Activities overview

Activities	Modality	Level
Activity 2.1.1 Image recognition with "pen&paper"	In class / Online	Basic
Activity 2.1.2 Teachable machine with Google	In class / Online	Basic
Activity 2.1.3 Testing an AI image generator	In class / Online	Basic

Activity 2.1.1 - Image recognition with "pen&paper"

Duration	60 minutes
Requirements	Having followed Module 1
Hardware and Software tools used	White sheets of paper, sheets of paper with some printed figures, some pencils/pens. NO hardware/software required.
Type of assessment	- Multiple choice questions test (e,g, regarding some definition such as feature extraction, database search, similarity score) - Open question (e.g. students describe one example in which the facial recognition system can be useful in the future)

Examples of dogs images, printed on different pieces of paper for the "Image recognition - pen&paper" activity of Module 2. Images are available from http://vision.stanford.edu/aditya86/ImageNetDogs/

Procedure (steps)

Anticipatory Set

These activities are optional and can be performed for anticipating the actual activities

1. Ask if students have already tried an image recognition system and provide any examples (you can find some of them following the links below, in the “resources for teachers” part);
2. Ask the class questions such as “How do we recognize an image and how does a machine make it?“
3. Image recognition can recall a black box: users show images to a camera ➜ something happens inside the system ➜ the computer is able to recognize/match the image. It is important to understand how we recognize images ➜ ask students to list the steps they would do to recognize an image ➜ explain that what they are doing is following an algorithm;
4. Explain that computers follow algorithms during the image recognition procedure as well (feature extraction, qualitative and quantitative data)

Direct Instruction & Guided Practice

Preparation: The teacher prepares print outs of the different images of dogs included in the resources for Teachers (or uses the digital versions). Image of the table for classifying dog breeds should be also provided to the students

Classroom discussion: Before the activity, the teacher can explain to the class that image recognition is not as easy as it seems and students will discover how difficult it can be to teach a machine to recognize a dog breed from pictures of dogs. A computer can match two photos pixel-by-pixel to check if there is an exact match. However, in real life the same element (for example dogs) may look differently in each photo due to different characteristics, perspective and posture. As humans we are able to recognise elements in a photo and we are very good at recognizing faces of other humans because our brain extracts and matches key features of the person inside the photos. The goal of this activity is to illustrate the key AI concept of feature extraction – conversion of data in the original format (for example, an image) into a series of quantitative or qualitative features that can be used to distinguish different objects in the original data. A computer cannot ‘see' a photo like a human, but it is good at comparing a list of features. By converting the original image into a series of features, a computer can behave like humans in terms of recognising the dog inside each photo.

Activity presentation: This activity consists of two parts – feature extraction and database search. The class is divided into groups of 4-5 students, all groups created except one will be

involved in the “feature extraction” step. Then the group completes the table, answering the questions about their dogs.

Feature extraction:

a. In the “feature extraction” step, we gave each group a “breed table” and for each person of the group a randomly chosen picture of a dog from the same breed (resulting in a different breed for each group). Students are instructed not to show the image to anyone of the other groups.
b. Ask the students to answer the questions in the table (body size fur color, hair length, hair colour, etc.,, see table in resources) on another sheet of paper;
c. Then the group comes together and fills out a single “breed table” for the group.

Database search:

d. Choose the group who did not participated from the “feature extraction” phase and tell them that they will be the “AI detective”;
e. assign them a picture of dogs printed on a piece of paper;
f. ask the “AI detectives” to answer the questions on the “breed table”;
g. When they have finished, in turns the “AI detectives” reads his/her answers in a loud voice;
h. one point is awarded to each of the 6 students who wrote an answer equal to that of the detective student.

Similarity score:

i. after having read all the answers, the detective student identifies which group has the highest similarity score and asks him/her to flip the card;

j. If things went as planned, the character of the detective student and the student with the highest similarity score should match.

Check for Understanding

During the “Direct Instruction & Guided Practice” section, it is important that teachers keep on asking questions throughout the activity, to make sure that students are feeling comfortable with all the new information and tasks.

Independent Practice

After this first part, the teacher can split the class into groups of 5-7 students. They can perform the same activity two or three times while the teacher moves between groups to make sure that students are doing right and to solve any problems/clarification questions.

Closing

1. This is the perfect opportunity to open up the class for a group discussion. Teachers can ask students questions that help them realize the importance of the activity/lesson with questions like, “how will you use this information in your everyday lives?”, “have you ever experienced similar situations?” or “what changes could this bring in the future?”.

2. Remember that this is not part of the final assessment, which is made at the end of each module. Instead this closing part aims to make the students critically reflect on what they have just done, making sure that they learn clearly and simply, answering any clarification questions about topics not understood.

Troubleshooting

Possible issue	Possible solution
Teachers don’t have time to search for different characters to print and use in class.	We should provide a list of images ready to be printed and used in class.
Printed characters might look too similar to be properly differentiated from the similarity score.	We should choose different characters in order to simplify the process and to better differentiate their characteristics.
Teachers can’t print the characters at school or they forget the printed ones at home.	Teachers can show the characters on a screen to each participant, making sure that the “detective student” does not see them before the similarity score is completed.

Resources for teachers

Dog pictures
https://drive.google.com/drive/folders/1tSteP04VOlGvoVaCWWxQ41PyOYkM-nNR

https://drive.google.com/drive/folders/1YsT321qg05bwt7LpiRUcQNqwn6kYXdR5 (Material in BULGARIAN)

“Breed table” - Breed table
Completed breed table with answers for each category - Breed categories