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: Object classification project

LEARNING SCENARIO	
School:	***Duration (minutes):*** 90
Teacher:	***Students' age:*** 13-14

Essential Question:	How does object classification work?

Topics:

- Interpreting outputs of object classification procedure

Aims:

- Practical use of object classification

Outcomes:

- Exploring the possibilities of machine learning extension in Scratch

Work forms:

- *work in pairs, group work*

Methods:

- *presentation, talk, discussion, interactive exercise*

ARTICULATION

Course of action (duration in minutes)

INTRODUCTION

Let's review what we've learned about object classification.
What is object detection?
How does object detection work?

The teacher leads a project in which students repeat the commands and skills used in Scratch and skills to train labels for object classification.

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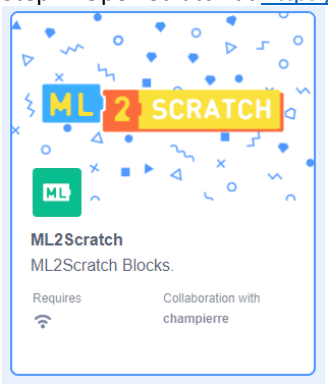
Defining the goal of the lesson:
Understanding of object classification procedure and its usage through practical projects .
Answer and discuss these questions in steps 10 and 12 of the project.

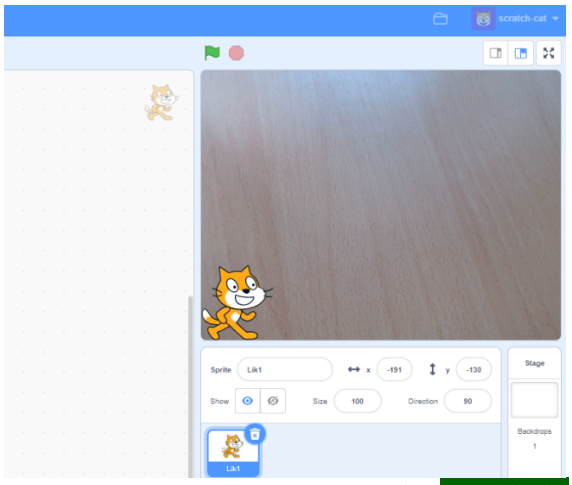
MAIN PART

Step 1: Connect webcam

Step 2: Open Scratch at https://stretch3.github.io/ and Add extension "ML2SCRATCH"



Step 3: Clean up the desk plug in and point webcam to an empty area, move a cat sprite to the corner as shown



Step 4: From ML2SCRATCH group pick a train label 1 and train label 2 blocks and place it on a programming area and check counts of labels 1 and counts of labels 2 as shown

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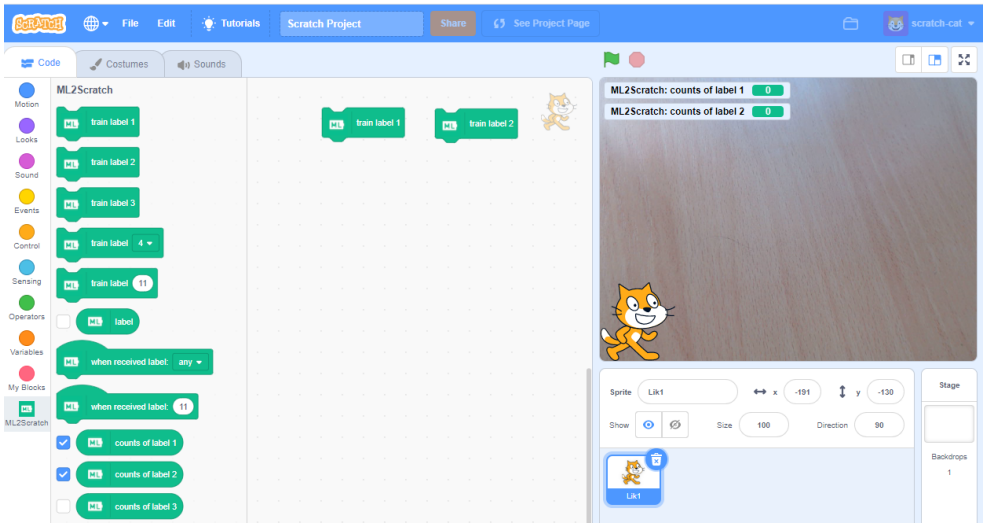
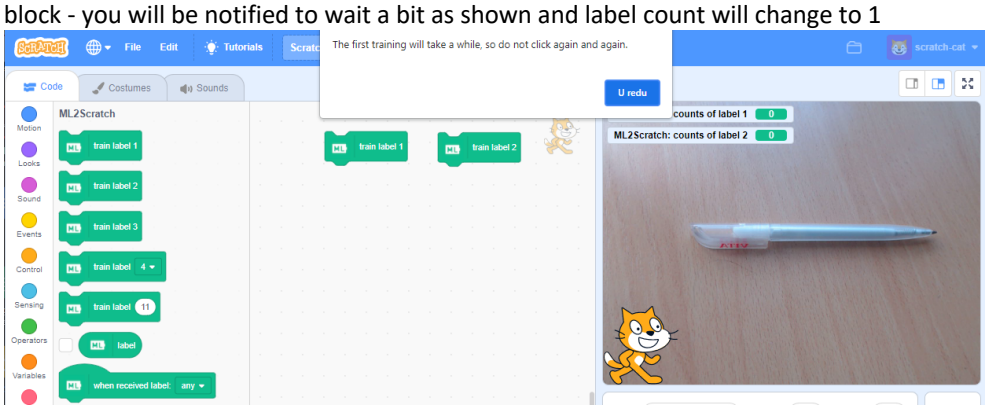
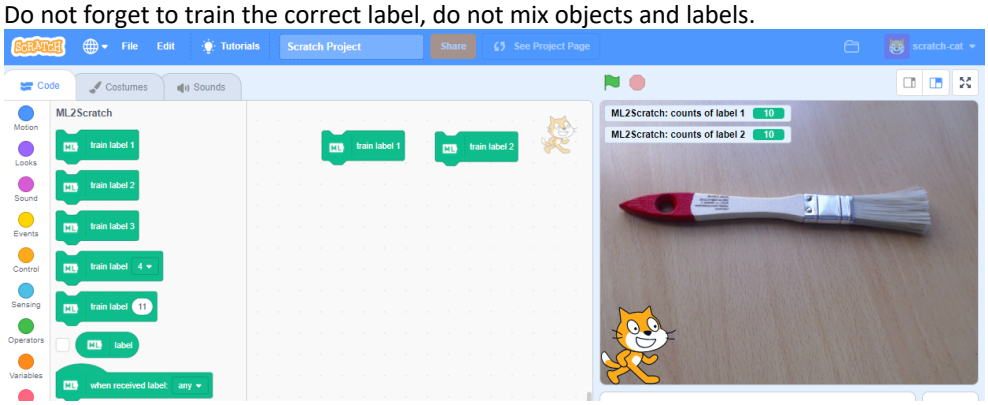


Step 5: Prepare two groups of objects for machine learning. In our case brushes and pens will be used for training the labels

Step 6: Place a first object from first group to the area the webcam is pointed at and click on train label 1 block - you will be notified to wait a bit as shown and label count will change to 1



Step 7: Take approximately 10 images of each object and vary a shape and placement.
Do not forget to train the correct label, do not mix objects and labels.



Step 8: Now pick two blocks when received label: any and change any to 1 on first and change any to 2 on second block as shown

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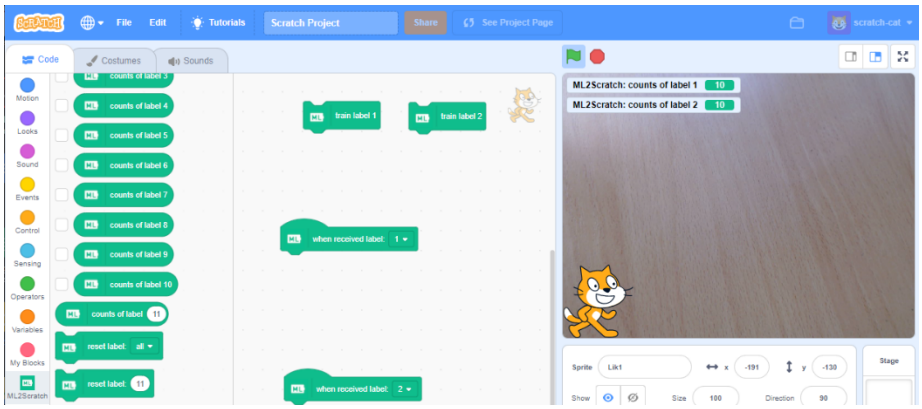
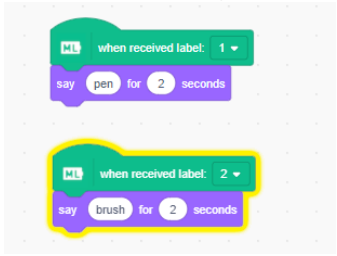
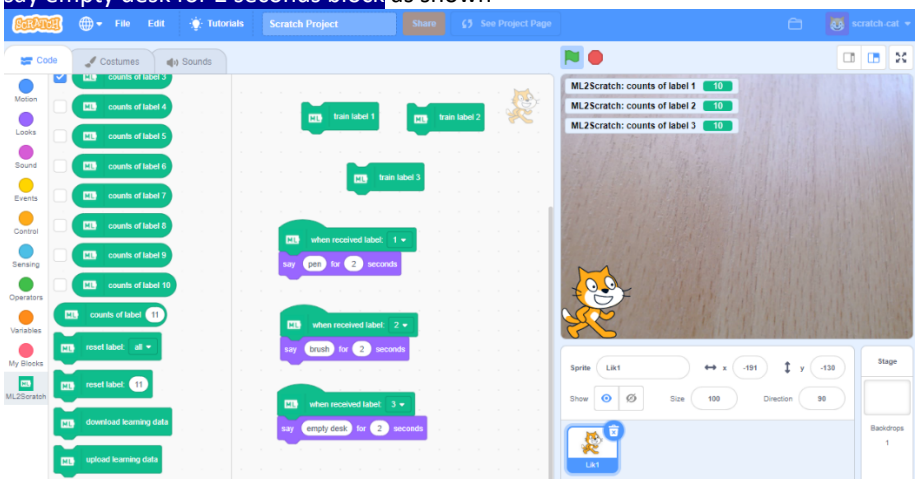


Step 9: From the Look group pick two say Hello! for 2 seconds blocks and change “Hello!” to “pen” on the first block and change “Hello!” to “brush” on second block as shown



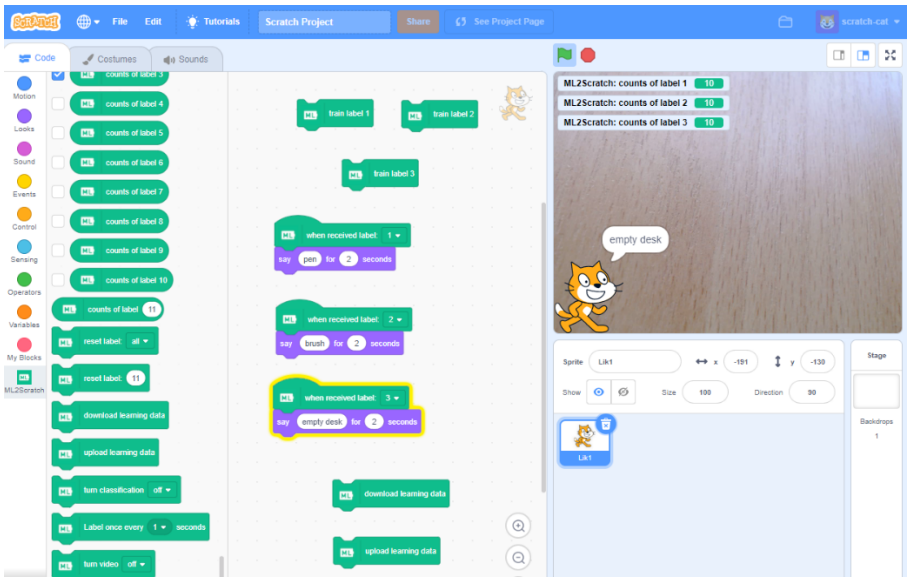
Step 10: Place randomly objects from two groups in the camera view area and note what's happening. Does it work? What's going on when no object is placed? How to solve an empty desk glitch?

Step 11: Solution: Use the third label, train it on empty desk and add the when received label 3 block with say empty desk for 2 seconds block as shown



Step 12: Discuss the accuracy of prediction. Try to train each label more and compare it with previous results. Does the accuracy improve?

Step 13: Use more groups of objects to train more labels. Download and upload your trained data with download learning data and upload learning data blocks (just click on block to save or upload .json file)



CONCLUSION

In simple words, image classification is a technique that is used to classify or predict the class of a specific object in an image. The main goal of this technique is to accurately identify the features in an image.
In general, the image classification techniques can be categorized as parametric and non-parametric or supervised and unsupervised as well as hard and soft classifiers. For supervised classification, this technique delivers results based on the decision boundary created which mostly relies on the input and output provided while training the model. But, in the case of unsupervised classification, the technique provides the result based on the analysis of the input dataset own its own; features are not directly fed to the models. The main steps involved in image classification techniques are determining a suitable classification system, feature extraction, selecting good training samples, image pre-processing and selection of appropriate classification method, post-classification processing, and finally assessing the overall accuracy. In this technique, the inputs are usually an image of a specific object, and the outputs are the predicted classes that define and match the input objects.
Now that we know all of this, please compare object classification and object recognition.

Do the (**K**now, **W**ant, **L**earned) chart with your students K.W.L..

What I **K**now	What I **W**ant to Know	What I **L**earned

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Methods	***Work forms***
presentation *interactive exercise / simulation on the computer*	*individual work* *work in pairs* *group work*

Material:

- https://stretch3.github.io/

Literature

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PERSONAL OBSERVATIONS, COMMENTS AND NOTES