



TITLE: Face detection and recognition for beginners in Scratch

LEARNING SCENARIO

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

Essential Question:

What is face detection and recognition?

Topics:

- Face detection and recognition for beginners in Scratch

Aims:

- To learn about face detection and recognition for beginners in Scratch

Outcomes:

- Becoming familiar with face detection and recognition with the help of simple examples in Scratch.
- Understanding the difference between Face detection and Face recognition

Work forms:

- work in pairs, group work

Methods:

- presentation, talk, discussion, interactive exercise

ARTICULATION

Course of action (duration in minutes)

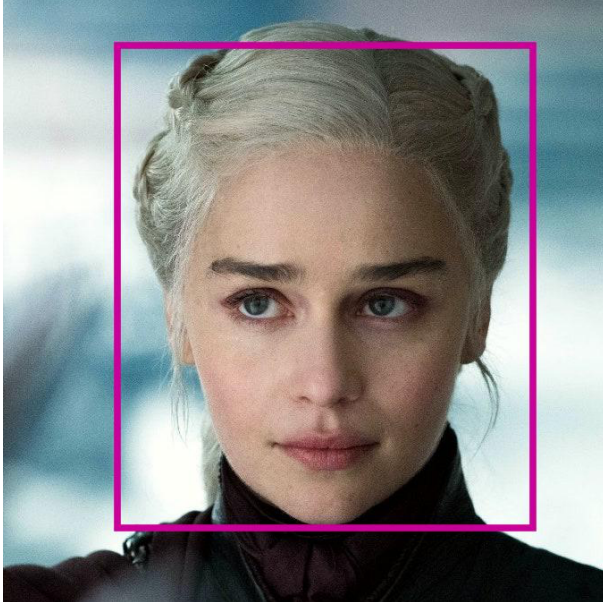
INTRODUCTION

Students should be asked to define what face recognition and face detection are. Give them an opportunity to describe the difference.



Terms face detection and face recognition are sometimes used interchangeably, but there are some key differences. To help clear things up, let's look at the term face detection and how it differs from the term face recognition.

Face detection is a process that determines the presence of face(s) in a still image or in a video clip. For example, such a function is available in most smartphone camera software. But the face detection module does not determine whose face is in the frame.



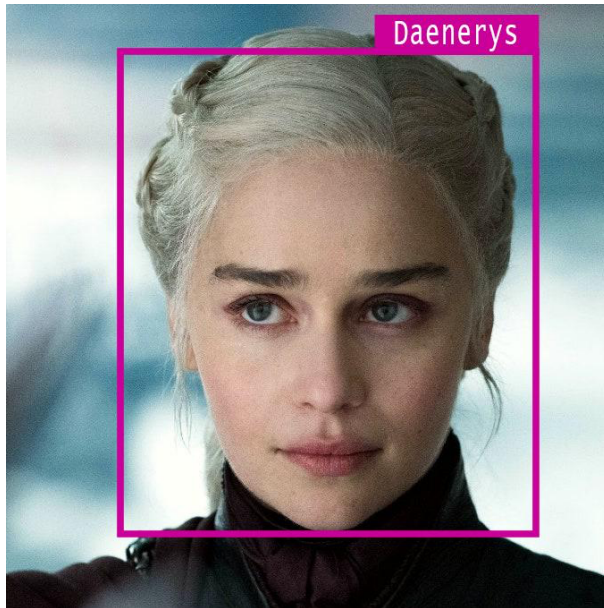
Face Detection does not memorize or save facial features. If the software detects a face of some particular person in the frame and later finds the same face on another image, it will not determine that the face belongs to the same person; it will just detect the presence of a face in the frames. The software can provide data regarding age and sex of a person on each frame, but no more than that. Face Detection software cannot recognize particular persons.

In contrast, Face Recognition relates to identifying and recognizing persons.

The purpose of software-based face recognition is to perform identification of persons appearing in a still image or a video clip by comparing it to a database. To ensure successful identification, the corresponding faces must first be entered into the database.



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The software determines the unique features of a face, saves them and uses them for subsequent identification. Later, during the identification process, the software will compare the unique features and identify a face of a particular person in case these features match.

Defining the goal of the lesson:

Introduction to face detection and recognition for beginners through examples of different applications.

MAIN PART

Scratch/Scratch based and other applications to use

Scratch (ML4KIDS) - <https://machinelearningforkids.co.uk/scratch3/>

Face detection extension with 3 reporter type blocks is available. In case that you're using a web camera as a source, combine it with Video sensing extension to turn camera video on/off and set transparency.



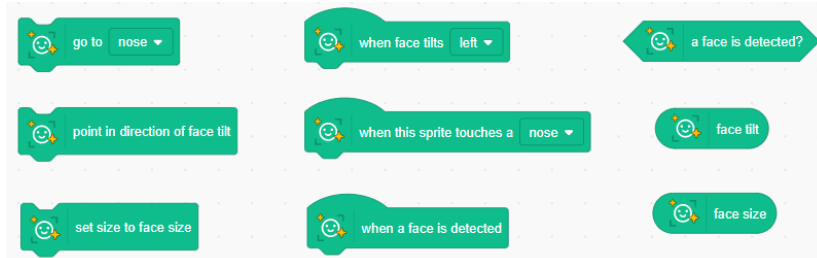
Scratch (MIT) - <https://lab.scratch.mit.edu/face/>

Click on "Try it out" and you will have 9 blocks for face recognition handling.



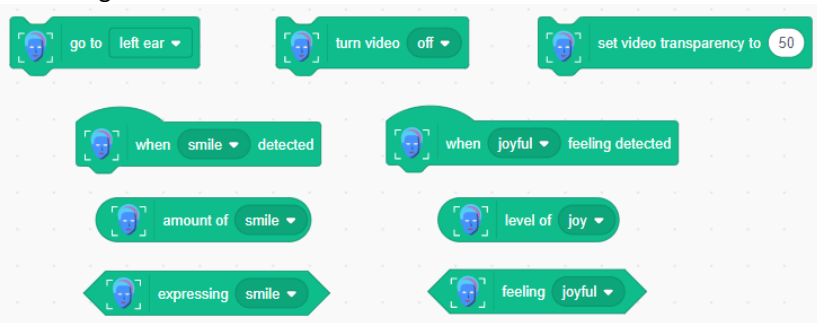


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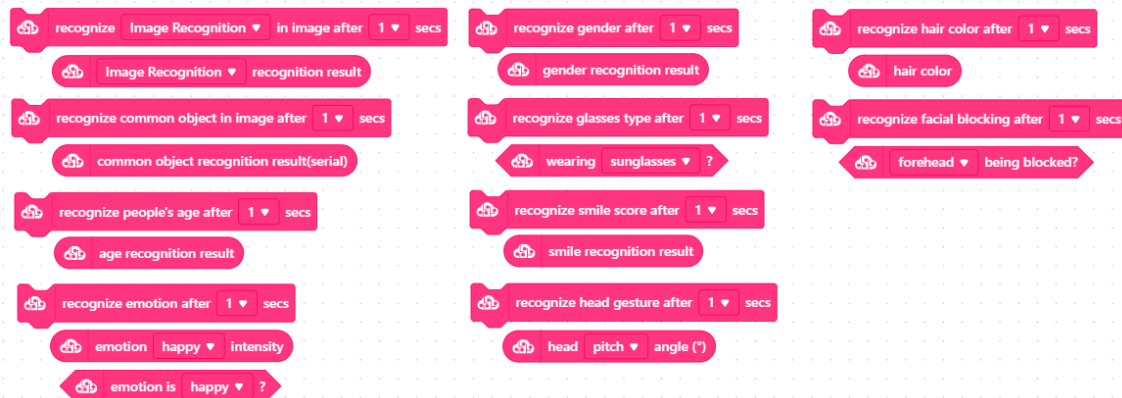
Scratch (MITMEDIALAB) - <https://mitmedialab.github.io/prg-extension-boilerplate/create/>

Load Face sensing extension and you will have 9 blocks for face detection handling. Some blocks are used for facial expression and feeling recognition. You can also use Teachable machine extension in combination with Google Teachable machine.



Makeblock (mBlock) - <https://ide.mblock.cc/>

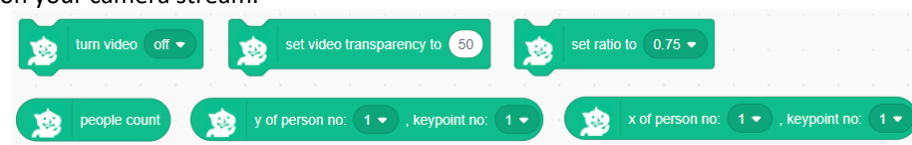
Load Cognitive services and Video Sensing extensions and you will have variety of blocks. There is no specific block for face detection, but you can detect a person inside a “recognize” block. But plenty of blocks are there to handle emotion, age, gender, smile, hair color, glasses and even a situation when you cover a part of your face.



Makeblock also provides Teachable machine extension (not to be confused with Google’s) where you can train up to 3 classes and use it for facial recognition or object detection.

Stretch3 (github.io) - <https://stretch3.github.io/>

Load Facemesh2Scratch extension to use 3 blocks for face detection (there are additional 3 blocks for handling video). Main feature is multiple face detection capability so you can detect more than one person on your camera stream.

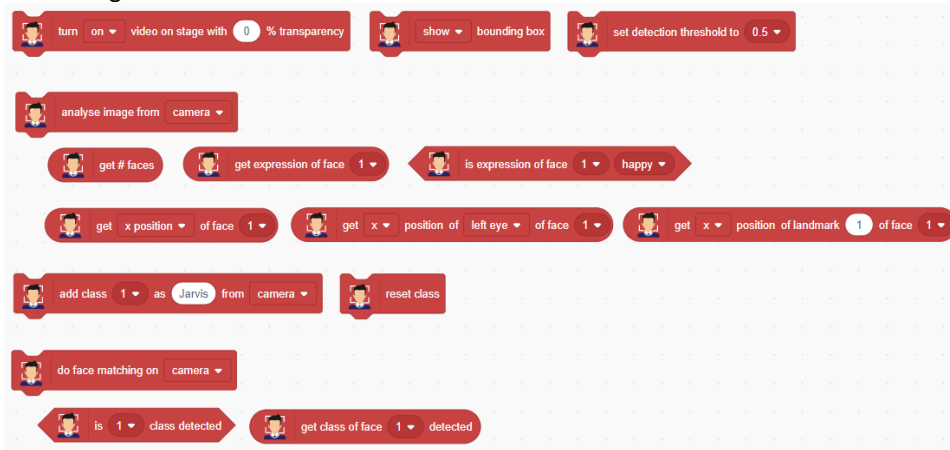




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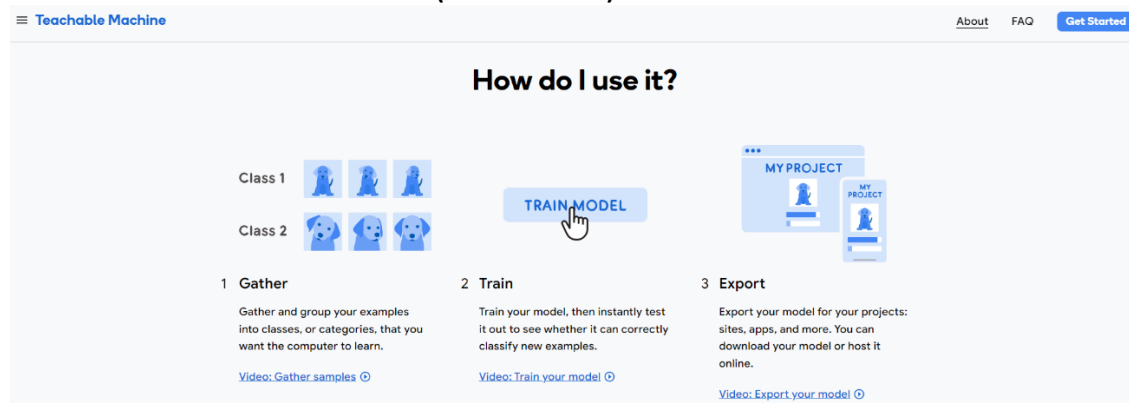
The last one to use is **PictoBlox**, a desktop type application which must be installed first from <https://thestempedia.com/product/pictoblox/download-pictoblox/> (427 Mb)

After installation use Face Detection extension and there you will see a pure treasure - you can detect multiple faces and their facial expressions. Also, there is a feature to train classes which leads us directly to facial recognition.



Teachable machine (Google) - <https://teachablemachine.withgoogle.com/>

This application is used to train your model and use it for face recognition in combination with Teachable machine extension available in **Scratch (MITMEDIALAB)**



CONCLUSION

We have seen three different applications but also a very similar one for face detection and recognition. Face Detection differs from Facial Recognition (the terms should not be used interchangeably) in that Face Detection involves only the detection of a face within a digital image or video. It simply means that the face detection system can identify that there is a human face present in an image or a video – it cannot identify the person. Face detection is a component of Facial Recognition systems – the first stage of facial recognition is detecting the presence of a human face in the first place. Face detection can also be used in cameras to help with auto-focus – you have probably noticed that on some digital cameras and phones, a





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small box will appear around the faces of people detected within the image, allowing the camera to prioritise focus on those faces. Identifying the presence of a human face is done using formulas and algorithms. Typically, the first thing that a face detection system will look for will be the eyes as these are one of the easiest features to identify. Then it might also search for the presence of mouth, eyebrows, nose, and nostrils. Face detection is an important part of the facial recognition process, however, from a security perspective, there is no independent benefit of a face detection system – it simply recognises a face is present but has no idea about the identity of that face. Facial recognition is playing a vital role across a huge range of industries, especially in border control and law enforcement. Accurately identifying individuals is helping to improve security and safety at airports and in towns and cities around the world, and this can only be done using market-leading facial recognition systems. As we can see, Facial Recognition technology is changing the world in which we live, and it feels like we are only just scratching the surface in terms of potential applications of facial recognition software. While uses for facial recognition may seem endless, we need to ensure that this technology is used appropriately and responsibly.

Now we are familiar with basic commands, and ready to do the same basic programming for face detection and recognition. Do the K.W.L. (**K**now, **W**ant, **L**earned) chart with your students. This table should include three columns. In the first column, write what you already know about the topic. In the second column, write what you want to know about the topic. After you have completed your research, write what you learned in the third column. Below you can find a table with sample answers.

What I K now	What I W ant to Know	What I L earned
Programing in Scratch	How to write a program for face detection and face recognition	Simple program for face detection and face recognition

Methods

presentation
interactive exercise / simulation on the computer

Work forms

work in pairs
group work

Material:

- <https://machinelearningforkids.co.uk/scratch3/>
- <https://lab.scratch.mit.edu/face/>
- <https://mitmedialab.github.io/prg-extension-boilerplate/create/>
- <https://ide.mblock.cc/>
- <https://stretch3.github.io/>
- <https://thetempedia.com/product/pictoblox/download-pictoblox/>
- <https://teachablemachine.withgoogle.com/>





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Literature

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PERSONAL OBSERVATIONS, COMMENTS AND NOTES

