligence, and has a user-friendly interface that everyone can easily use.

Teachable Machine makes it possible to create models using image, audio, and pose (motion) data.

Teachable Machine

Train a computer to recognize your own images, sounds, & poses.

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

[Get Started](#)



A screenshot from TM web site





How to access TM platform?

Open Web Browser: Teachable Machine is a web-based platform, so you can use any modern web browser (Chrome, Firefox, Edge, etc.)

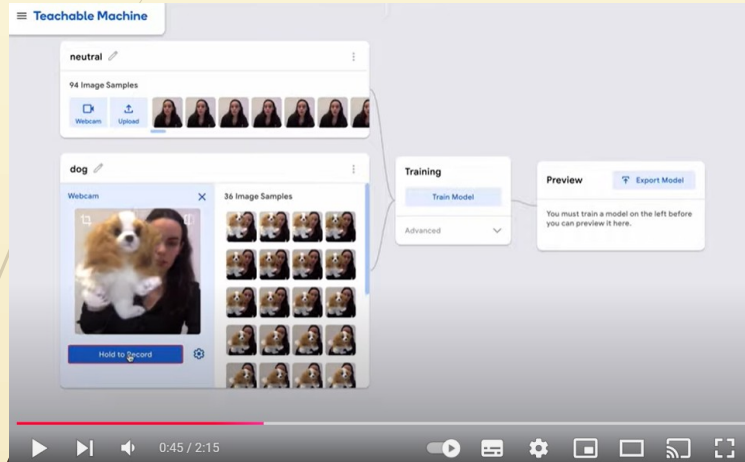
Go to Website: Go to the Teachable Machine website.
(<https://teachablemachine.withgoogle.com/>)





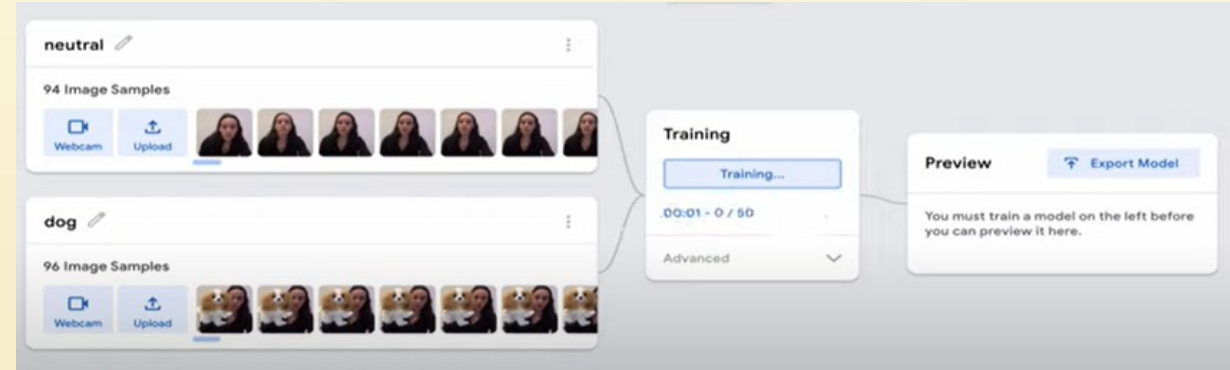
How to use TM platform?

Step 1: gather data(dataset)

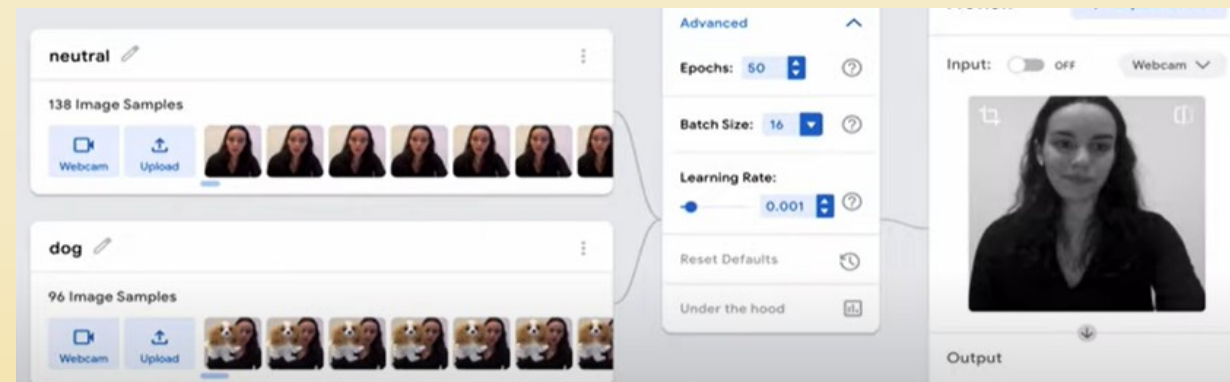


<https://www.youtube.com/watch?v=DFBbSTvtpy4>

Step 2: train model



Step 3: prediction



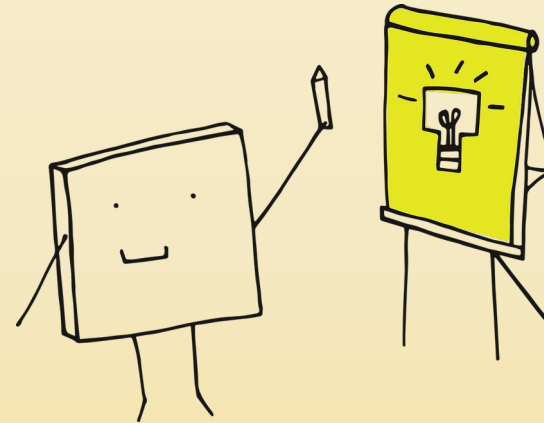
<https://www.youtube.com/watch?v=CO67EQ0ZWgA>





B: About the training

Training phase



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Task 1:

Work in pairs to design and create a waste classification system that can distinguish between glass and plastic waste. You will use the Teachable Machine platform to train a machine learning model for this task. If physical materials such as a webcam are not available, you will use pre-collected images for training.



You have **20 minutes** to design and create the AI waste separation system on the TM platform. If there are learners with special needs in your group, you will receive an additional **10 minutes** to ensure that their contributions and ideas are fully integrated, while other groups work on refining their solutions.



Ensure that you collaborate effectively with your partner. Support learners who may have visual or physical impairments, ensuring everyone has the opportunity to contribute.



Task 2: Another AI Projects with Codey Rocky-Waste Sorting



<https://www.youtube.com/watch?v=Hg4CtXjcGEI>

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Watch the video and describe what you observed. Work together with others to discuss your thoughts, or use your mobile phone to record an audio message about your ideas



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Task 3: Design Your Own Waste Classification Model

Design your waste classification model using the Teachable Machine platform and test it some sample images for some times. On the each test, observe how the system performs in classifying glass and plastic waste, and write down your observations in the observation protocol.

At the end, come together and share your observations and experiences. Ensure that everyone is involved and that discussions follow the agreed-upon classroom norms and community guidelines.





H5P- Tasks 1: about AI waste separator-waste materials

You have made **1** attempt. You got 100% correct on your last attempt.

Waste that is sorted and recycled according to its type not only prevents harm to the planet but also contributes to the economy.

☐ True

☐ False

☒ Submit

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H5P- Tasks 2: about AI waste separator-teachablemachine



Drag drop to fill in the blanks with the word given the right side.

is a platform offered by that allows users to create models. This platform makes it possible to create models using data. Thanks to its user-friendly interface, model training can be done without requiring any .

images, audio, pose

Google

Browser

machine learning

Teachable Machine

deep learning

coding knowledge

✓ Submit

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H5P- Tasks 2: about AI waste separator- waste categories

You have made **2** attempts. You got 100% correct on your last attempt.

Waste can be classified according to its source and type. Common classifications not include:

Hazardous waste

Organic waste

Inorganic waste

Wood waste

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H5P- Tasks 3: about AI waste separator-separation technics

You have made **2** attempts. You got 100% correct on your last attempt. ×

Which one(s) is the **Recycling Method**? 🔊

- Magnetic Separation*
- Robotic Techniques*
- All*
- Optical Separation*

H5P ↻ Reuse I am confused 🚩

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H5P- Tasks 4: about AI waste separator- climate change and global warming

You have made 1 attempt. You got 100% correct on your last attempt. X

Which of the following are impacts of waste materials on climate and global warming? (You can select more than one correct answer)

- ☐ Proper waste disposal reduces methane gas emissions.
- ☐ Failure to segregate waste positively affects global warming.
- ☐ Proper management of waste reduces greenhouse gas emissions.
- ☐ Recycling helps to conserve natural resources.
- ☐ Incinerating waste decreases the level of carbon dioxide in the atmosphere.

✓ Submit

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Congratulation!

**You mastered the activity of
creating a waste classification
system using the Teachable
Machine platform**

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