AI FOR GOOD Summer Camp

INDIANA UNIVERSITY
BLOOMINGTON

Webpage link

https://bit.ly/iuaigood

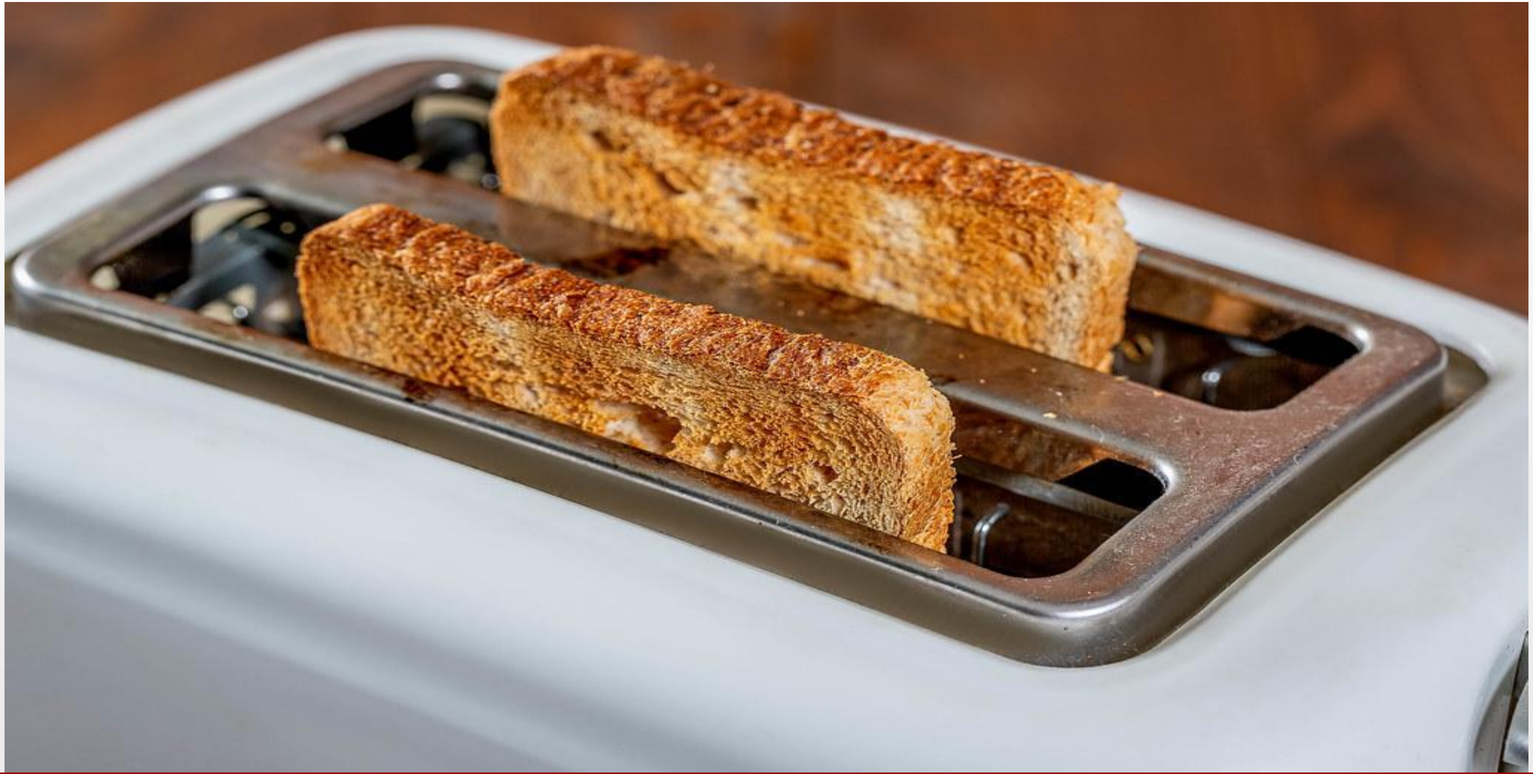
Day 1

Introduction

Check

your understanding of AI

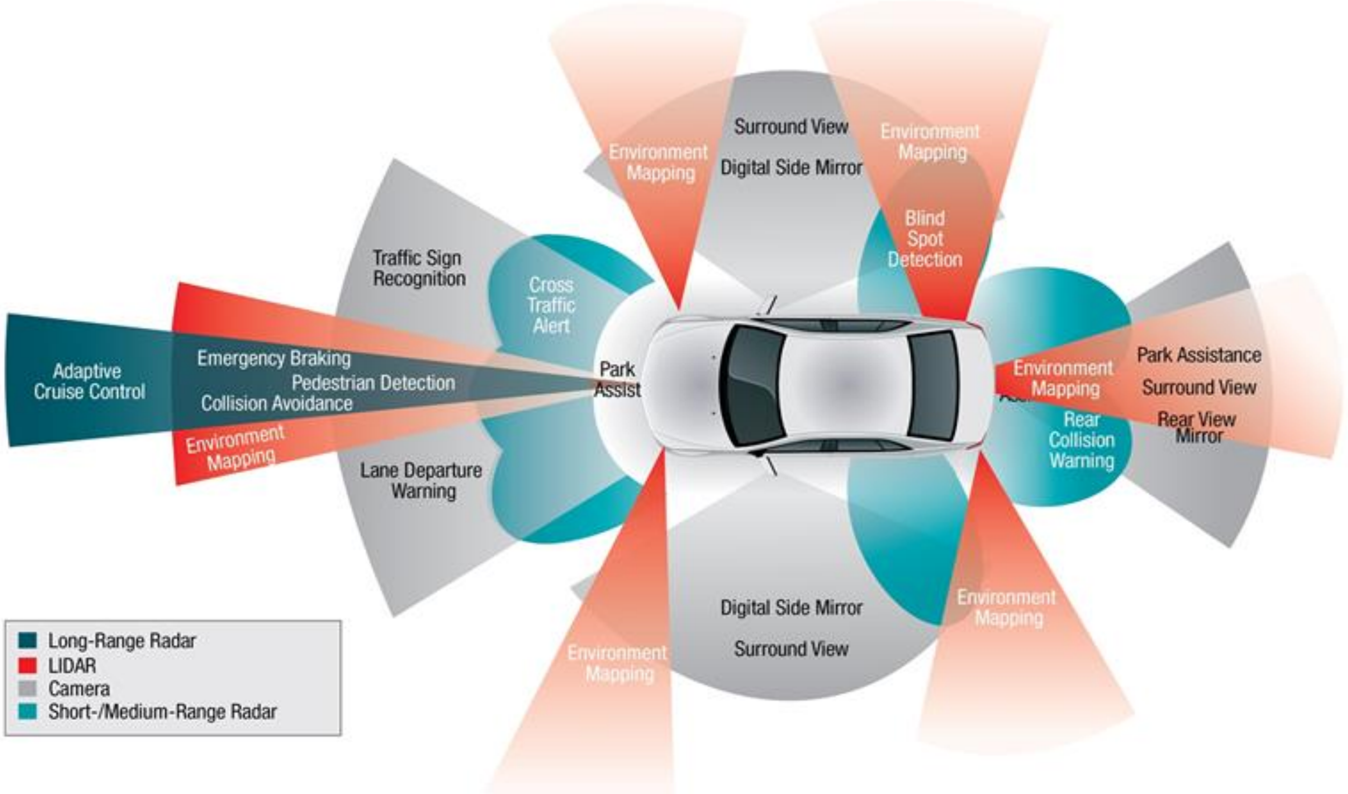
AI vs. Not AI



Toaster

Siri on iPhone

Barcode scanner


Surround View
Digital Side Mirror
Environment Mapping
Environment Mapping
Blind Spot Detection
Traffic Sign Recognition
Cross Traffic Alert
Adaptive Cruise Control
Emergency Braking
Pedestrian Detection
Collision Avoidance
Environment Mapping
Park Assist
Lane Departure Warning
Environment Mapping
Park Assistance
Surround View
Rear View Mirror
Rear Collision Warning
Digital Side Mirror
Surround View
Environment Mapping
Environment Mapping
Long-Range Radar
LIDAR
Camera
Short-/Medium-Range Radar

Smart Car

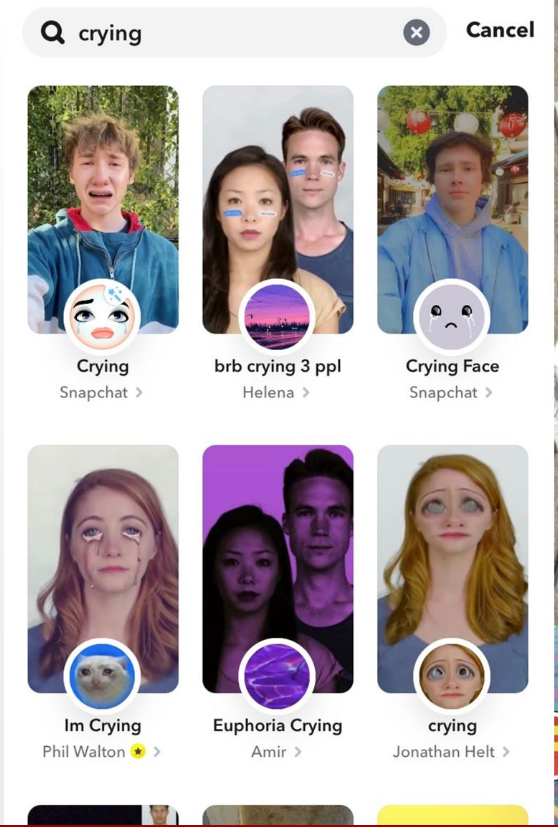
Washing Machine

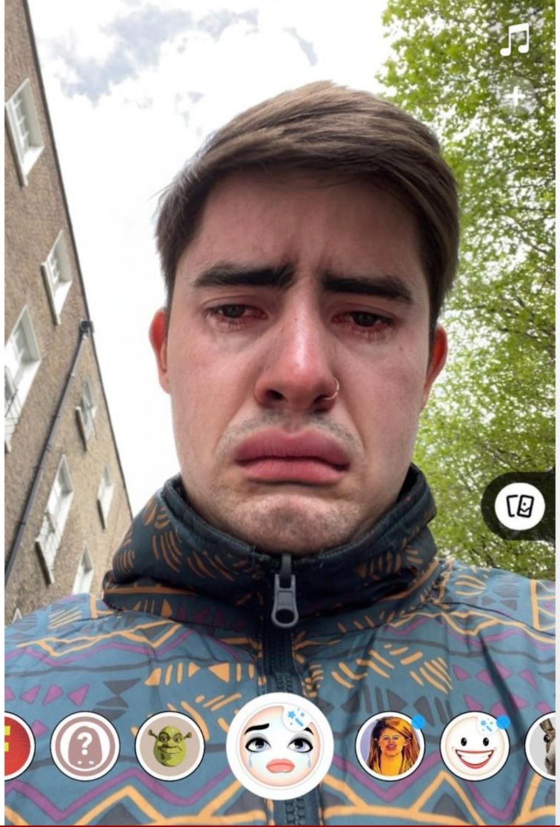
Netflix

Industrial robot

Delivery Robot

Mixer





Tiktok facefilter

Electronic toll collection

What is AI?
What does AI Stand for?

What is Artificial?

- Made by humans; produced by humans (opposed to natural): artificial flowers

What is Intelligence?

- An organism uses data to improve decision making

What is AI?

- A way for a computer program to work “intelligently”
- The art of teaching computers how to "think."
- A discipline concerned with the designing of computers that make predictions and decisions.

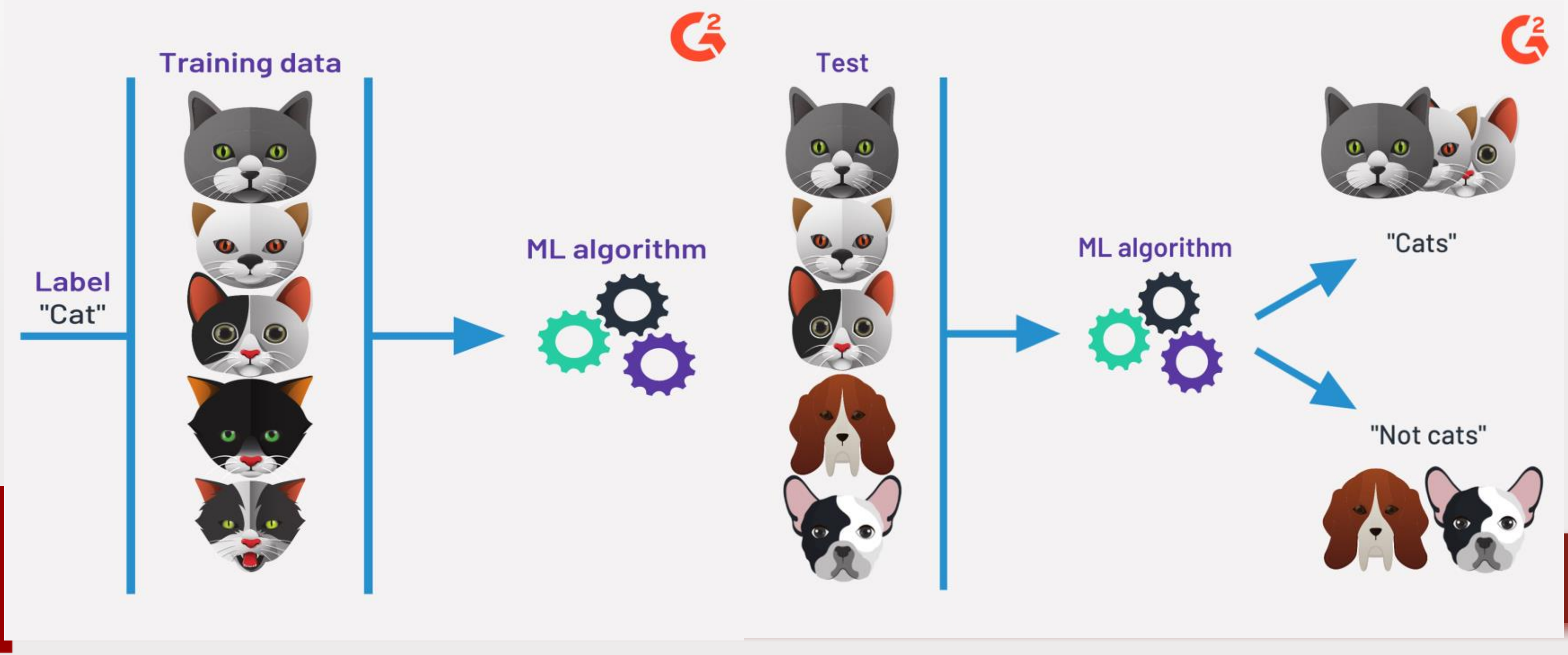
How AI works?

What is ML(machine learning)?

- Machine Learning (ML) is a process when AI learns for itself through data and experience
- Enable AI systems to come up with their own solutions
- Complete certain tasks at great speed and scale
- When you think of ML, who or what do you think of?

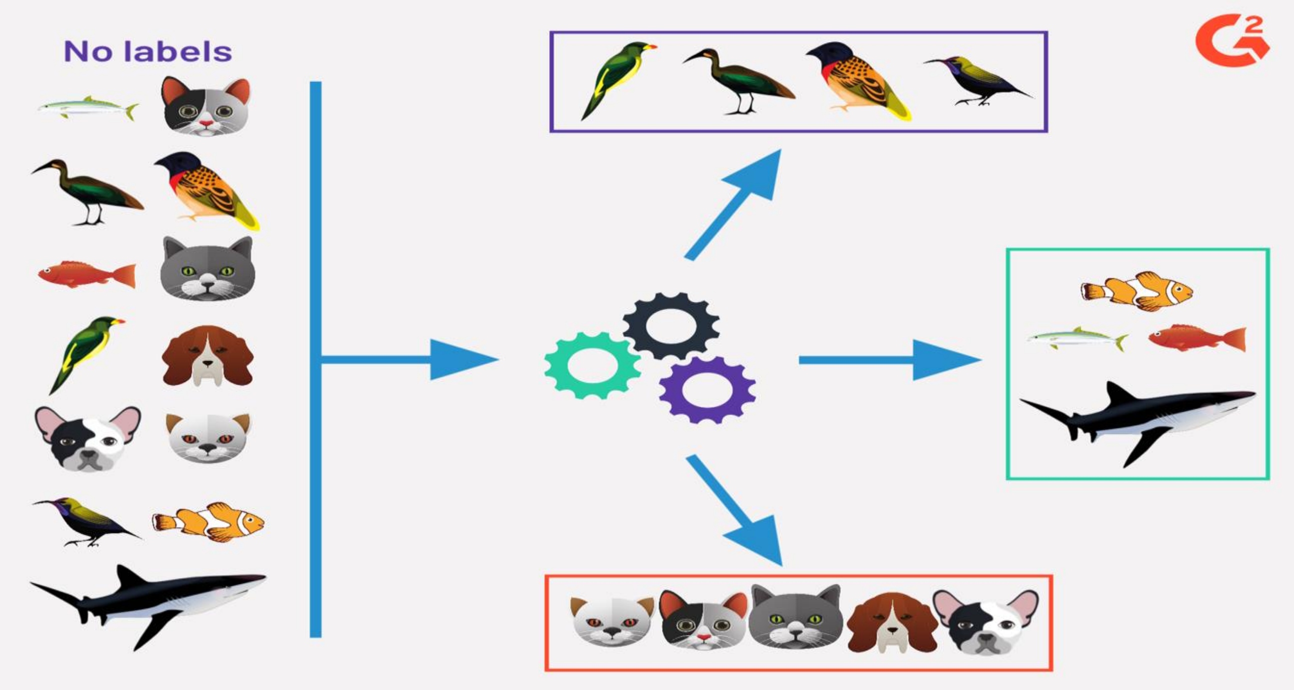
What is ML (Supervised)?

Train an AI model with labeled data



What is ML (Unsupervised)?

Train an AI model without labeled data

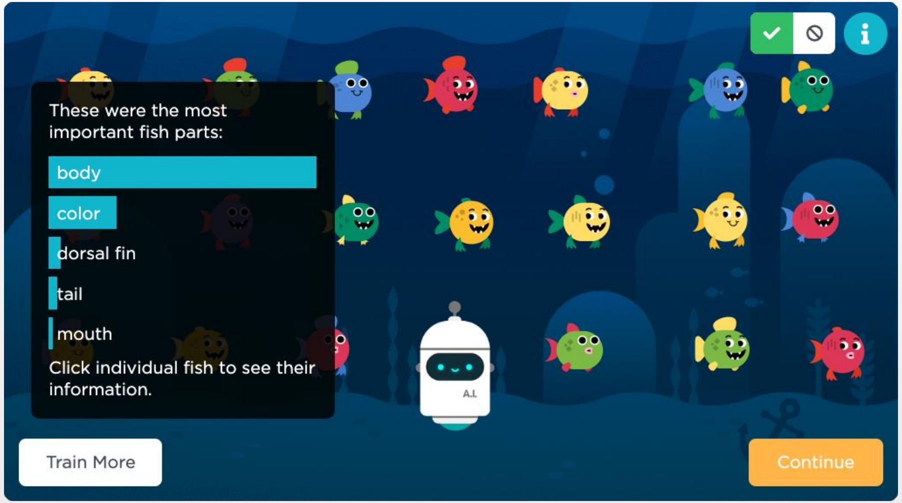


Introductory activity

AI for Oceans

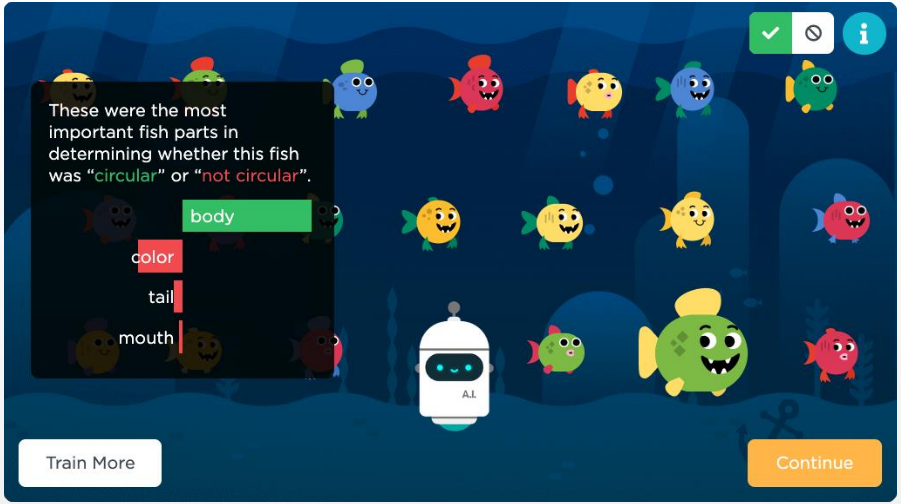
- AI for Oceans
  - How can we help protect the oceans using ML?

AI for Oceans

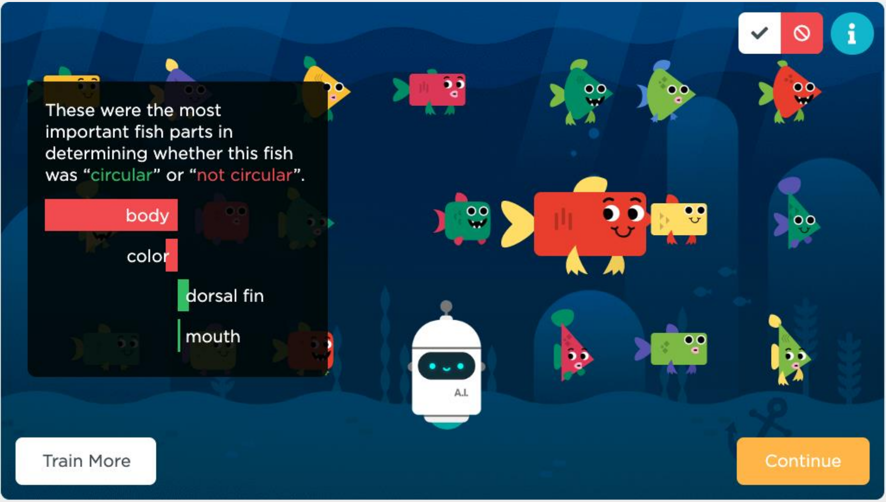


These were the most important fish parts:

Click individual fish to see their information.



These were the most important fish parts in determining whether this fish was “circular” or “not circular”.



These were the most important fish parts in determining whether this fish was “circular” or “not circular”.

Let’s Think….

- How do AI know what a “fish” may look like?
  - Why did we need to label and distinguish different objects in “AI for Oceans” activity (e.g., “fish” versus “not fish”)? How do you call this step?
  - How important this step was for machine learning?
- Please leave your thought on the google jamboard (AIFORGOOD Discussion board)

Seeing AI

- Seeing AI
  - Explore it using the app with iPad
  - How does the Seeing AI help low vision people?
  - How does ML work in the Seeing AI?
  - Please leave your thought on the google jamboard on 4th slide (AIFORGOOD Discussion board)

Seeing AI in new languages

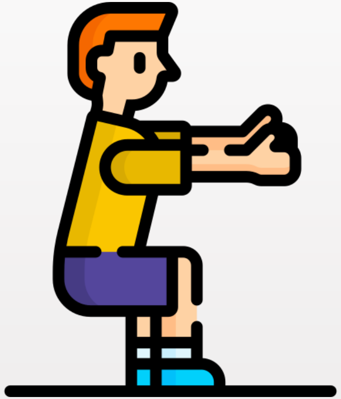
A free app that narrates the world around you, now available in Italian, Turkish, Dutch, German, French, Japanese and Spanish.

Hands-on Activity

Choose the activities interested most

AI emergency text message

AI garbage collector



AI Squat machine

Hands-on Activity 1
AI emergency text message

AI emergency text message

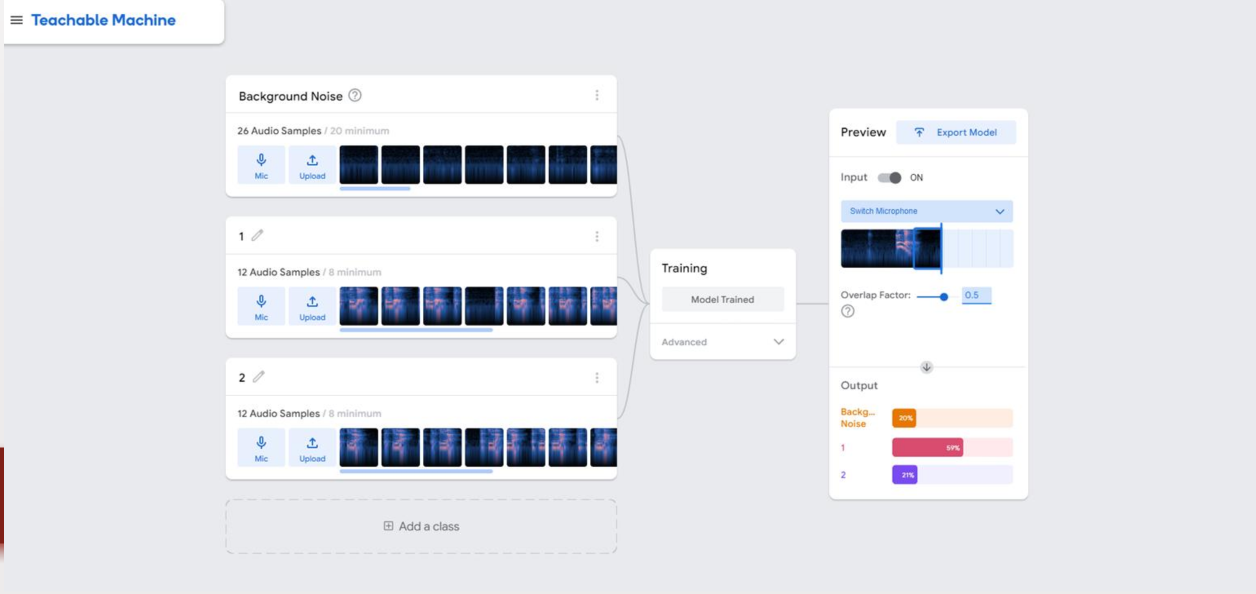
- Problem to solve
    - Emily wants to send out the emergency text messages to her families but she often face difficulty typing on her phone due to a time-sensitive situation or if she has difficulty using her hands or fingers to type. Thus, she wants to send the text messages by using simple words. How can we help help her to send out the text message with using her voice?

AI emergency text message making process

1. Train the AI model using ML with Teachable Machine (e.g.,https://teachablemachine.withgoogle.com/models/llrqwNrQ7/)
2. Export the model to BYOTM (https://byotm-282218.ue.r.appspot.com/)
3. Test the model and modify it

AI emergency text message

- Train the AI model using ML with Teachable Machine (e.g.,https://teachablemachine.withgoogle.com/models/llrqwNrQ7/)
    - 1: Keunjae → Text to Keunjae / 2: Yunha → Text to Yunha



26 Audio Samples / 20 minimum

12 Audio Samples / 8 minimum

12 Audio Samples / 8 minimum

Input ON

Overlap Factor: 0.5

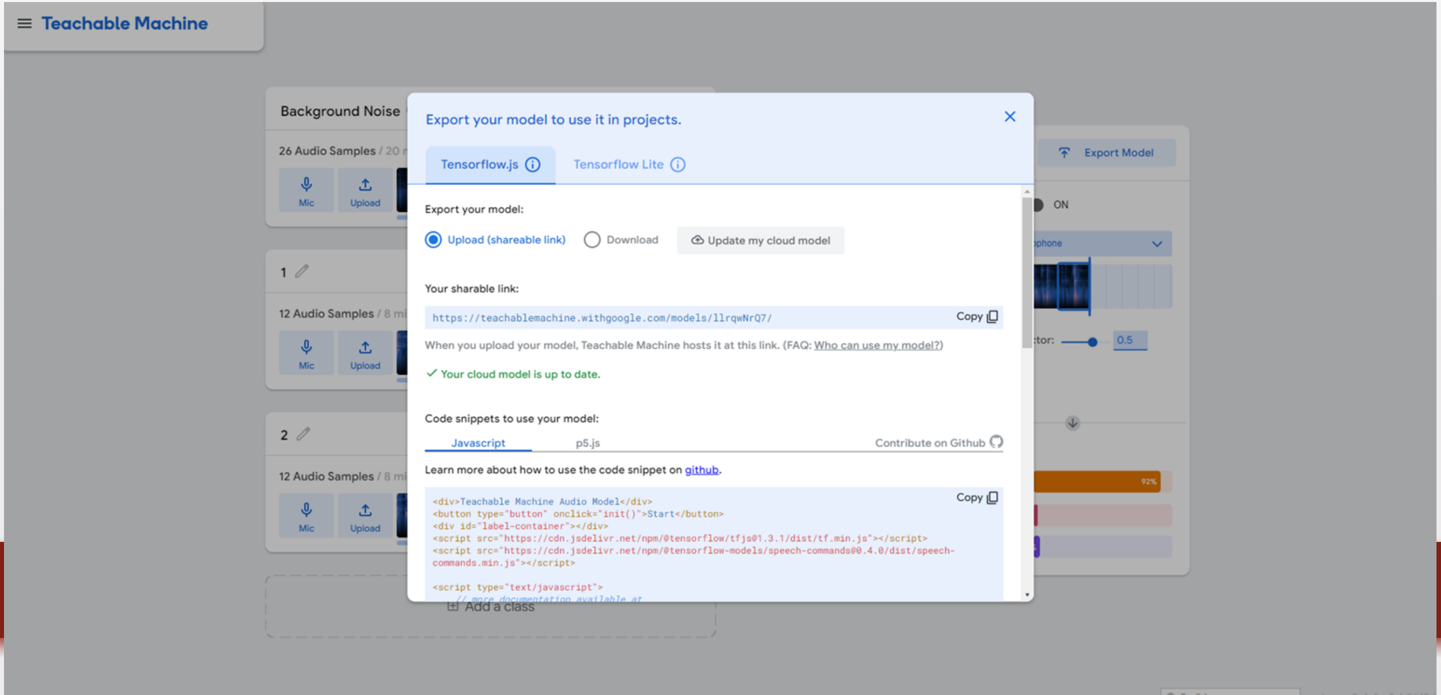
Backg... Noise 20%

1 59%

2 21%

AI emergency text message

- Click the **Export Model** and **Upload my cloud model**
- Copy the sharable link of your AI model



Export your model to use it in projects.

Tensorflow.js | Tensorflow Lite

Export your model:

● Upload (shareable link) ○ Download | Update my cloud model

Your sharable link:

`https://teachablemachine.withgoogle.com/models/llrqwNrQ7/` Copy

When you upload your model, Teachable Machine hosts it at this link. (FAQ: Who can use my model?)

✓ Your cloud model is up to date.

Code snippets to use your model:

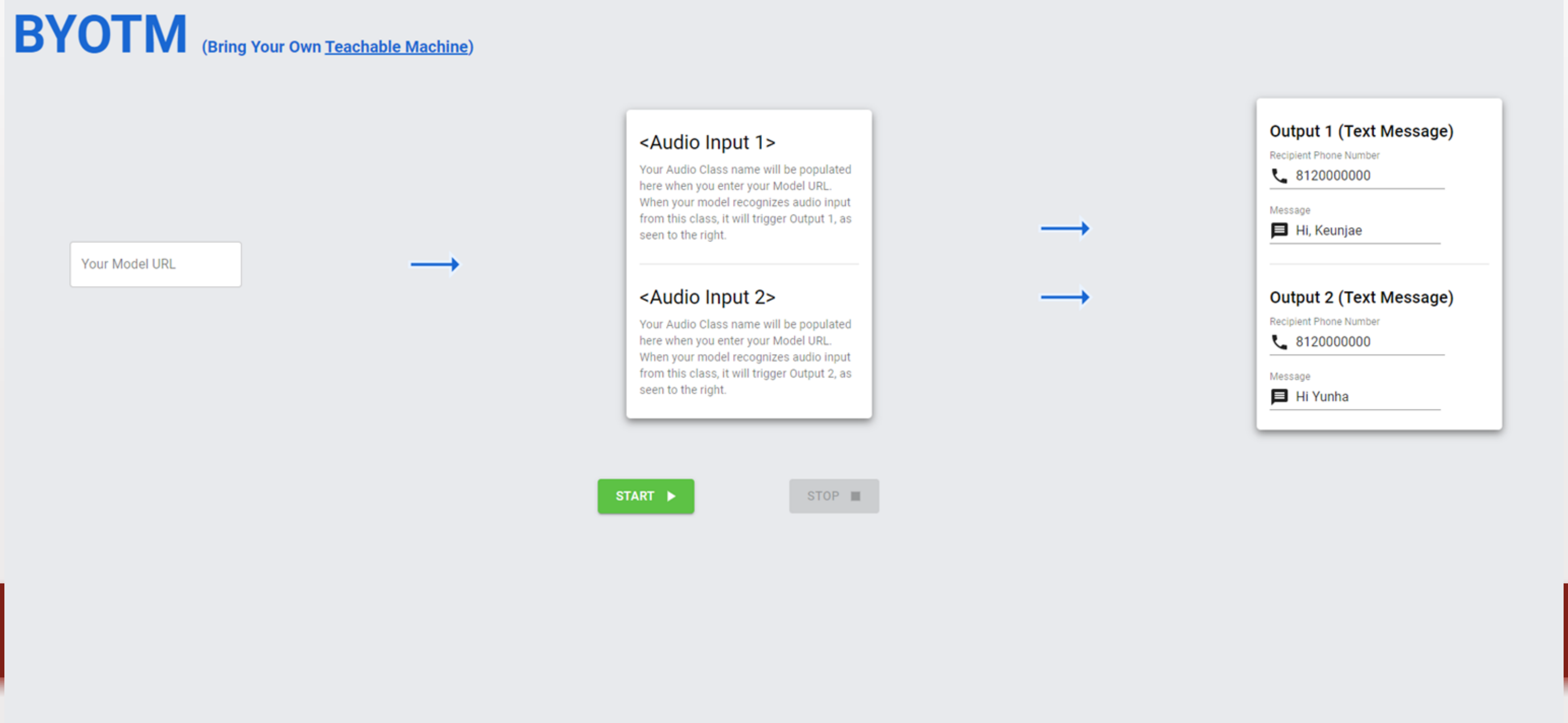
Javascript | p5.js | Contribute on Github

Learn more about how to use the code snippet on github.

```
<div>Teachable Machine Audio Model</div>
<button type="button" onclick="init()">Start</button>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow-models/speech-commands@0.4.0/dist/speech-
commands.min.js"></script>

<script type="text/javascript">
    // more documentation available at
```

AI emergency text message

- Go to BYOTM (https://byotm-282218.ue.r.appspot.com/)



BYOTM (Bring Your Own Teachable Machine)

Your Model URL

<Audio Input 1>

Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 1, as seen to the right.

<Audio Input 2>

Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 2, as seen to the right.

Output 1 (Text Message)

Recipient Phone Number
☎ 8120000000

Message
Hi, Keunjae

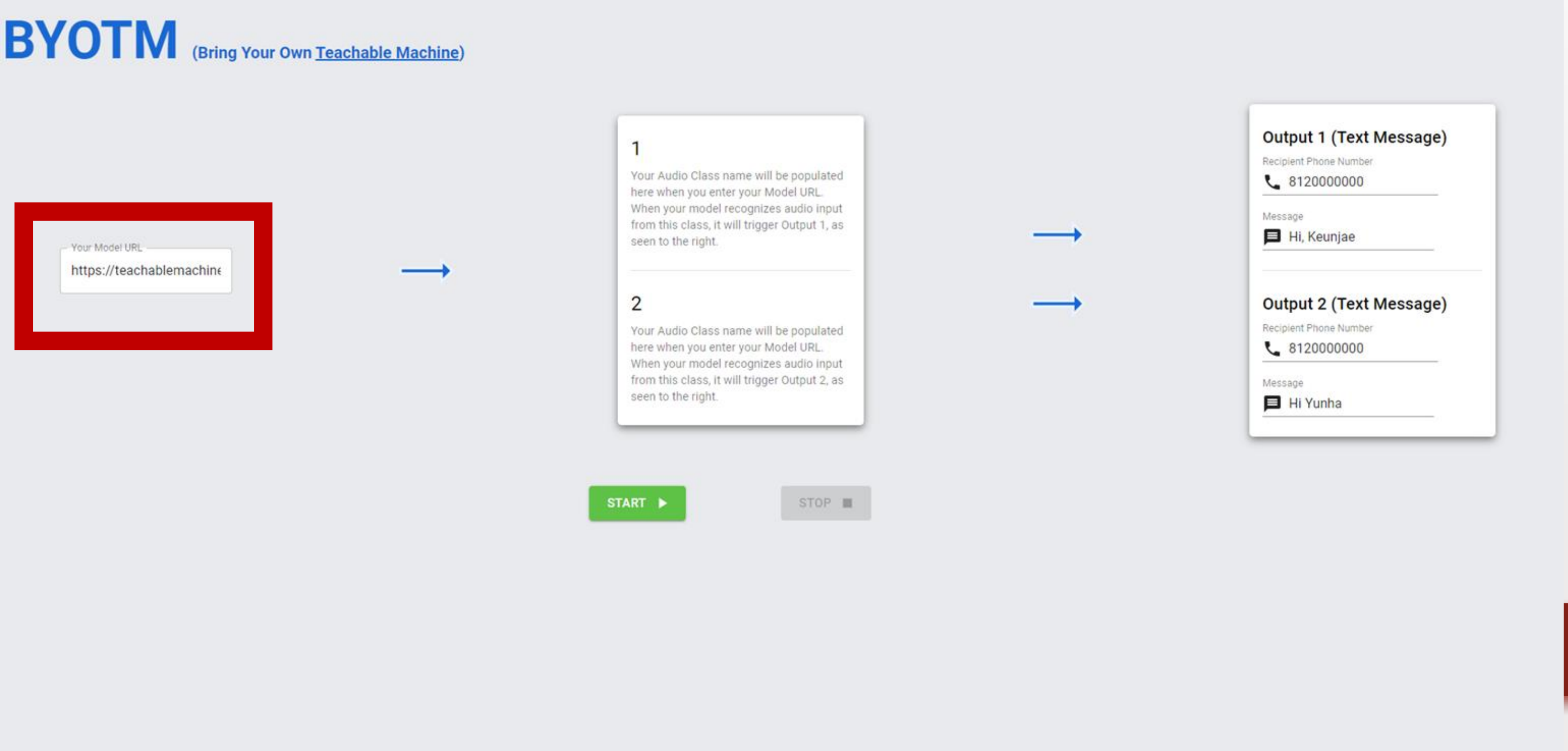
Output 2 (Text Message)

Recipient Phone Number
☎ 8120000000

Message
Hi Yunha

AI emergency text message

- Paste the URL to **Your Model URL**



BYOTM (Bring Your Own Teachable Machine)

Your Model URL: https://teachablemachine

1

Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 1, as seen to the right.

2

Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 2, as seen to the right.

Output 1 (Text Message)

Recipient Phone Number: ☎ 8120000000

Message: Hi, Keunjae

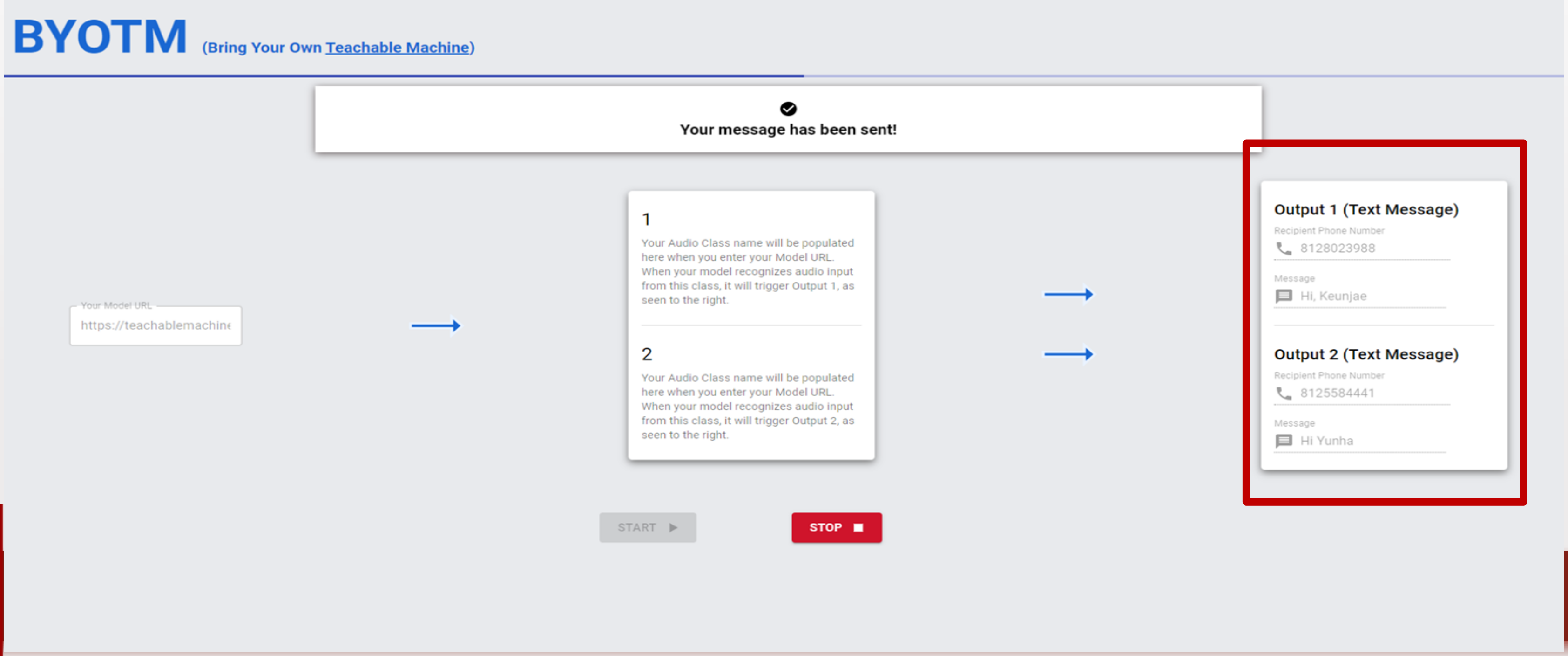
Output 2 (Text Message)

Recipient Phone Number: ☎ 8120000000

Message: Hi Yunha

AI emergency text message

- Write the phone number and text message you want to send



BYOTM (Bring Your Own Teachable Machine)

Your message has been sent!

Your Model URL
https://teachablemachine

1
Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 1, as seen to the right.

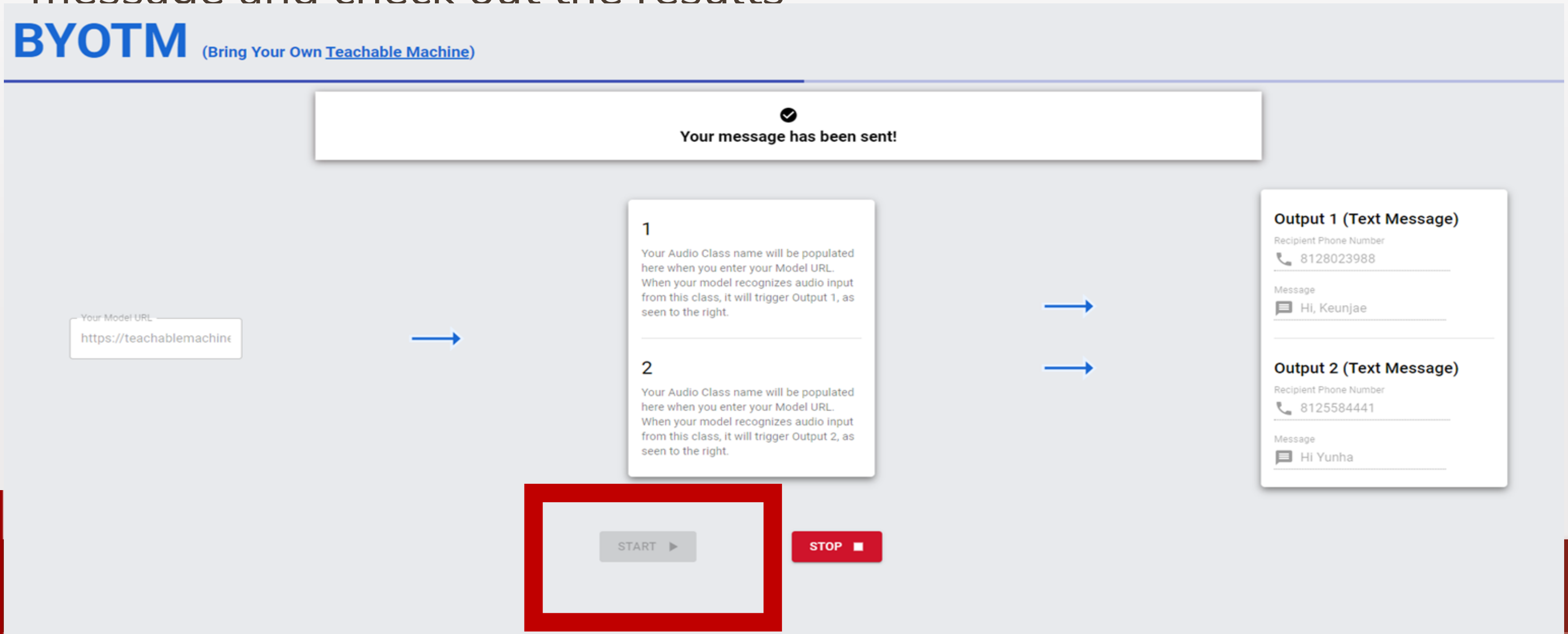
2
Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 2, as seen to the right.

Output 1 (Text Message)
Recipient Phone Number: 8128023988
Message: Hi, Keunjae

Output 2 (Text Message)
Recipient Phone Number: 8125584441
Message: Hi Yunha

AI emergency text message

- Click the Start button and tell your word to AI emergency text message and check out the results



BYOTM (Bring Your Own Teachable Machine)

✓ Your message has been sent!

Your Model URL: https://teachablemachine

1
Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 1, as seen to the right.

2
Your Audio Class name will be populated here when you enter your Model URL. When your model recognizes audio input from this class, it will trigger Output 2, as seen to the right.

Output 1 (Text Message)
Recipient Phone Number: 8128023988
Message: Hi, Keunjae

Output 2 (Text Message)
Recipient Phone Number: 8125584441
Message: Hi Yunha

Discussion

- Importance of data quality and data quantity
    - Why is it important to have accurate and reliable data?
    - How can we ensure that the data we collect is accurate and reliable?
    - How can poor quality data affect the AI-based app you made?
    - How can we ensure that the data we collect is of high quality? What steps can be taken to reduce errors and inaccuracies in data?
    - Have you ever come across an example where having more data would have helped solve a problem or make a decision? How might more data have been beneficial?
    - Do you think that collecting more data always leads to better decisions? Why or why not?

Hands-on Activity 2
AI garbage collector

AI garbage collector

- Problem to solve
  - Jane lives in Bloomington, IN, and she saw that there was a lot of trash in her town but not enough people to clean it up. So, she asked Indiana University to create a robot to collect the garbage, called an "AI garbage collector."
  - However, the robot doesn't know the town's routes, so the university asked Jane to teach the robot by using her body movements to control it.

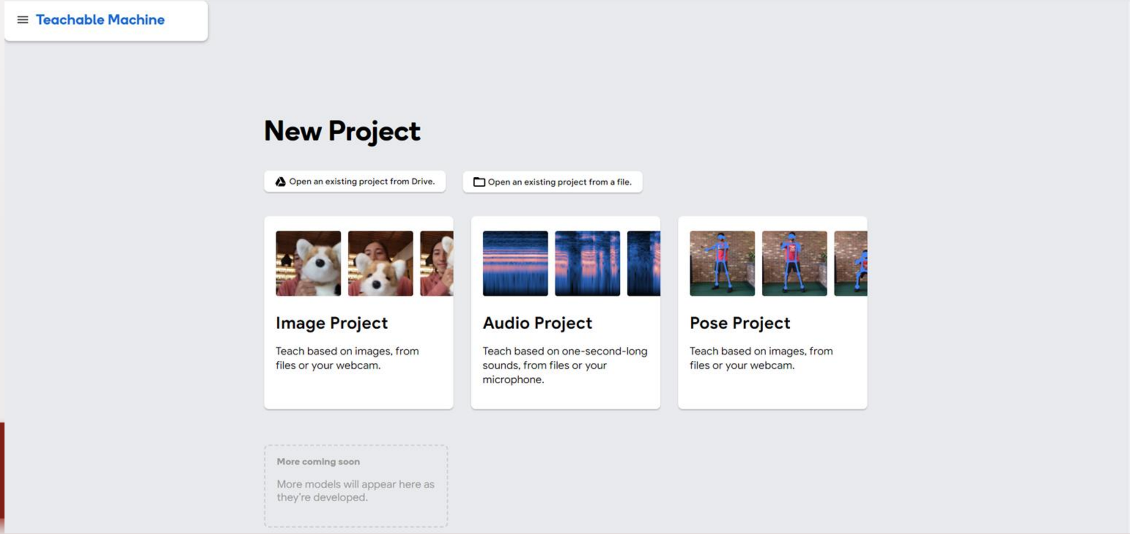
AI garbage collector

AI garbage collector making process

1. Train the AI model using ML with Teachable Machine (e.g.,https://teachablemachine.withgoogle.com/models/zZ1ioJ-i3)
1. Programming with Scratch (https://playground.raise.mit.edu/create/)
2. Test the model and modify it

AI garbage collector (modeling)

- Go to Teachable Machine (https://teachablemachine.withgoogle.com/) and choose Pose project



≡ Teachable Machine
Open an existing project from Drive.
Open an existing project from a file.

New Project

Image Project

Teach based on images, from files or your webcam.

Audio Project

Teach based on one-second-long sounds, from files or your microphone.

Pose Project

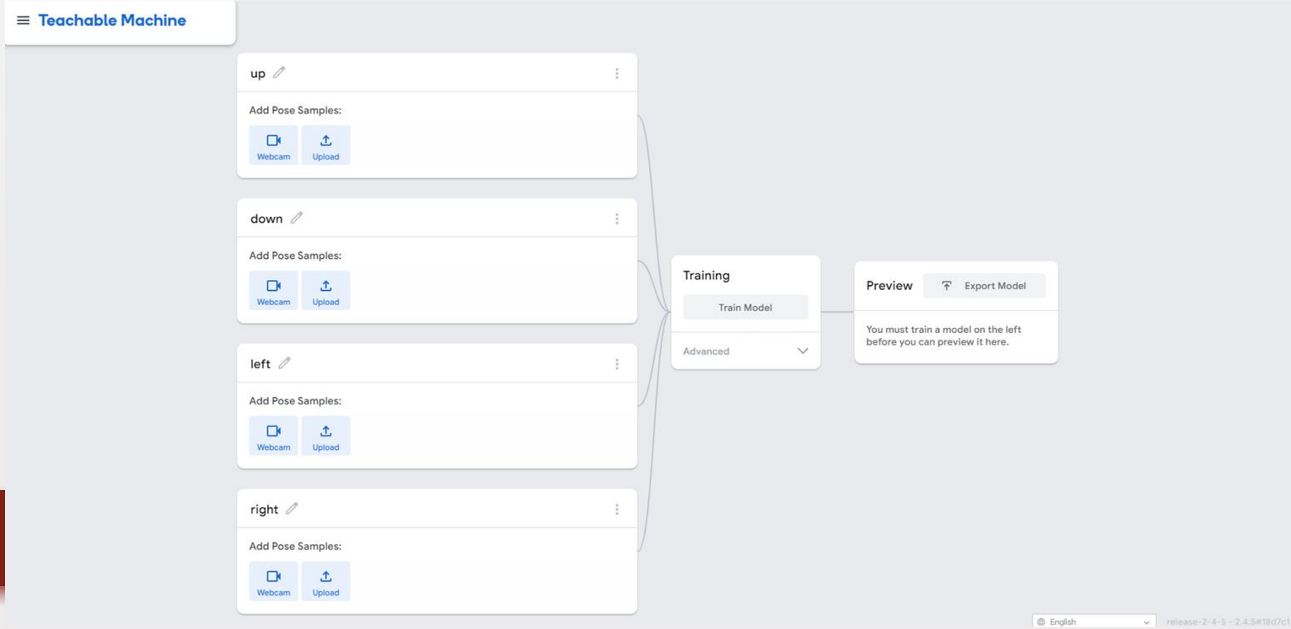
Teach based on images, from files or your webcam.

More coming soon

More models will appear here as they're developed.

AI garbage collector (modeling)

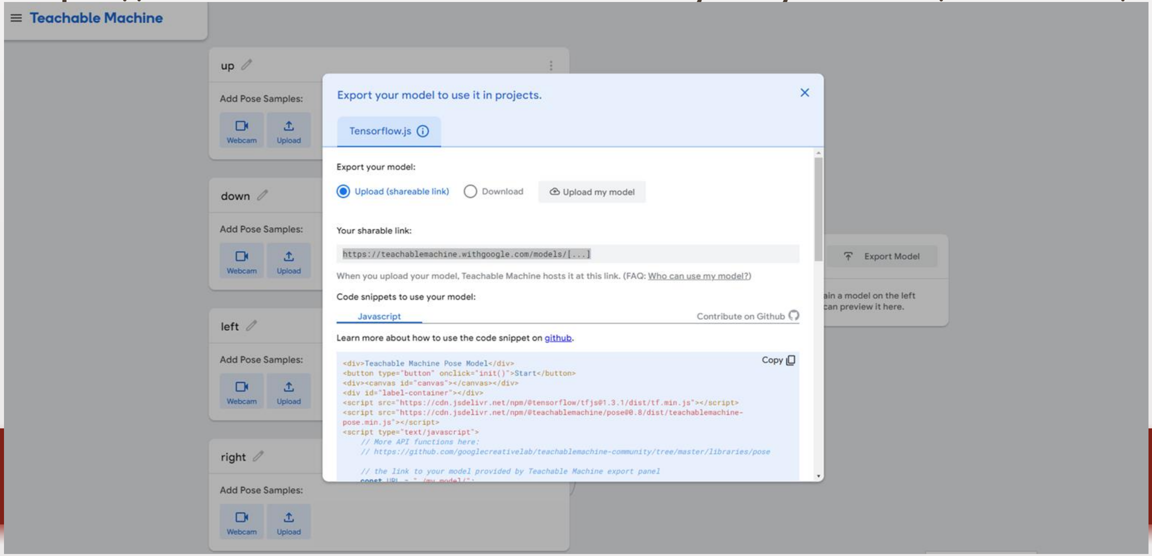
- Create 4 labels (up, down, left, and right) and train the AI model by inputting the data using a webcam



You must train a model on the left before you can preview it here.

AI garbage collector (modeling)

- Click export model and choose upload (sharable link)
- Copy the sharable link (e.g., https://teachablemachine.withgoogle.com/models/zZ1ioJ-i3/)



Export your model to use it in projects.

Tensorflow.js

Export your model:

● Upload (shareable link) ○ Download Upload my model

Your sharable link:

`https://teachablemachine.withgoogle.com/models/[...]`

When you upload your model, Teachable Machine hosts it at this link. (FAQ: Who can use my model?)

Code snippets to use your model:

Javascript Contribute on Github

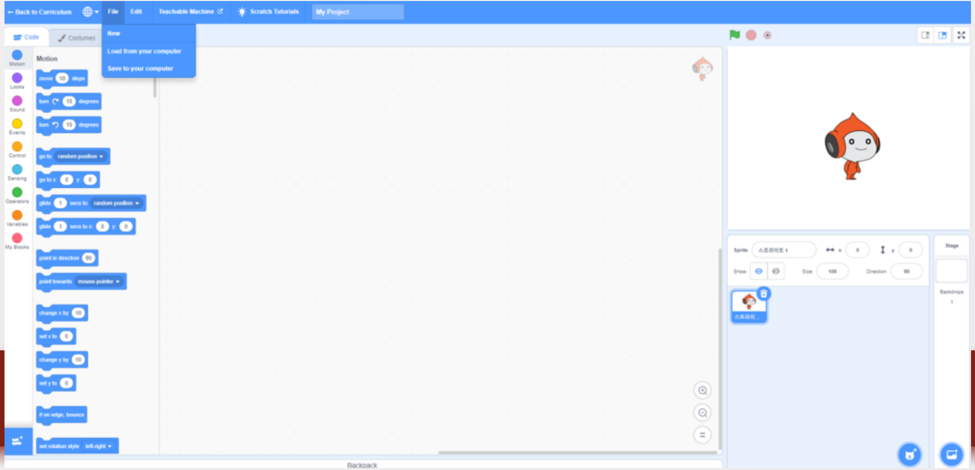
Learn more about how to use the code snippet on github.

Copy

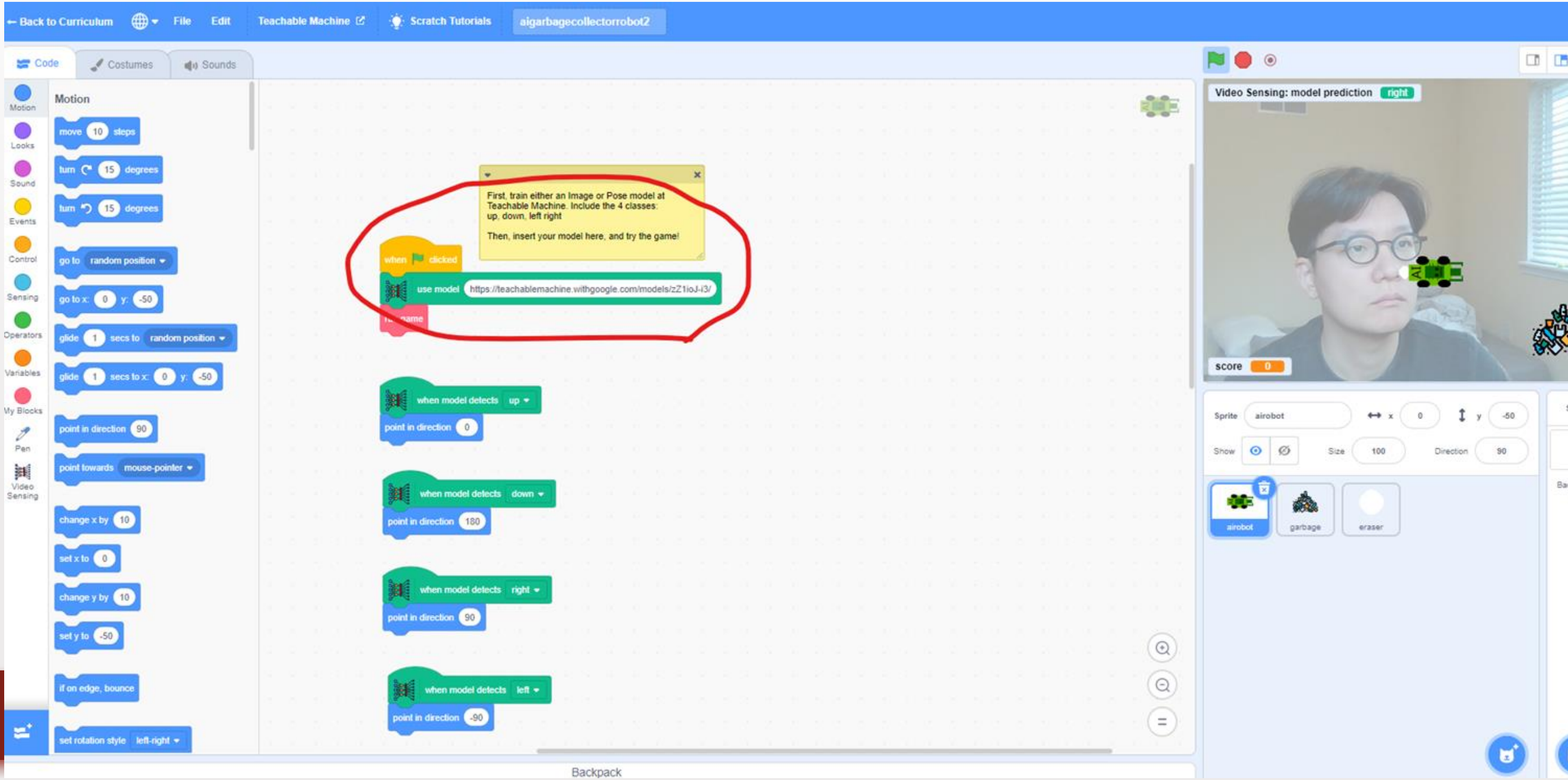
```
<div>Teachable Machine Pose Model</div>
<button type="button" onclick="init()">Start</button>
<div><canvas id="canvas"></canvas></div>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm/@teachablemachine/pose@0.8/dist/teachablemachine-
pose.min.js"></script>
<script type="text/javascript">
    // More API functions here:
    // https://github.com/googlecreativelab/teachablemachine-community/tree/master/libraries/pose

    // the link to your model provided by Teachable Machine export panel
    const URL = "./my_model/";
```

AI garbage collector (programming)

- Go toScratch Playground (https://playground.raise.mit.edu/create/)
- Click the file and choose Load from your computer- “aigarbagecollectorrobot2.sb3”



AI garbage collector (Test & Modify)



First, train either an Image or Pose model at Teachable Machine. Include the 4 classes:
up, down, left right

Then, insert your model here, and try the game!

```
when 🏁 clicked
use model https://teachablemachine.withgoogle.com/models/zZ1ioJ-i3/
[illegible] game

when model detects up
point in direction 0

when model detects down
point in direction 180

when model detects right
point in direction 90

when model detects left
point in direction -90
```

```
move 10 steps
turn ⟳ 15 degrees
turn ⟲ 15 degrees
go to random position
go to x: 0 y: -50
glide 1 secs to random position
glide 1 secs to x: 0 y: -50
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to -50
if on edge, bounce
set rotation style left-right
```

Discussion

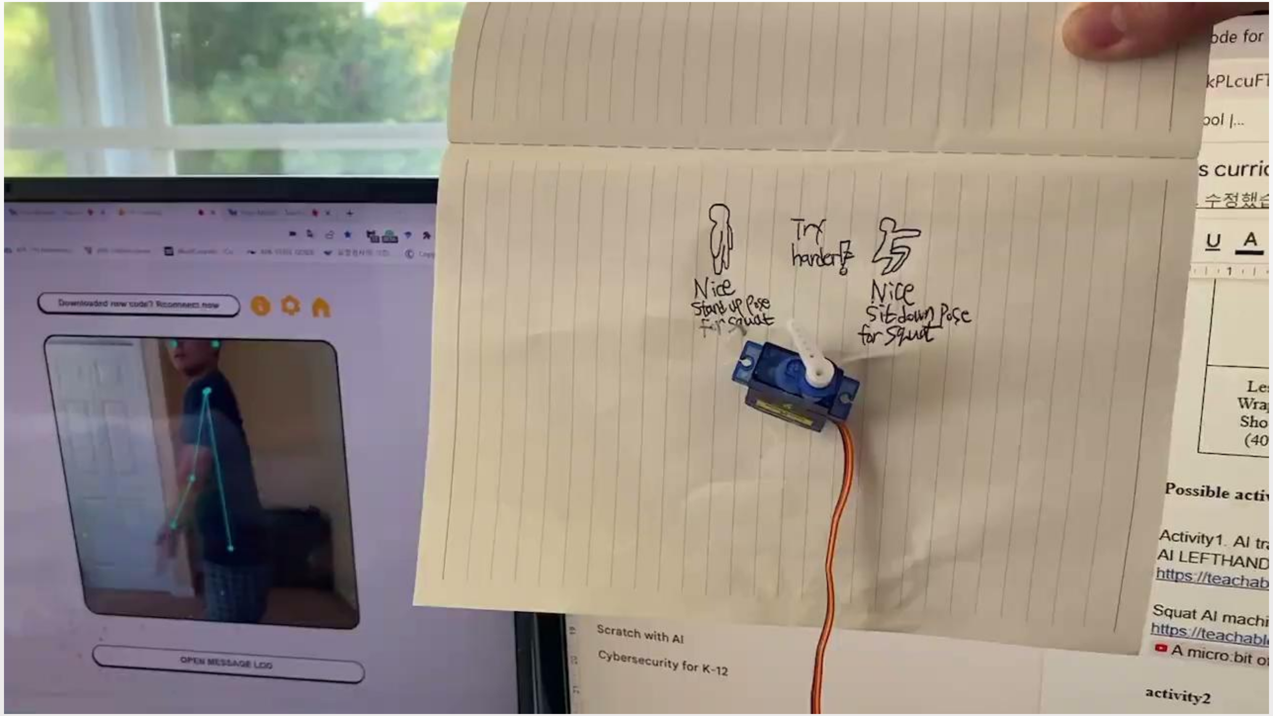
- Importance of data quality and data quantity
  - Why is it important to have accurate and reliable data?
  - How can poor quality data affect the AI-based app you made?
  - How can we ensure that the data we collect is accurate and reliable?
  - How can we ensure that the data we collect is of high quality? What steps can be taken to reduce errors and inaccuracies in data?
  - Have you ever come across an example where having more data would have helped solve a problem or make a decision? How might more data have been beneficial?
  - Do you think that collecting more data always leads to better decisions? Why or why not?

Hands-on Activity 3
AI Squat machine

AI Squat Machine

- Problem to solve
  - Due to COVID-19 restrictions, many students in Indiana are unable to exercise regularly. As a result, home workouts such as squats, push-ups, and sit-ups have become more popular. However, a significant number of students are not familiar with how to properly perform these exercises, particularly squats.
  - What measures can be taken to help students exercise correctly and with proper form?

AI Squat Machine

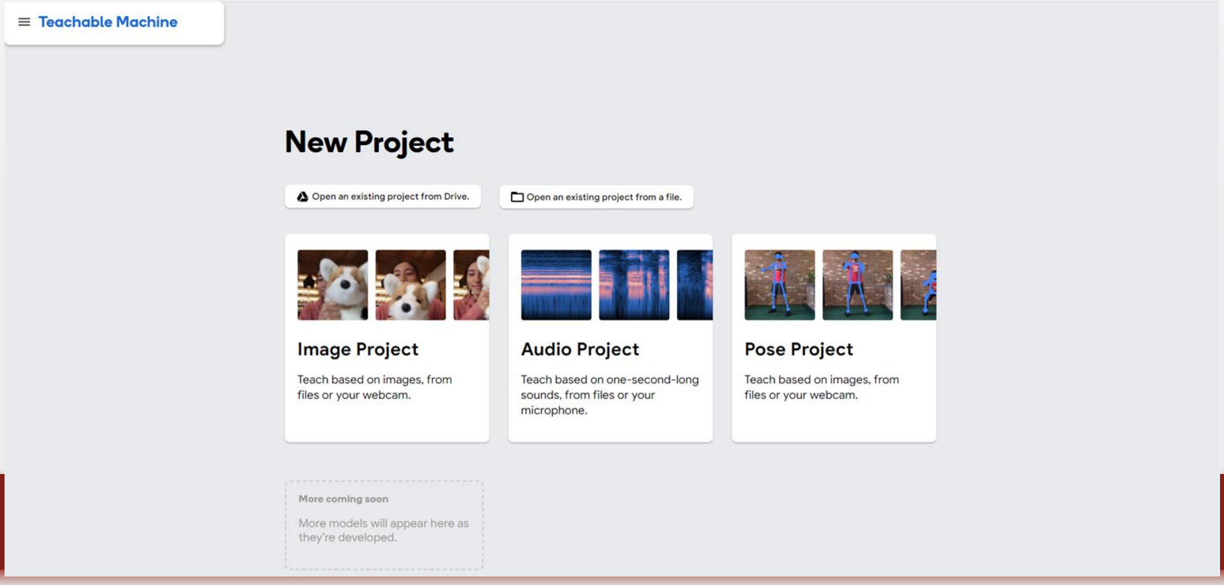


AI Squat Machine making process

1. Train the AI model using ML with Teachable Machine (https://teachablemachine.withgoogle.com/models/ltiv7fcu3/)
2. Create the Squat machine with Microbit and servomotor
3. Programming with Makecode (https://makecode.microbit.org/) and connect the Microbit
4. Upload the AI model to AI training (https://ai-training.glitch.me/) and sync with the Microbit
5. Test the model and modify it

AI Squat Machine (Modeling)

- Go to Teachable Machine (https://teachablemachine.withgoogle.com/) and choose Image project



New Project

Open an existing project from Drive.
Open an existing project from a file.

Image Project

Teach based on images, from files or your webcam.

Audio Project

Teach based on one-second-long sounds, from files or your microphone.

Pose Project

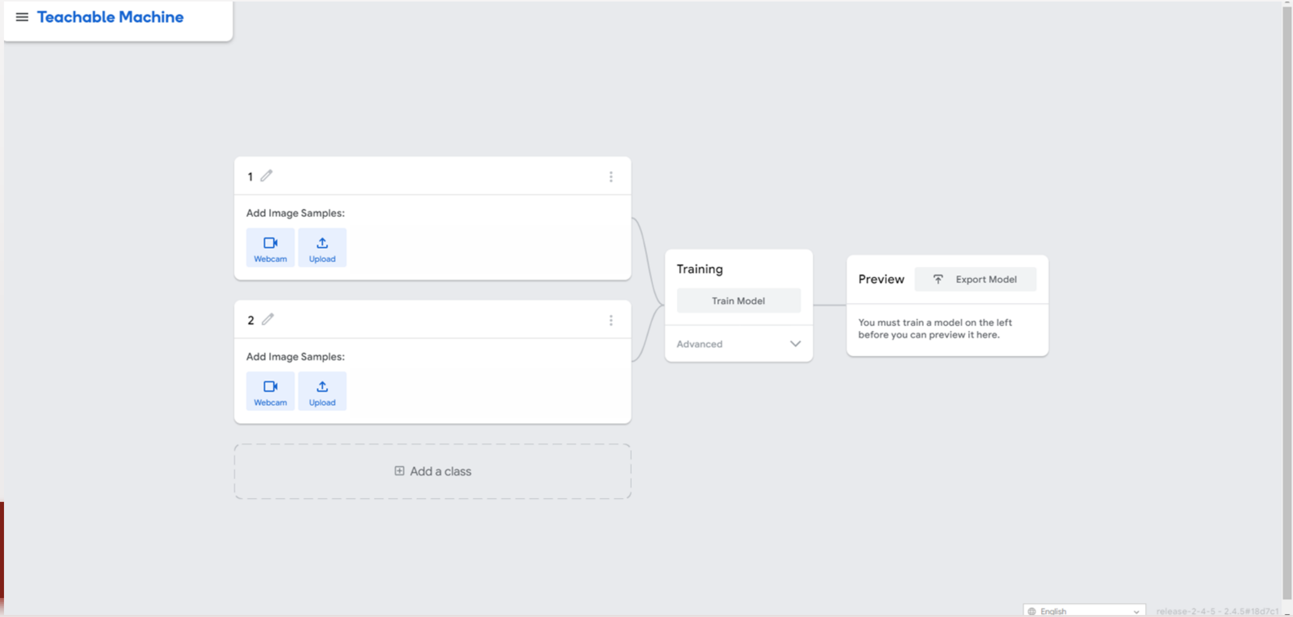
Teach based on images, from files or your webcam.

More coming soon

More models will appear here as they're developed.

AI Squat Machine (Modeling)

- Create 2 labels (1: Sit-down pose, 2: Stand-up pose, or vice versa) and train the AI model by inputting the data using a webcam. The label's name should be a number instead of using

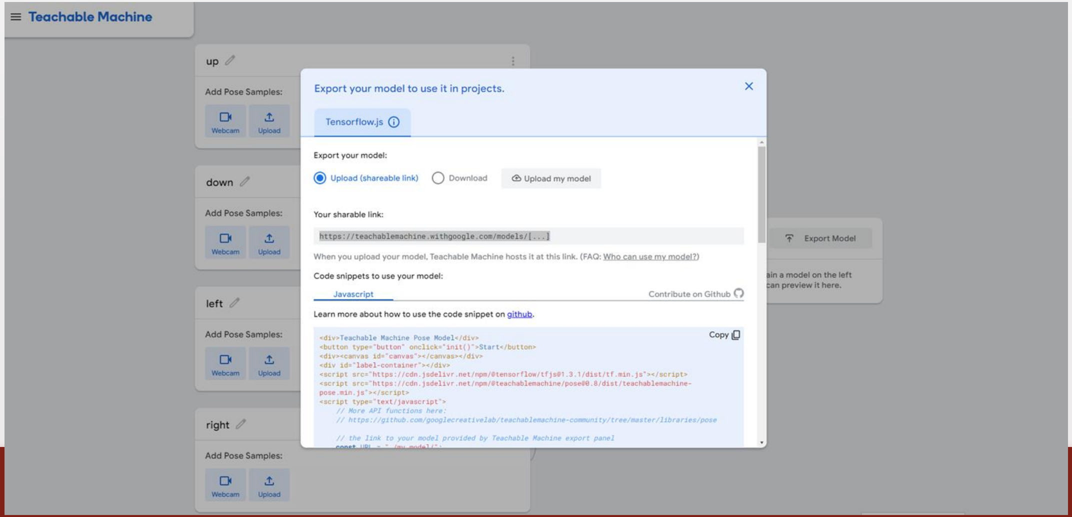


You must train a model on the left before you can preview it here.

AI Squat Machine (Modeling)

- Click export model and choose upload (sharable link)
- Copy the sharable link

(e.g., https://teachablemachine.withgoogle.com/models/ltiv7fcu3/)



Export your model to use it in projects.

Export your model:

● Upload (shareable link) ○ Download Upload my model

Your sharable link:

`https://teachablemachine.withgoogle.com/models/[...]`

When you upload your model, Teachable Machine hosts it at this link. (FAQ: Who can use my model?)

Code snippets to use your model:

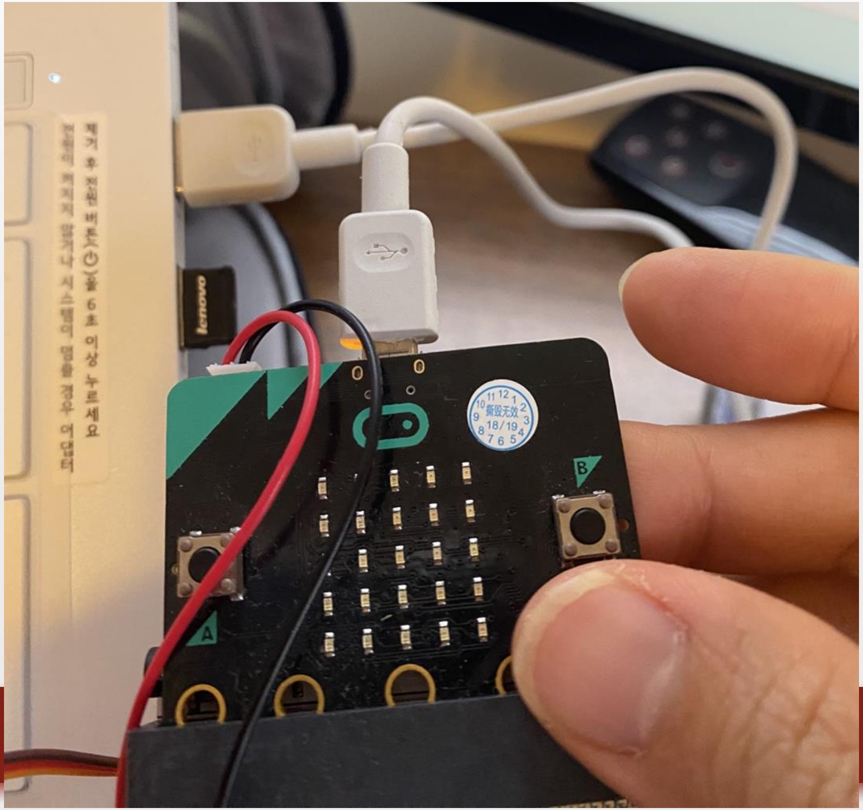
Javascript — Contribute on Github

Learn more about how to use the code snippet on github.

```
<div>Teachable Machine Pose Model</div>
<button type="button" onclick="init()">Start</button>
<div><canvas id="canvas"></canvas></div>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm/@teachablemachine/pose@0.8/dist/teachablemachine-
pose.min.js"></script>
<script type="text/javascript">
    // More API functions here:
    // https://github.com/googlecreativelab/teachablemachine-community/tree/master/libraries/pose

    // the link to your model provided by Teachable Machine export panel
    const URL = "./my_model/";
```

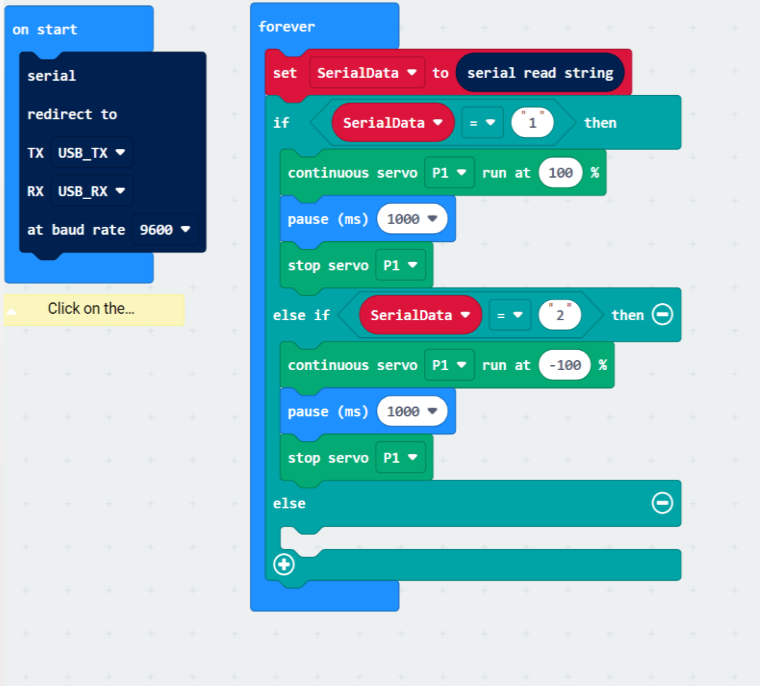
AI Squat Machine (making)

- Connect the Microbit with the laptop using USB cable



AI Squat Machine (making)

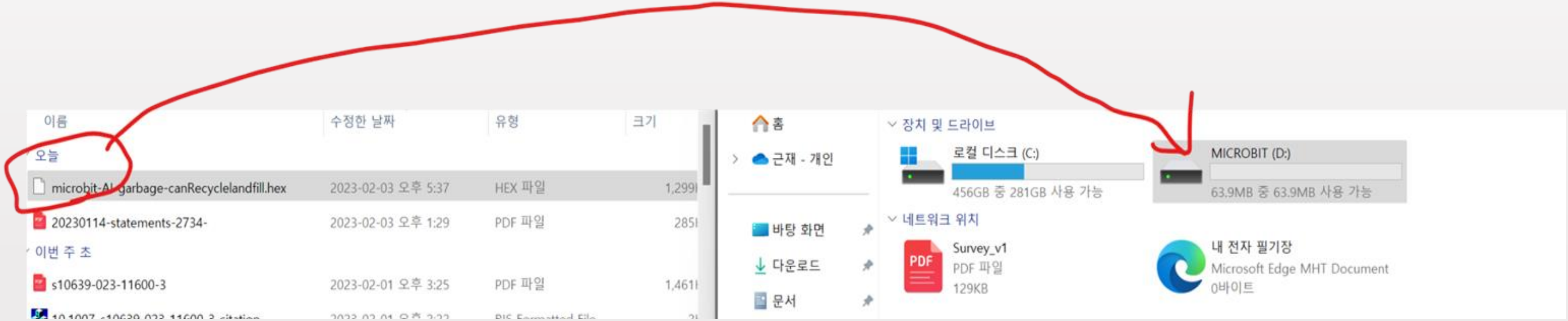
- Go to Makecode (https://makecode.microbit.org/)
- Click the setting-connect device button and connect with Microbit



```
on start
    serial
    redirect to
    TX USB_TX
    RX USB_RX
    at baud rate 9600

Click on the...

forever
    set SerialData to serial read string
    if SerialData = "1" then
        continuous servo P1 run at 100 %
        pause (ms) 1000
        stop servo P1
    else if SerialData = "2" then
        continuous servo P1 run at -100 %
        pause (ms) 1000
        stop servo P1
    else
```

AI Squat Machine (making)

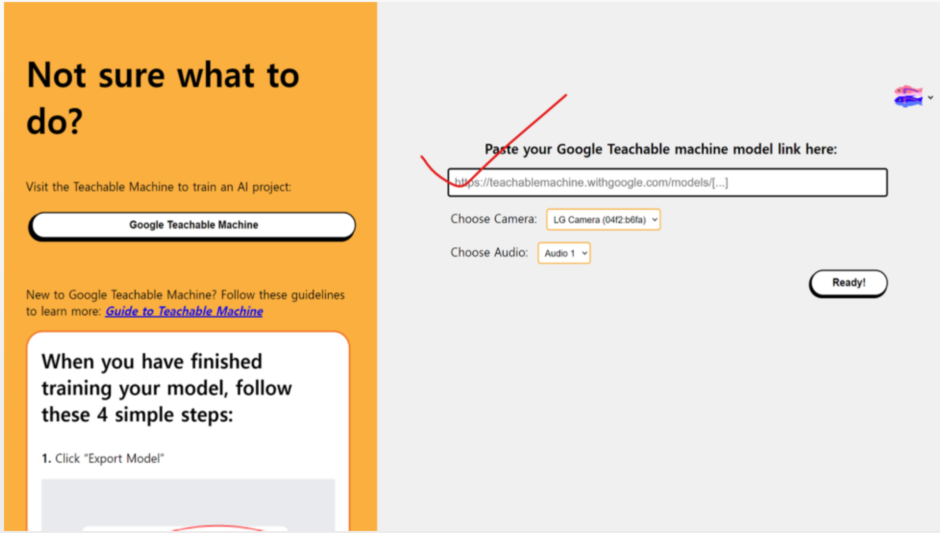
- Make sure to download the hex file. *Drag and drop the* ***hex*** *file into Microbit (D:) folder.*



이름	수정한 날짜	유형	크기
오늘			
microbit-AI-garbage-canRecyclelandfill.hex	2023-02-03 오후 5:37	HEX 파일	1,299
20230114-statements-2734-	2023-02-03 오후 1:29	PDF 파일	285
이번 주 초			
s10639-023-11600-3	2023-02-01 오후 3:25	PDF 파일	1,461
10.1007_s10639-023-11600-3_citation	2023-02-01 오후 3:22	RIS Formatted File	2

AI Squat Machine (Test & Modify)

- Go to AI training (https://ai-training.glitch.me/)and click “Pair Microbit” to sync with the Microbit
- Paste the trained AI model from the Teachable Machine and click “Ready!”



Not sure what to do?

Visit the Teachable Machine to train an AI project:

New to Google Teachable Machine? Follow these guidelines to learn more: *Guide to Teachable Machine*

When you have finished training your model, follow these 4 simple steps:

1. Click "Export Model"

Paste your Google Teachable machine model link here:

https://teachablemachine.withgoogle.com/models/[...]

Choose Camera: LG Camera (04f2:b6fa)

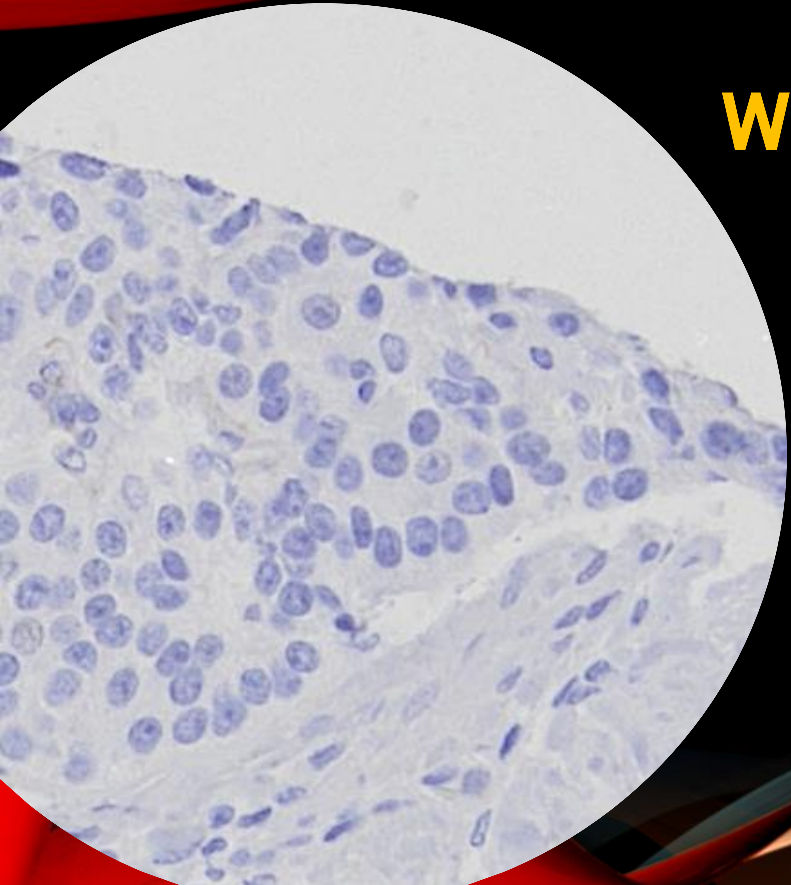
Choose Audio: Audio 1

Discussion

- Importance of data quality and data quantity
    - How did you fix the problems encountered while developing AI-based artifacts?
    - Why is it important to have accurate and reliable data?
    - How can poor quality data affect the AI-based app you made?
    - Please leave your thought on the google jamboard (https://jamboard.google.com/d/1gu2qSoTgSPZVc3JN6vm7E9xPodCx1tZ7zG08dmnSqbM/edit?usp=sharing)

Invited Talk

Dr. Xuhong Zhang



When AI Meets Healthcare

AI Goes Rural

AI4Me Summer Camp

June, 5th, 2023

INDIANA UNIVERSITY

AI & HEALTH CARE

- When we talk about health care, what comes to your mind?

Health
Insurance

AI & HEALTH CARE

- How the AI and Health care can be related?

AI & HEALTH CARE

- Basically speaking, AI can help us ***making decisions.***

- In Health Care, what decision we need to make?

AI & HEALTH CARE

- Biomedical Imaging Computing: Make Sense from Biomedical Image Pixels

AI HISTORY FOR BIOMEDICAL IMAGING

~2013

Early methods mainly use basic image processing techniques, but they usually produce inferior performance compared to machine-learning based approaches[1].

2013~2017

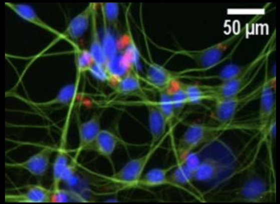
Other supervised machine learning methods have been applied: SVM, linear classifier, Bayes classifier, etc.

2017~present

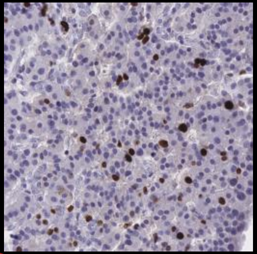
Convolutional Neural Network

Biomedical Imaging

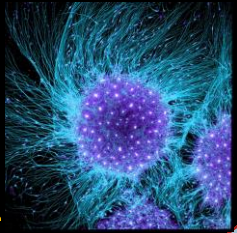
Overlay of betaIII-tubulin neuron stained image and DAPI stained cell nuclei image (1)

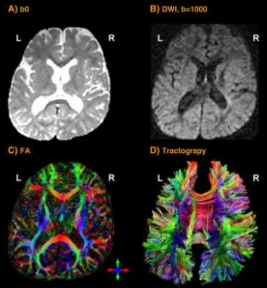


Immunohistochemical (IHC) Stained tissue microarray image



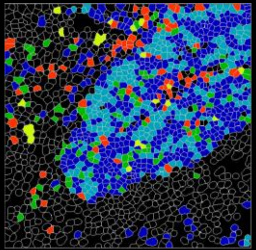
Human neural rosette primordial brain cells (2)





Primary data containing a T2 (baseline b0) image, diffusion weighted MRI (3)

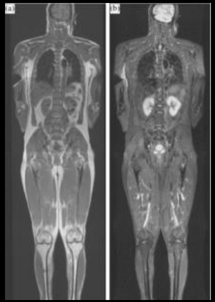
Images analyzed with HALO® software using dsDNA for nuclear segmentation



And a lot more ... !!!

Micro-level

Macro-level



Whole body MRI on T1SE(a) and STIR(b) (4)

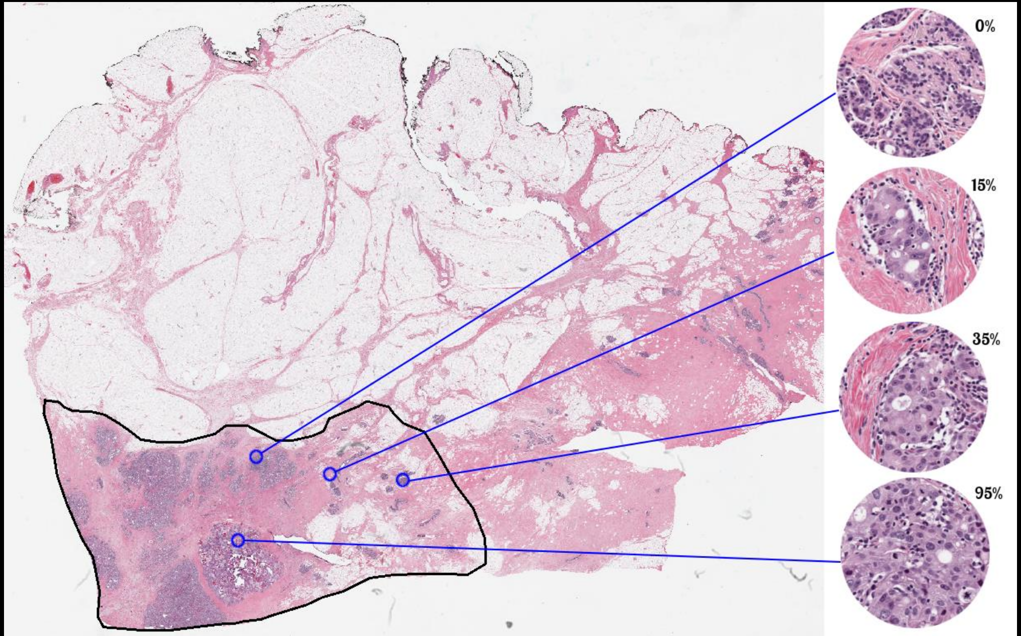
Image Credit:

(1) J Zhang, E Moradi, MG Somekh, ML Mather. Label-Free, High Resolution, Multi-Modal Light Microscopy for Discrimination of Live Stem Cell Differentiation Status. *Scientific Reports*. (2018)8:697

(2) GF. Croft, L Pietila, S Tse, S Galgoczi, M Fenner, AH, Brivanlou. *A small world*. The Rockefeller University, Brvanlou Lab.

(3) ZA Englander and et al., Diffuse reduction of white matter connectivity in cerebral palsy with specific vulnerability of long Range fiber tracts. *NeuroImage: Clinical* 2 (2013) 440-447

RECOGNIZE CELLS



Breast cancer: find regions with many tumor cells

Disease Classification

- Myositis: 5 ~ 10 people per million.
- Symptoms:
  - Proximal muscle weakness
  - Inflammation
  - Gottron’s rash (pictured, A)
  - Calcification (B & C)
- H&E stained biopsies
- Types of myositis:
  - Dermatomyositis (DM)
  - Polymyositis (PM)

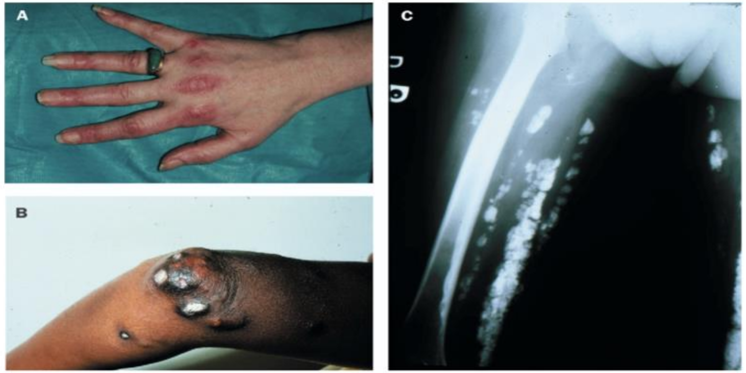
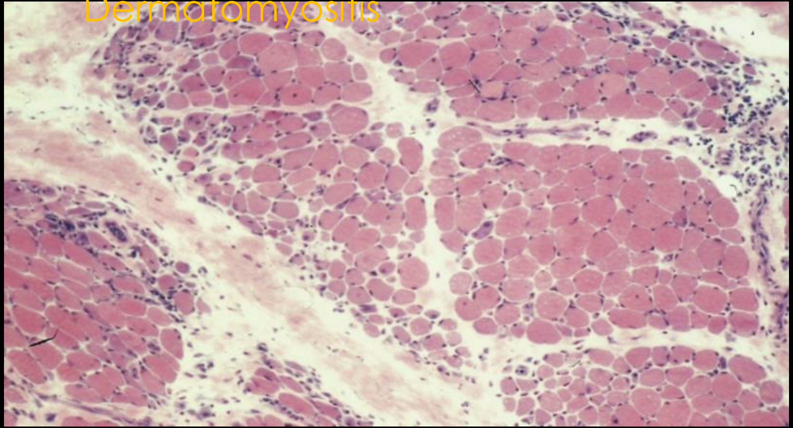


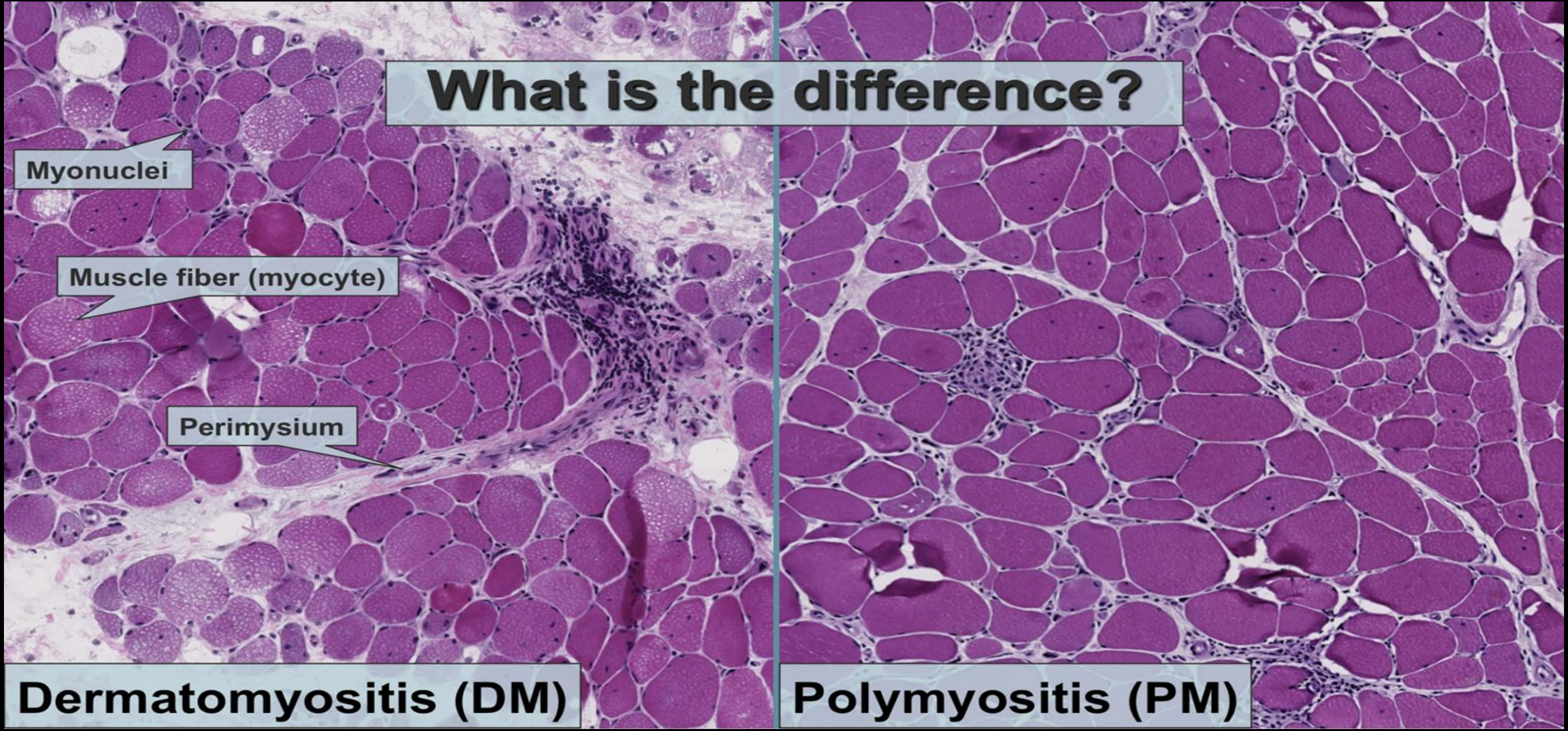
Figure 1: **Rash and calcifications in dermatomyositis**
A: Gottron’s rash. B: Skin effects of calcification. C: Radiographic evidence of calcification.

Perifascular Atrophy in Dermatomyositis



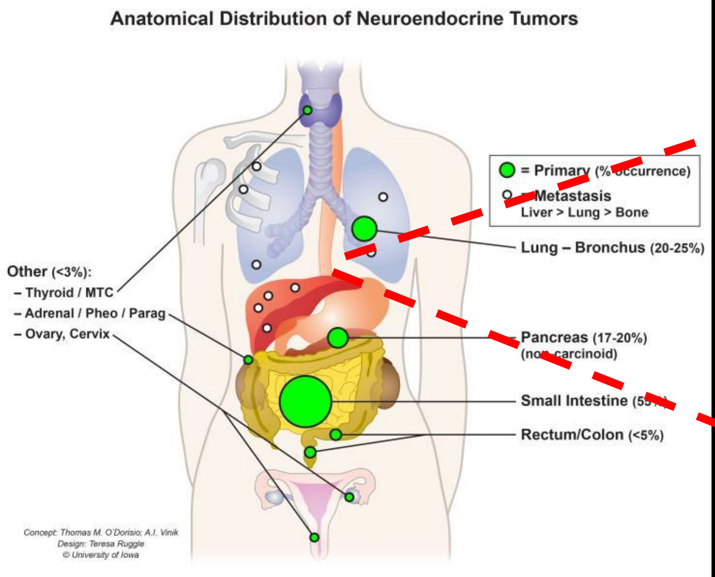
Marinos C. Dalakas and Reinhard Hohlfeld, “Polymyositis and dermatomositis”,
The Lancet, vol. 362, no. 9388, pp. 971-982, 2003.

DISEASE CLASSIFICATION



DISEASE GRADING

Neuroendocrine Tumors



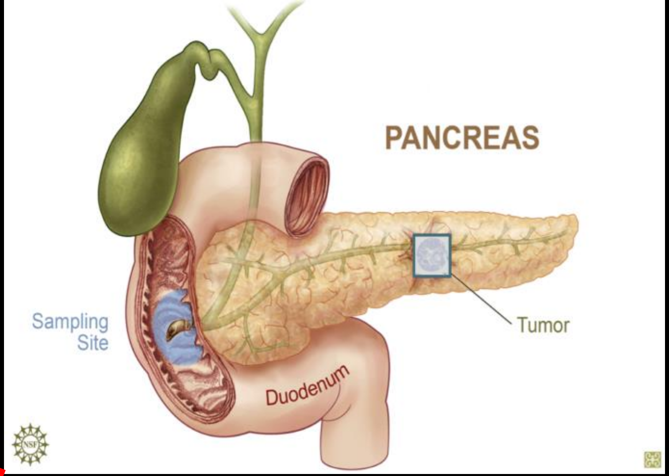


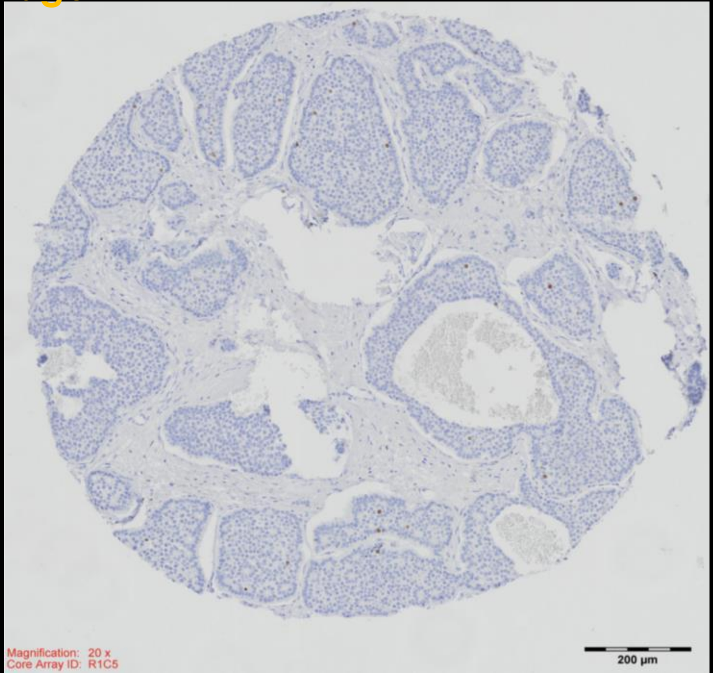
Image Credit: https://uihc.org/health-topics/what-neuroendocrine-cancer

DISEASE GRADING

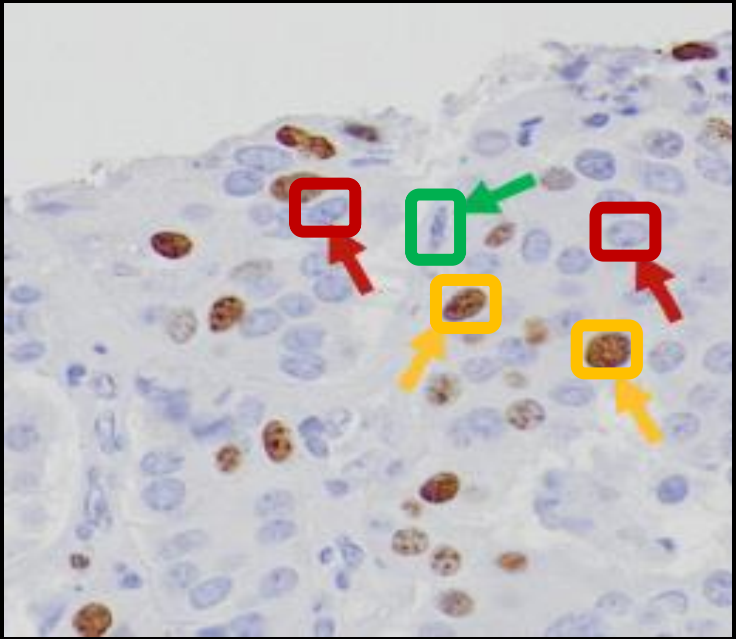
- Neuroendocrine Tumors (NETs)
  - 12,000 new diagnoses in the US per year.[1]

- Tumor progress
  - Low: <3%
  - Intermediate: 3%~20%
  - High: >20%

Pancreatic tissue microarray (TMA) image

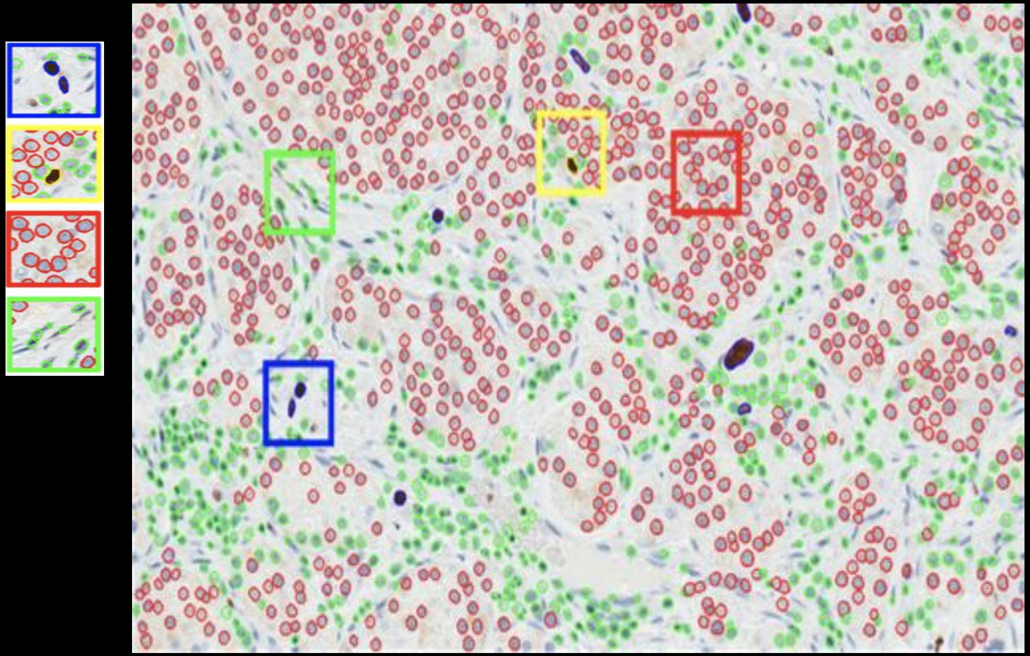


DISEASE GRADING



- ❑ ➡ Immunopositive tumor nuclei
- ❑ ➡ Immunonegative tumor nuclei
- ❑ ➡ Non-tumor nuclei

DISEASE GRADING



Non- tumor cells (non-lymphocytes),
Immunopositive tumor,
Immunonegative tumor,
lymphocytes

Collecting Data

- https://docs.google.com/forms/d/1f6Mtw_AEeidFahMWrZCnZpY90D0H1uNp8mOjfAfR-44/edit