



TITLE: Programing face recognition in Scratch

LEARNING SCENARIO

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

Essential Question:

How to program face recognition in Scratch

Topics:

- Programing face recognition in Scratch
- Interpreting outputs of face recognition algorithm

Aims:

- To learn to program face recognition with uploaded examples
- Practical use of face recognition

Outcomes:

- Knowing how to write a program for face recognition using Scratch
- Exploring the possibilities of face recognition extension in Scratch

Work forms:

- *work in pairs, group work*

Methods:

- *presentation, talk, discussion, interactive exercise*

ARTICULATION

Course of action (duration in minutes)

INTRODUCTION

In order to understand face recognition, we need to review what we've learned so far.

What is face recognition?

How does face recognition work?

What practical applications can it have?





Talk with your students about what they have learned about *face recognition*.
Do they know anything about making a program for *face recognition* before you lead them in?
The teacher introduces students to face recognition programming in Scratch and instructs them on how to upload images and then use these images for recognition programs.

Defining the goal of the lesson:

Through examples of one program, you will gain a better understanding of face recognition programs and their use.

MAIN PART

Step 1: Open your web browser and download all 20 images from: <https://bit.ly/daenerys-data>

It will be used to train Class 1

Step 2: Open your web browser and download all 20 images from: <https://bit.ly/arya-data>

It will be used to train Class 2

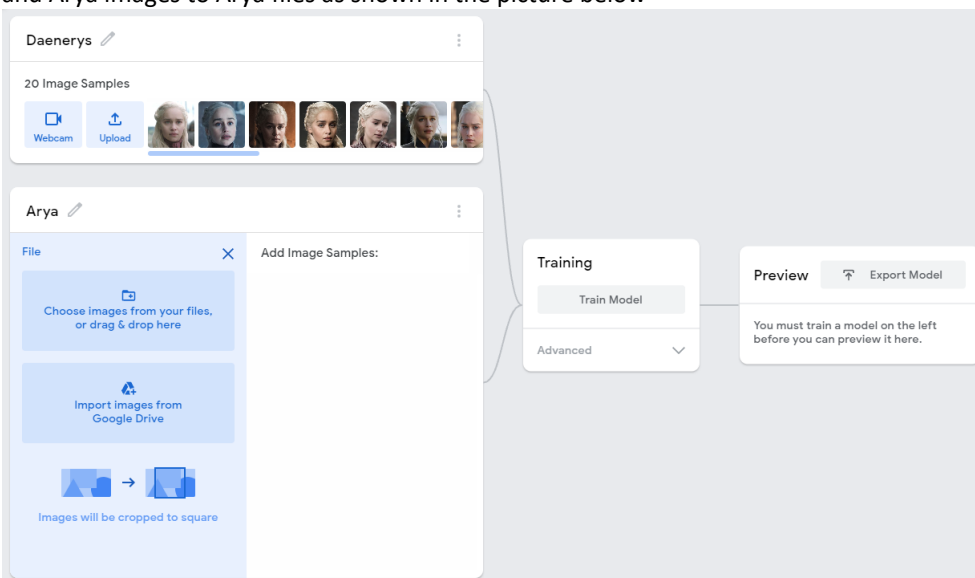
Step 3: Open your web browser and go to: <https://teachablemachine.withgoogle.com/>

Step 4: Click on Get started.

Step 5: Choose the Image project

Step 6: Choose the Standard image model

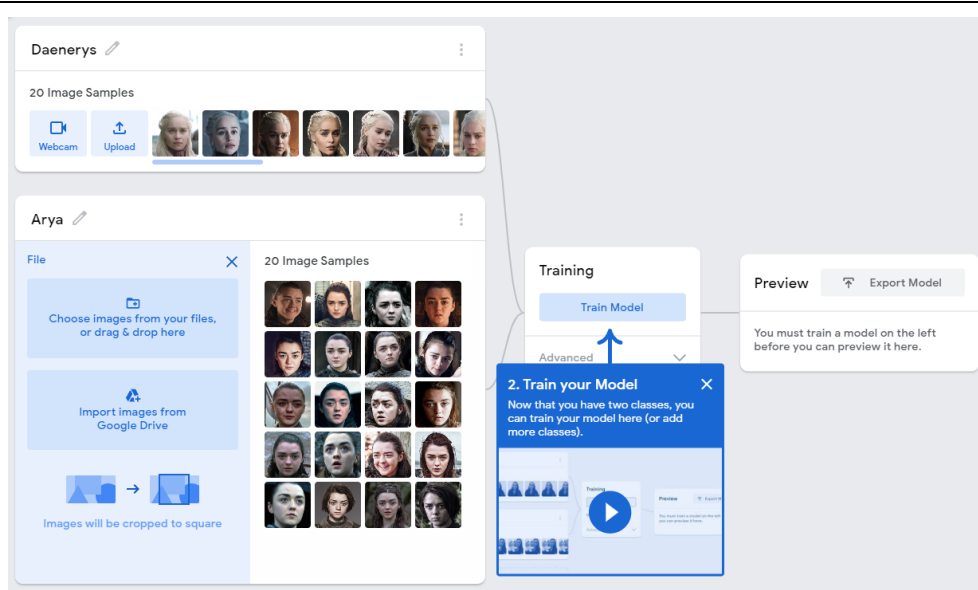
Step 7: Change Class 1 name to Daenerys and Class 2 to Arya. Upload Daenerys images to Daenerys files and Arya images to Arya files as shown in the picture below



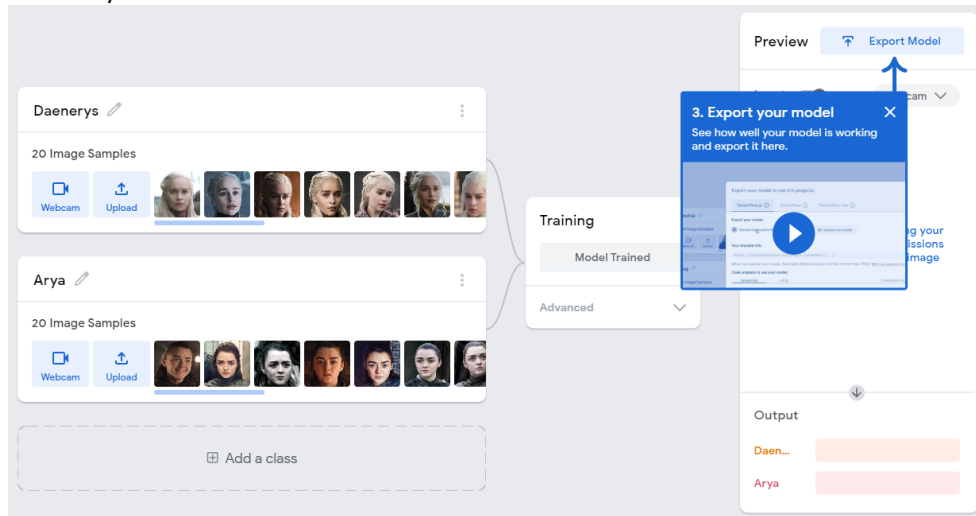
Step 8: Train your model. Don't switch browser tabs during training process.



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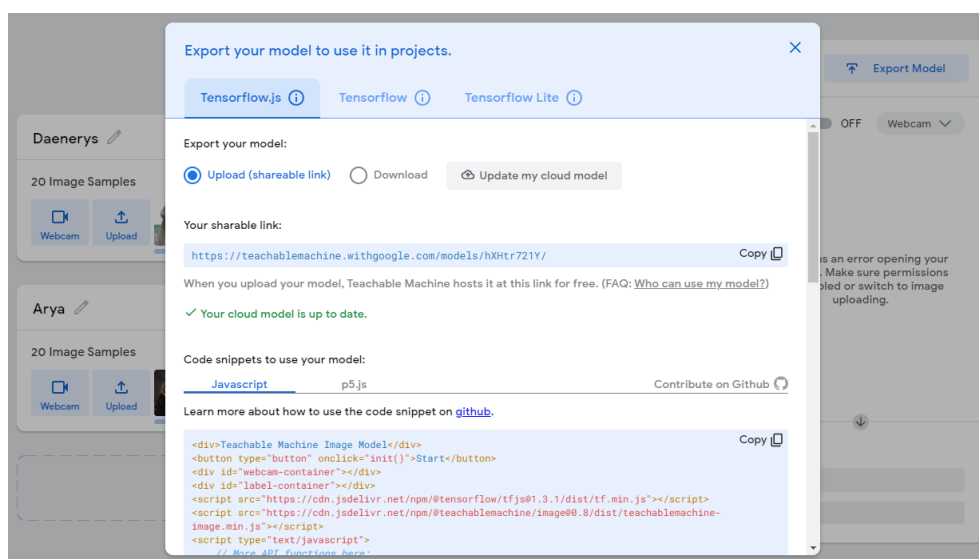
Step 9: Export your model. On the pop-up window choose to upload it to cloud (third option) and Google will host your data for free.



Step 10: Copy the link given in the text field below - this is the URL of your model.
In this case it was <https://teachablemachine.withgoogle.com/models/hXHtr721Y/>



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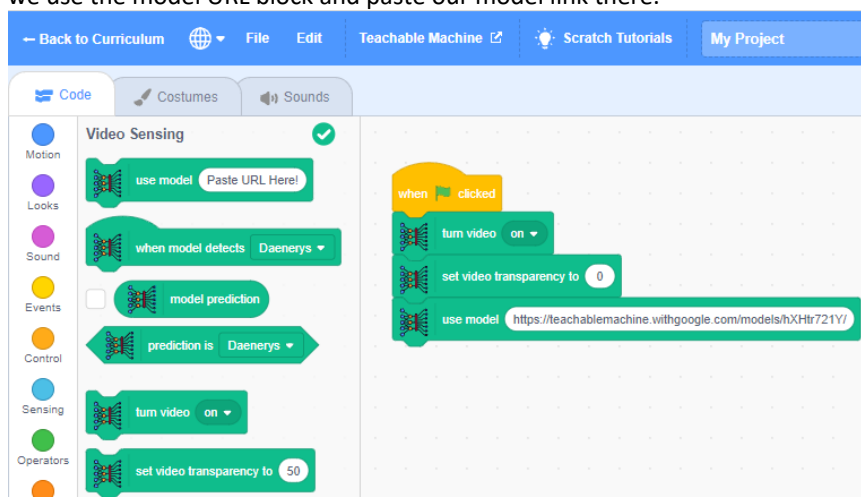


Step 11: Your model is ready to use

Step 12: Open Scratch GUI at: <https://mitmedialab.github.io/prg-extension-boilerplate/create/> and load Teachable Machine extension.



Step 13: First, we must turn on video from camera and set the transparency to 0 (non-transparent). Next, we use the model URL block and paste our model link there.

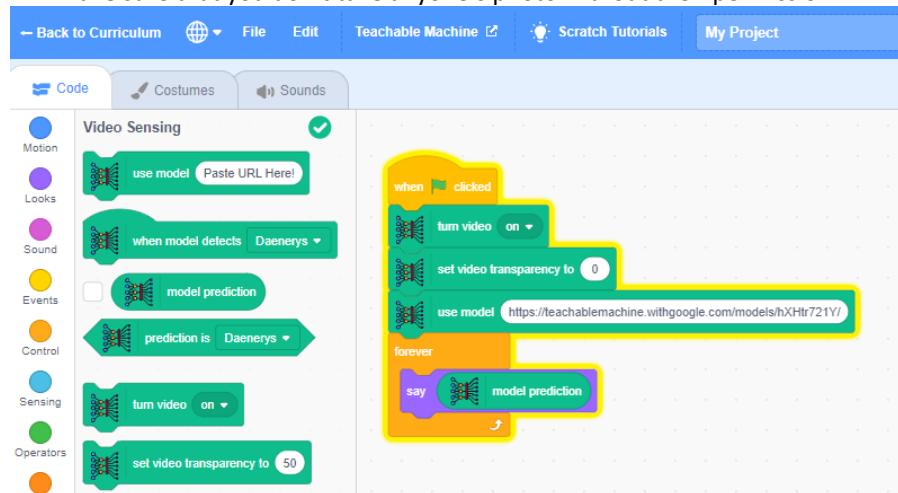


Step 14: Last few blocks are loop (forever) and say block which contains reporter type block with the prediction result. I'm pretty sure that you won't be able to get the real Daenerys or Arya in front of your camera so use your smartphone with their images and point it to the camera to see the results. You can

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train the model with your own images or images of your friends.

*** Make sure that you don't take anyone's photo without their permission.

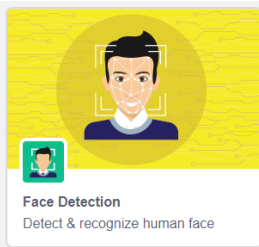


PICTOBLOX (Desktop application):

Step 1a: Since there is no online GUI available, you have to install PictoBlox from:

<https://thestempedia.com/product/pictoblox/download-pictoblox/> (427 Mb)

Step 2a: Open PictoBlox and choose Face detection expansion



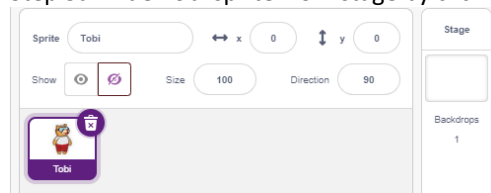
Step 3a: Open your web browser and download all 20 images from: <https://bit.ly/daenerys-data>

It will be used to train Class 1

Step 4a: Open your web browser and download all 20 images from: <https://bit.ly/arya-data>

It will be used to train Class 2

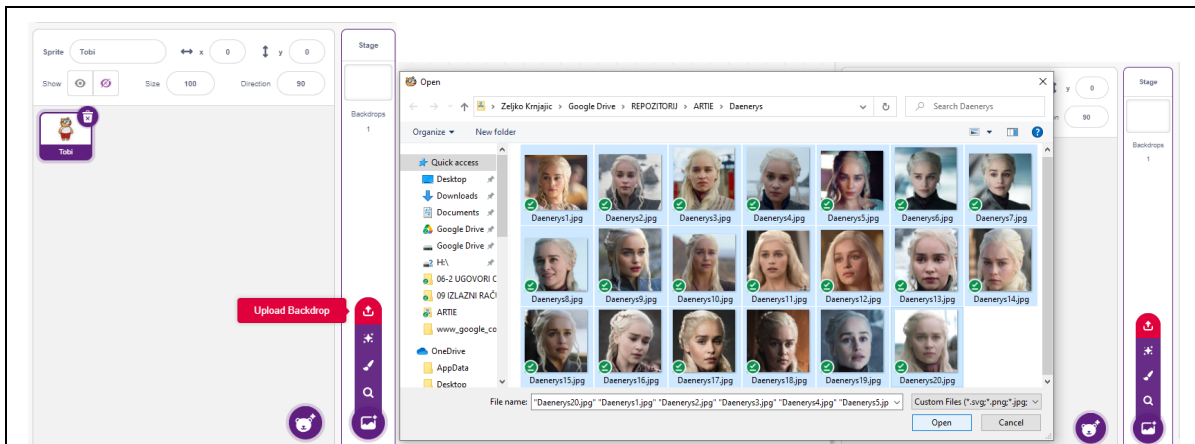
Step 5a: Hide Tobii sprite from stage by clicking on icon as shown on picture below.



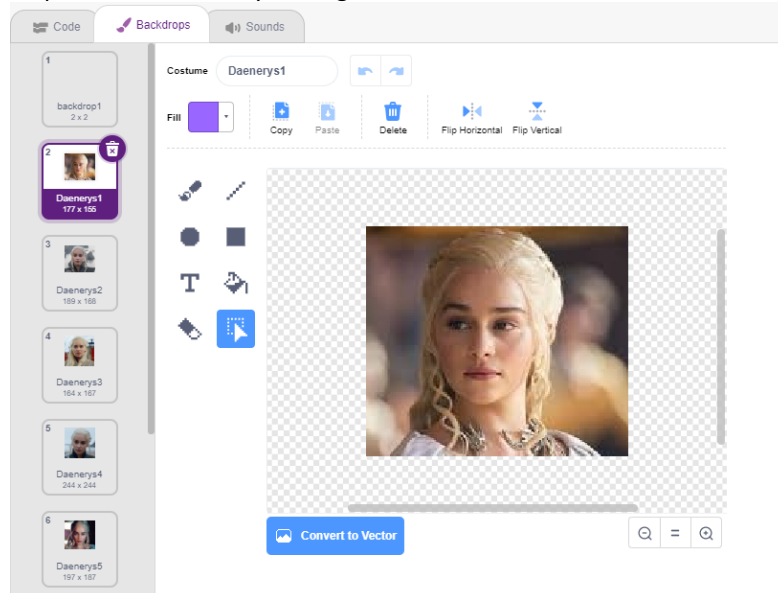
Step 6a: Upload all Daenerys images to backdrop (Upload backdrop - Select all images - Open)



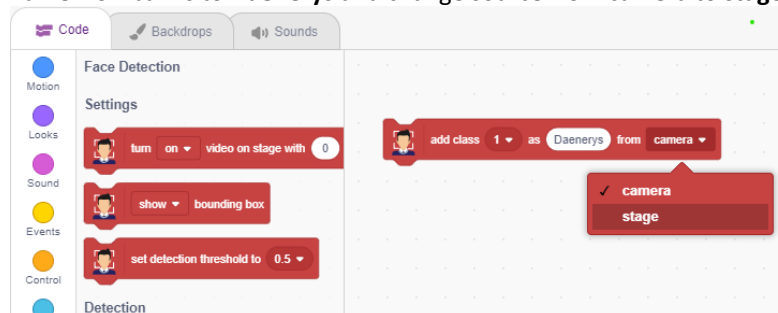
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Step 7a: Select Daenerys1 image and switch to Code tab



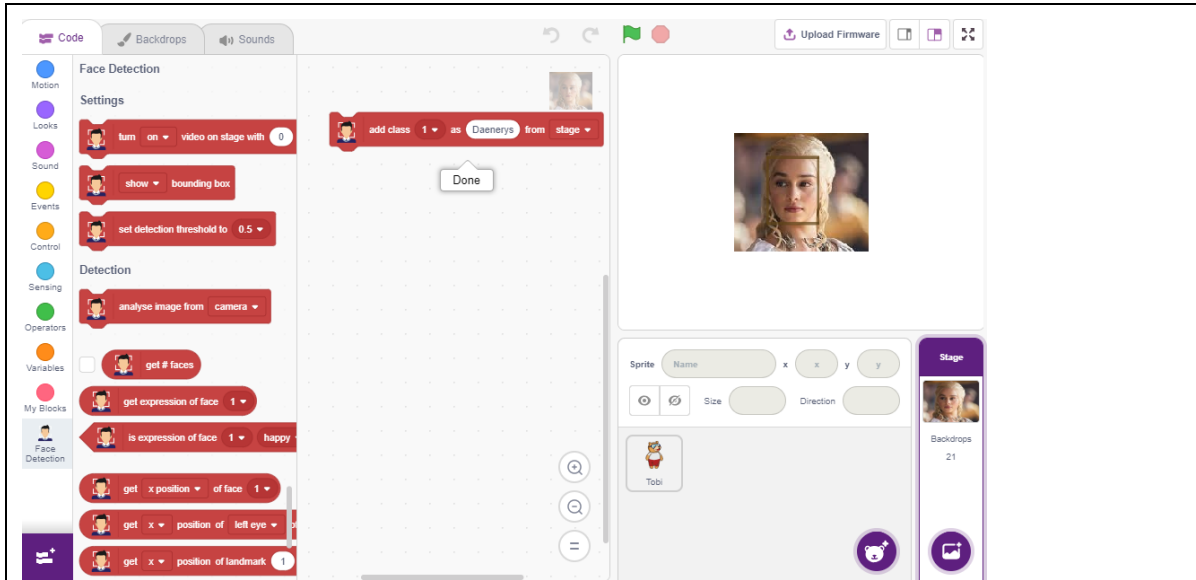
Step 8a: In Face Detection group search for **add class** block, drag & drop it in code area and rename class name from Jarvis to **Daenerys** and change source from camera to **stage** as shown in picture below.



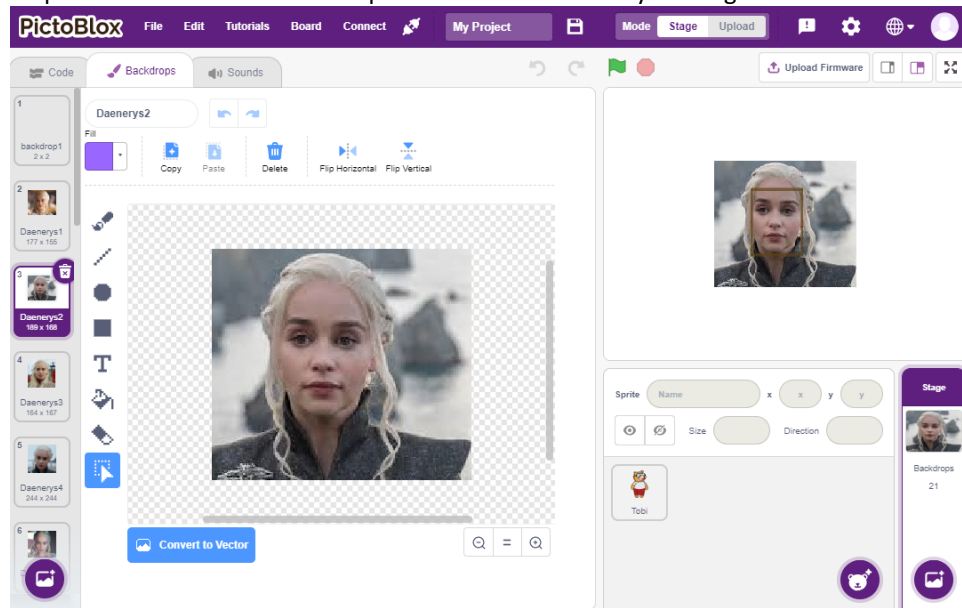
Step 9a: After changes have been made - just click on add class block to start training. You will receive a "Done" message and see the bounding box on Daenerys's face. Training with the 1st image is completed, and you will have to repeat these steps for every other image.



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Step 10a: Switch back to Backdrops tab and select Daenerys 2 image.

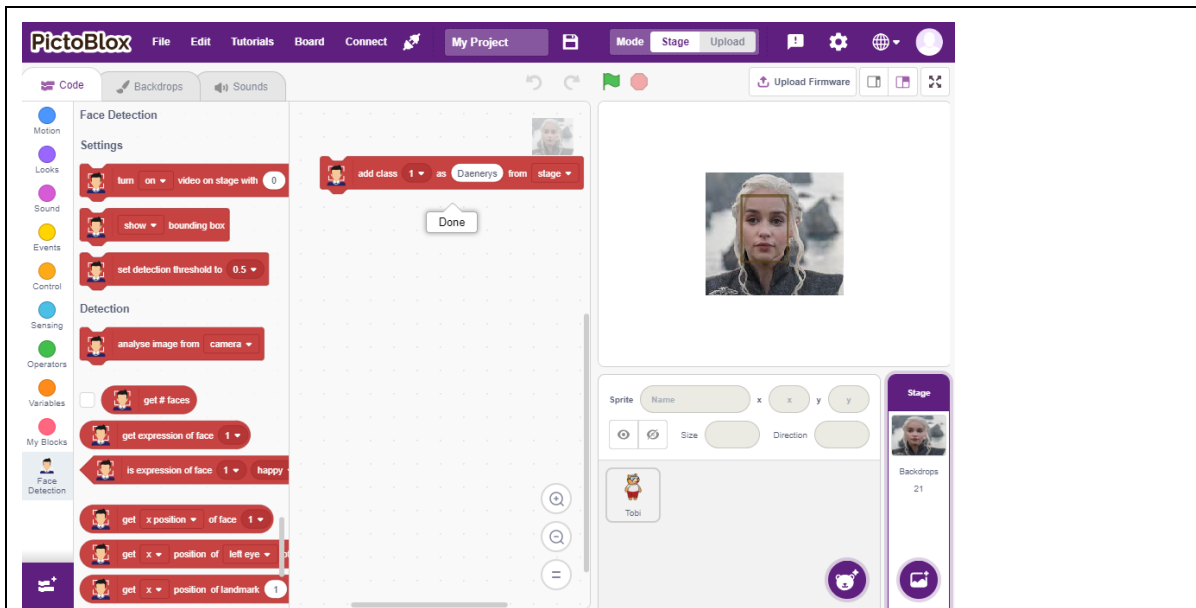


Step 11a: Switch back to Code tab and click on add class block again

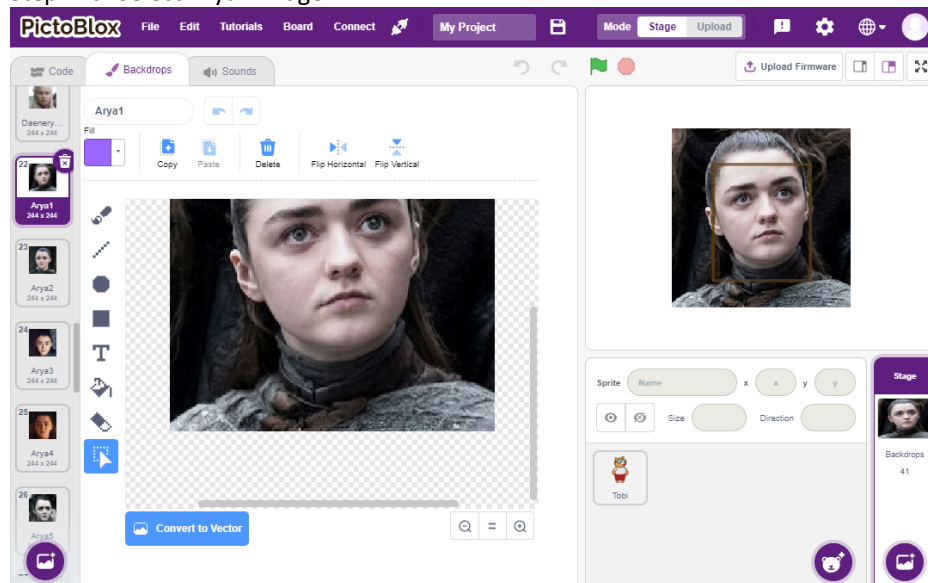




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Step 12a: Repeat Steps 10a and 11a for every single image (up to Daenerys20)
Step 13a: Now upload all Arya images to backdrop same way you did in Step 6a
Step 14a: Select Arya1 image

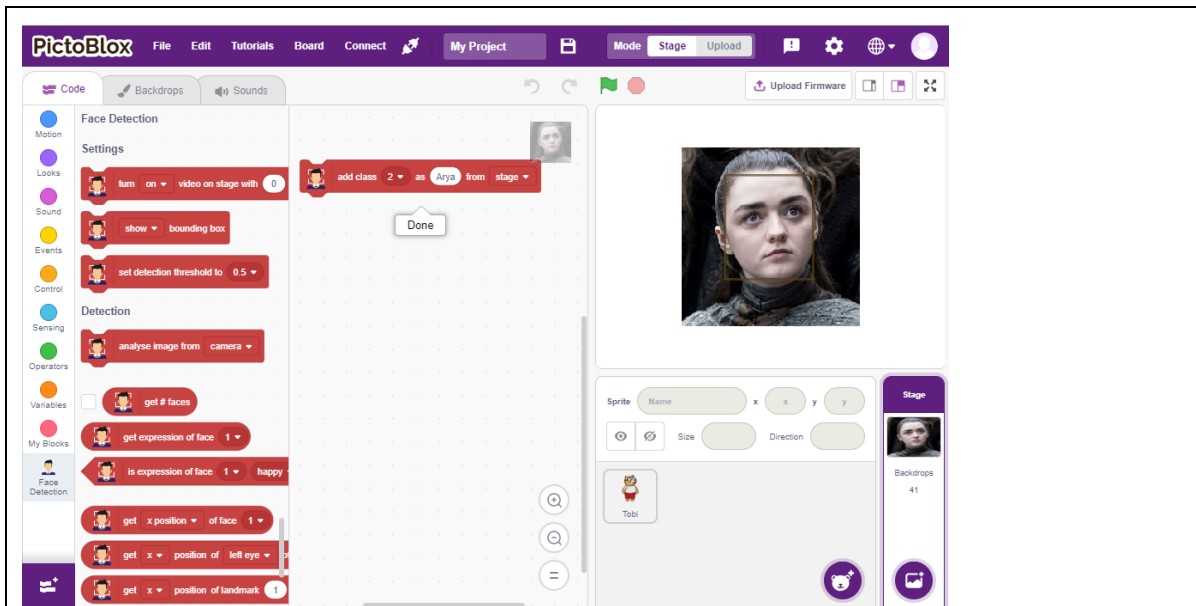


Step 15a: Switch back to the Code tab and **change** (this is important since we are training 2nd class) the **add class** name from Daenerys to **Arya**. Source remains the same - from the stage. After that click on that block to train the 1st image of Arya class.





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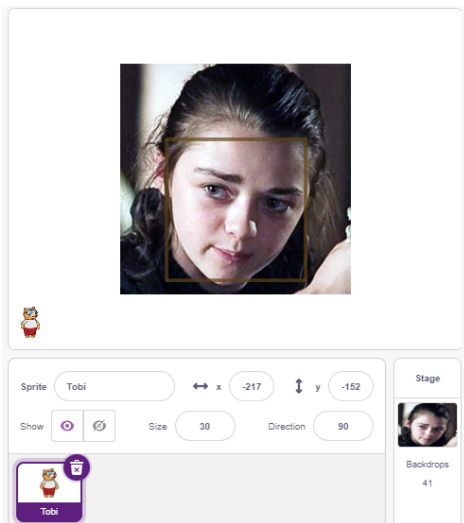


Step 16a: Switch to Backdrops tab and select Arya2 image

Step 17a: Switch to Code tab and click on **add class** block

Step 18a: Repeat Steps 16a and 17a for every single image (up to Arya20)

Step 19a: Your model is now ready for testing. Select Tobi sprite and make it visible (show). Set Tobi size to 30% and move it from centre to corner.

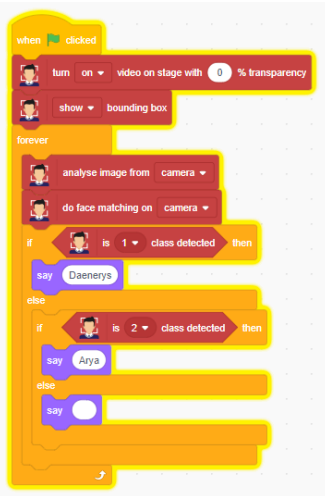


Step 20a: Plug in your camera (if you don't have one) and start coding. Turn on video with 0% transparency and show the bounding box. Next block is forever loop and Tobi will show the face recognition result based on face recognition result. It is a double if-else block and the last else case will return an empty string if no face is recognized.





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Step 21a: Start the program. Use your smartphone with images of Daenerys or Arya and point it to the camera to see the results. You can train the model with your own images or images of your friends.
*** Make sure that you don't take anyone's photo without their permission.

PROJECT WITH FACE RECOGNITION

INTRODUCTION

Here is a little project which is basically a use case of face recognition. We have prepared a trained model of 8 female celebrities for you in Teachable Machine to compare it with your face. We have Adriana Lima, Emilia Clarke, Gal Gadot, Natalie Portman, Selena Gomez, Emma Stone, Zoe Saldana, Maisie Williams. You'll have to find out which face from the list has most similarities with you.

MAIN PART

Step 1b: Open Scratch GUI at:
<https://mitmedialab.github.io/prg-extension-boilerplate/create/> and load Teachable Machine extension.



Step 2b: First, we set the sprite size and position and then turn on video from the camera and set the transparency to 0 (non-transparent). Next, we use the model URL block and paste this model link:
<https://teachablemachine.withgoogle.com/models/smuBDQTuY/>





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Step 3b: Next, we'll use an event type block which is face matching triggered. And just add a say block "You look like..." to it.

Step 4b: Add this combination of blocks for each celebrity in the list.

Step 5b: Plug in/enable your web camera, start the code, and see who your match is!

Step 6b: Want to change the current model with your own? There is a great celebrity images dataset at: <https://www.kaggle.com/hereisburak/pins-face-recognition>

You may be asked to register with Kaggle before you can download it.

Or you may collect images manually via Google search. After you collect all the images you want - use the Teachable machine at: <https://teachablemachine.withgoogle.com/> to train your model the way you did in **Programing face recognition in Scratch** scenario.





CONCLUSION

Face recognition is a technology capable of identifying or verifying a subject through an image, video, or any audiovisual element of his face. Generally, this identification is used to access an application, system, or service. Before we start programming face recognition, we must collect the photos of specific face and train the model. We have used an application called Teachable Machine. Teachable Machine is a web-based tool that makes creating machine learning models fast, easy, and accessible to everyone. Did you notice that this project is completely web based and no software installation is needed?

Today, many consumers worldwide regularly interact with facial recognition technology.

Key Functionalities of Facial Recognition:

Identity Verification:

Identify individuals and apply specified rules based on the category they fall into, for example, VIP, registered visitor, block listed, employee, or student. Use the information to enhance and automate processes such as (1) access control, (2) security protection, (3) customer or visitor greetings, and (4) employee time clocks.

eKYC and Spoofing Prevention:

Validate a person's identity using a live photo or video capture with a scanned (and verified) ID. This is called eKYC (electronic Know Your Customer) and is widely used in BFSI or similar cases.

Authorization:

Identify whether an individual is in a pre-authorized database to (1) withdraw cash from an ATM, (2) access a medical cabinet containing secured drugs, or (3) unlock expensive machinery requiring well-trained operators.

Customer Segmentation and Analytics:

For smart advertising, analyse the characteristics of a person standing in front of a digital sign, such as gender, age, and emotion.

Health Measures:

Confirm that a person is properly wearing a mask, as well as verifying they do not have a fever before granting access to a building or restaurant.

When looking at vertical markets, 10 industries stand out as being ripe for integrating facial recognition and, in many cases, are already embracing it:

1. Manufacturing and warehousing
2. Banking, Financial Services and Insurance (BFSI)
3. Smart offices
4. Smart homes and residential complexes
5. Retail
6. Public transportation and airports
7. Healthcare facilities
8. Schools and universities
9. Hospitality
10. Restaurants and bars

Discuss which face from the list has most similarities with you.

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

What I K now	What I W ant to Know	What I L earned
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Methods	Work forms
<p><i>presentation</i> <i>interactive exercise / simulation on the computer</i></p>	<p><i>work in pairs</i> <i>group work</i></p>

Material:
<ul style="list-style-type: none"> ● https://bit.ly/daenerys-data ● https://bit.ly/arya-data ● https://teachablemachine.withgoogle.com/ ● https://teachablemachine.withgoogle.com/models/hXHtr721Y/ ● https://mitmedialab.github.io/prg-extension-boilerplate/create/ ● https://thetempedia.com/product/pictoblox/download-pictoblox/ ● https://mitmedialab.github.io/prg-extension-boilerplate/create/ ● https://teachablemachine.withgoogle.com/models/smuBDQTuY/ ● https://www.kaggle.com/hereisburak/pins-face-recognition

Literature

PERSONAL OBSERVATIONS, COMMENTS AND NOTES

