

2022 지역ICT 이노베이션 확산사업 인공지능 교육

# 인공지능 체험하기

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# 학습 내용

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- 오토 드로우
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  2. 포즈 인식 모델
  3. 소리 인식 모델
- **이미지 인식 모델 활용하기**

# 퀵 드로우(Quick Draw):

- 지도 학습 방법으로 학습하여 낙서를 인식할 수 있는 인공지능
- <https://quickdraw.withgoogle.com/>

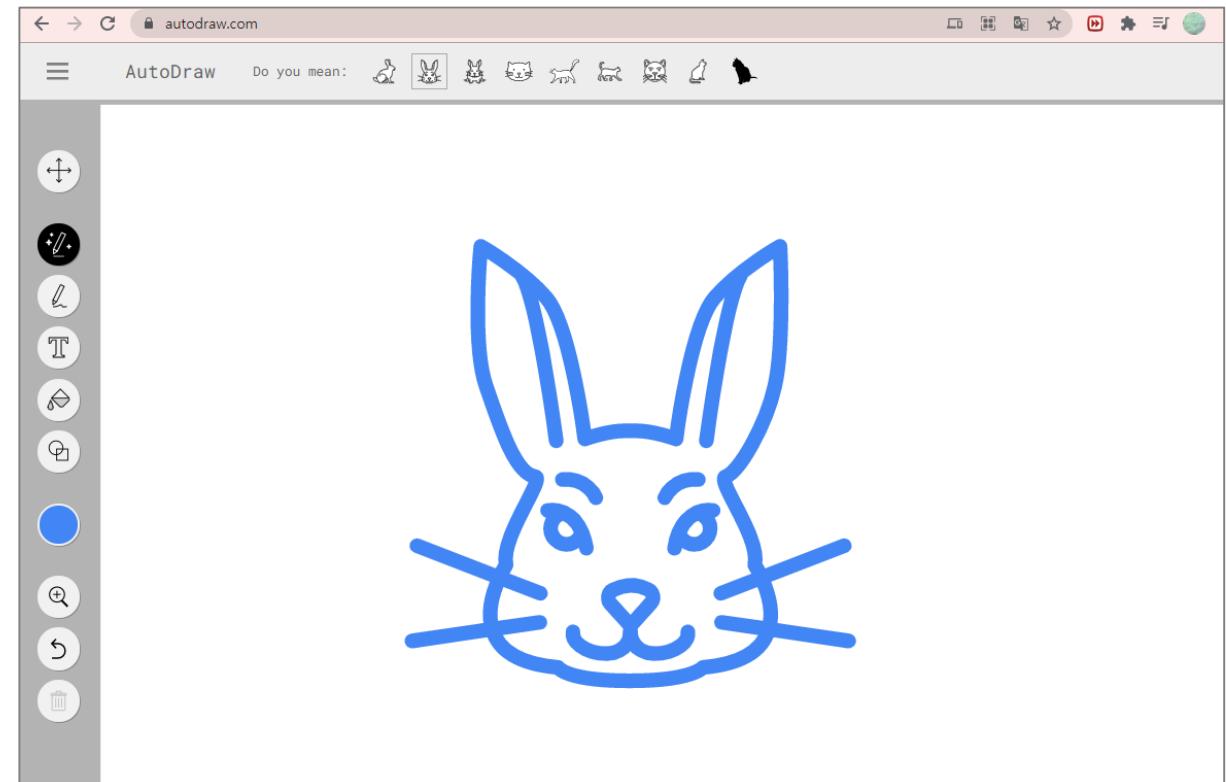
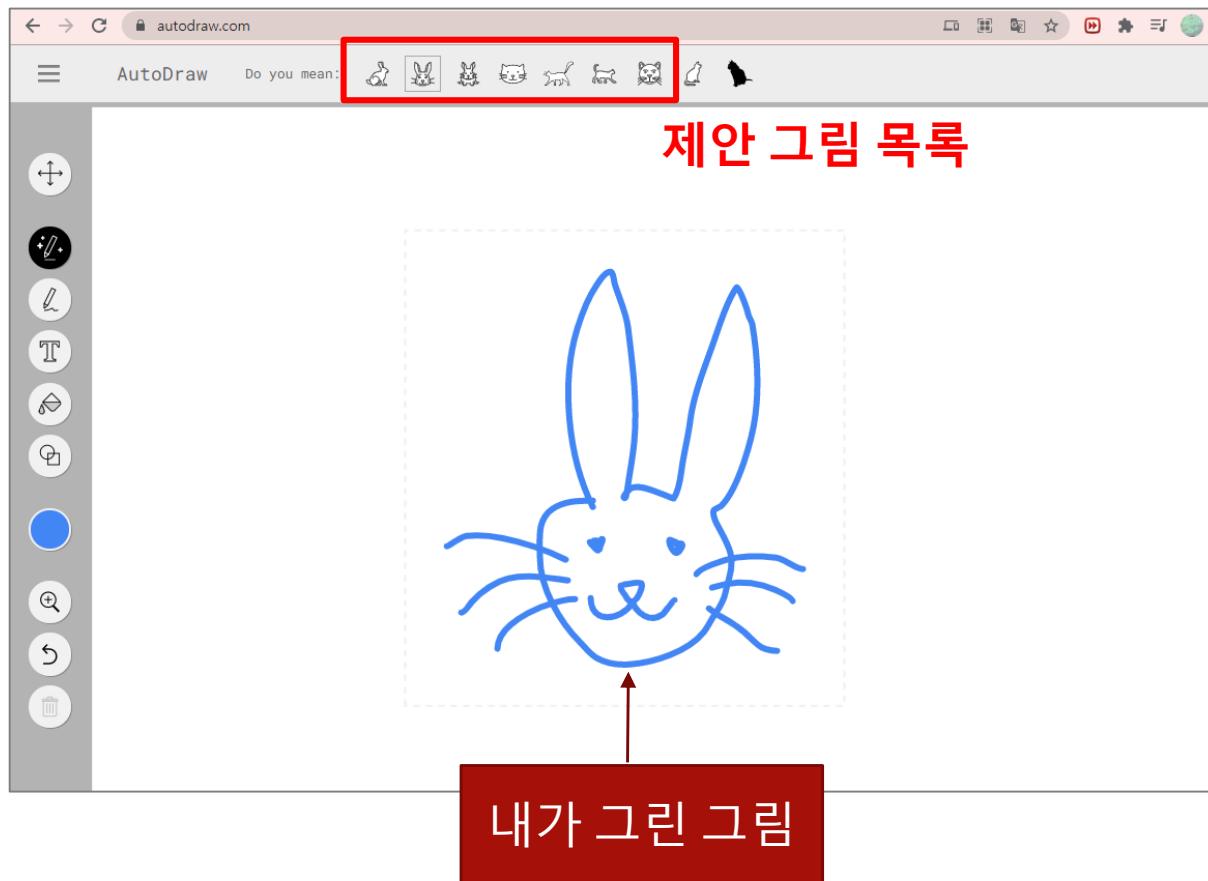
The screenshot shows the main interface of the Quick Draw! game. At the top, a banner reads "QUICK, DRAW!". Below it is a hand holding a pencil, surrounded by various small line drawings of objects like a bicycle, a pizza slice, a coffee cup, a soccer ball, a spider, a bicycle wheel, a tooth, and a key. A small robot character is also visible. At the bottom left, there is explanatory text in Korean: "머신 러닝 기술이 학습을 통해 낙서를 인식할 수 있을까요?" and "여러분의 그림으로 머신 러닝의 학습을 도와주세요. Google은 머신 러닝 연구를 위해 [세계 최대의 낙서 데이터 세트](#)를 오픈소스로 공유합니다.". A yellow "시작하기" (Start) button is located at the bottom center.

The results screen shows a yellow background with the message "잘 그리셨어요!" (Well drawn!). Below it, a message says "신경망이 낙서 5개를 맞췄습니다. 하지만 1개는 알아보지 못했어요. 낙서를 선택하여 신경망이 무엇으로 인식했는지 알아보세요." There are six small boxes showing the drawings and their AI recognition results: 1. 고등건물 (High-rise building) - checkedmark. 2. 햄버거 (Hamburger) - checkedmark. 3. 교회 (Church) - checkedmark. 4. 전자레인지 (Microwave) - checkedmark. 5. 드라이버 (Screwdriver) - checkedmark. 6. 얼룩무늬 위장 (Camouflage) - crossed-out. At the bottom, there are buttons for "그림 공유하기" (Share drawing) with social media icons for Twitter and Facebook, and a green "다시 플레이하기" (Play again) button.

# 오토 드로우(AutoDraw)

- 이용자가 그린 그림을 업그레이드 해주는 기능
- <https://www.autodraw.com/>

<https://experiments.withgoogle.com/autodraw>



# MachineLearning for kids

- <http://machinelearningforkids.co.uk/>

The screenshot shows a web browser window for the 'Machine Learning for Kids' website. The page is in Korean. On the left, there's a large title '인공지능 게임을 만들어봐요.' (Create an AI game). Below it is a blue button labeled '프로젝트로 이동' (Move to project). To the right, there's a numbered list of three steps:

- 1 먼저 여러 데이터를 모아보세요
- 2 데이터를 사용하여 인공지능을 훈련시켜보세요
- 3 인공지능을 사용하여 스크래치 게임을 만들어보세요

The browser interface includes a title bar 'Machine Learning for Kids', a address bar 'machinelearningforkids.co.uk', and a navigation menu with links like '소개', '프로젝트', '워크시트', etc.

# MachineLearning for kids

The screenshot shows a web interface for a machine learning project titled "aiProj". The top navigation bar includes links for 소개 (About), 프로젝트 (Project), 워크시트 (Worksheet), 학습된 책 (Learned Book), 새소식 (News), 도움말 (Help), 로그아웃 (Logout), and Language selection. Below the title, there are three main sections:

- 훈련**: Trains a machine learning model using various data types. Description: 컴퓨터가 훈련할 수 있도록 다양한 데이터를 준비하세요. Button: 훈련
- 학습 & 평가**: Evaluates a machine learning model using images. Description: 데이터를 사용하여 컴퓨터를 학습시키세요. images. Button: 학습 & 평가
- 만들기**: Creates a game or app using trained models. Description: 당신이 게임이나 앱을 만들기 위해 훈련시킨 머신러닝 모델을 스크래치, 파이썬, 앱 인벤터에서 사용해 보세요. Button: 만들기

# MachineLearning for kids



소개 프로젝트 워크 시트 사전 훈련 도서 뉴스 도움말 로그 아웃

언어

## 인식 이미지로 고양이 또는 개

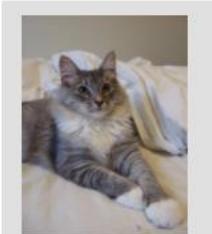
<프로젝트로 돌아 가기

+ 새로운 레이블 추가

고양이



개



웹



웹캠



그리기

20



웹



웹캠



그리기

21

7

# github.com 에 저장소 만들기

- 프로젝트 웹 게시를 위한 준비
  - 각자 github에 로그인
  - 새로운 repository 생성

Create a new repository  
A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Owner \*  Repository name \*  반드시 username.github.io로 저장소 이름을 정해야 web 서비스가 됨

Great repository names are short and memorable. Need inspiration? How about re-imagine\_brocoli?

Description (optional)  
2022년 AI를 활용한 무인이동체 개발 교육

Public  
Anyone on the internet can see this repository. You choose who can commit.

Private  
You choose who can see and commit to this repository.

Initialize this repository with:  
Skip this step if you're importing an existing repository.

Add a README file  
This is where you can write a long description for your project. [Learn more](#).

Add .gitignore  
Choose which files not to track from a list of templates. [Learn more](#).

.gitignore template: None ▾

Choose a license  
A license tells others what they can and can't do with your code. [Learn more](#).

License: None ▾

This will set `main` as the default branch. Change the default name in your [settings](#).

ⓘ You are creating a public repository in your personal account.

**Create repository**

# github.com에 저장소 만들기

## ■ index.html 파일 작성

The image shows two screenshots of a GitHub repository named 'aicsdit/aicsdit.github.io'.  
The top screenshot shows the repository page with a 'Code' tab selected. A red box highlights the 'Add file' button. The repository has 1 branch and 0 tags. It contains a single commit from 'aicsdit' labeled 'Initial commit' and a 'README.md' file.  
The bottom screenshot shows the 'index.html' file being edited. A red box highlights the file name in the navigation bar. The code editor shows the following HTML:

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <meta charset="utf-8">
5     <title>나의 AI 프로젝트</title>
6   </head>
7   <body>
8     <h2>Hello, World!!!!</h2>
9   </body>
10  </html>
11  |
```

To the right of the editor, a browser window displays the rendered website at [aicsdit.github.io/index.html](https://aicsdit.github.io/index.html). The page content is 'Hello, World!!!!'. A red box highlights the URL in the browser's address bar, with the text '웹사이트 주소' (Website Address) written above it.

# Teachable Machine

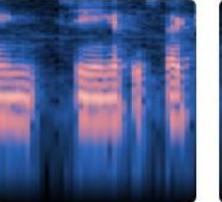
- 머신러닝 **모델**들을 만들기 위한 웹 기반 도구
- <https://teachablemachine.withgoogle.com/>

## 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.

# Teachable Machine

## How do I use it?

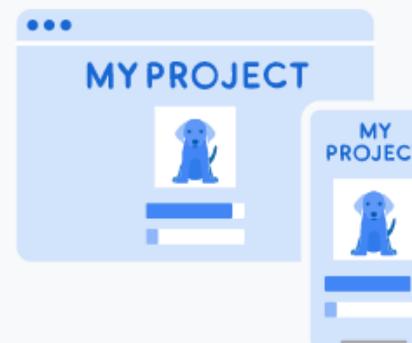
Class 1



Class 2



TRAIN MODEL



### 1 Gather

Gather and group your examples into classes, or categories, that you want the computer to learn.

[Video: Gather samples](#) ◎

### 2 Train

Train your model, then instantly test it out to see whether it can correctly classify new examples.

[Video: Train your model](#) ◎

### 3 Export

Export your model for your projects: sites, apps, and more. You can download your model or host it online for free.

[Video: Export your model](#) ◎

# Teachable Machine으로 모델 생성하기

## ■ 모델 만들기 단계

1. 자료수집
2. 학습
3. 인식(판별)

The screenshot shows the Teachable Machine interface. On the left, there are two sections for adding image samples: 'Class 1' and 'Class 2', each with 'Webcam' and 'Upload' buttons. A dashed box at the bottom center contains the text '+ Add a class'. On the right, there is a 'Training' panel with a 'Train Model' button and an 'Advanced' dropdown menu. The 'Advanced' menu is expanded, showing three configuration options: 'Epochs: 50', 'Batch Size: 16', and 'Learning Rate: 0.001'. A red box highlights these three settings. Below the Advanced menu are 'Reset Defaults' and 'Under the hood' buttons. To the right of the Training panel is a 'Preview' section with a message: 'You must train a model on the left before you can preview it here.' There is also an 'Export Model' button.

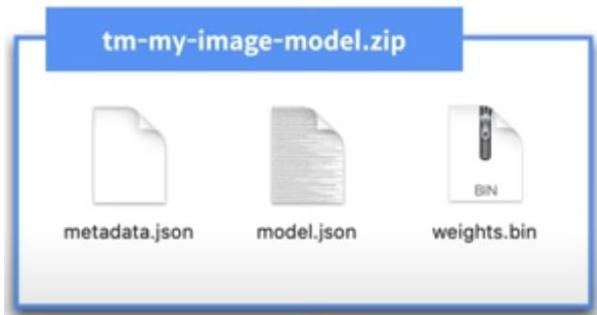
- **Epochs** : 전체 데이터 학습 횟수
- **Batch Size** : 전체 데이터를 총 16개로 나누어 학습(연산)
- **Learning Rate** : 학습율

# Teachable Machine으로 모델 생성하기

- Class
  - 서로 연관된 것들을 모아서 그룹핑(분류) 한 것이라는 의미
  - 해당 클래스에 들어갈 자료를 **수집**
- Training
  - 기계에게 **학습**을 시키는 단계
- Preview
  - 학습된 모델을 통해 현재 이미지를 **판별**
  - 기계가 학습을 제대로 했는지 평가
  - 학습 상태를 보고 Class의 자료들을 재정리
    - 부정확하거나 Class에 속하지 않은 자료 삭제

# 학습 모델 Export

- 학습 모델(판단력) 활용
  - 로컬에 다운로드



Export your model to use it in projects.

[Tensorflow.js](#) [Tensorflow](#) [Tensorflow Lite](#)

Export your model:

Upload (shareable link)  Download [Download my model](#)

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 Image Model</div>
<button type="button" onclick="init()">Start</button>
<div id="webcam-container"></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/image@0.8/dist/teachablemachine-image.min.js"></script>
```

[Copy](#)

- 클라우드에 업로드
  - 링크 사용

Export your model to use it in projects.

[Tensorflow.js](#) [Tensorflow](#) [Tensorflow Lite](#)

Export your model:

Upload (shareable link)  Download [Update my cloud model](#)

Your sharable link:

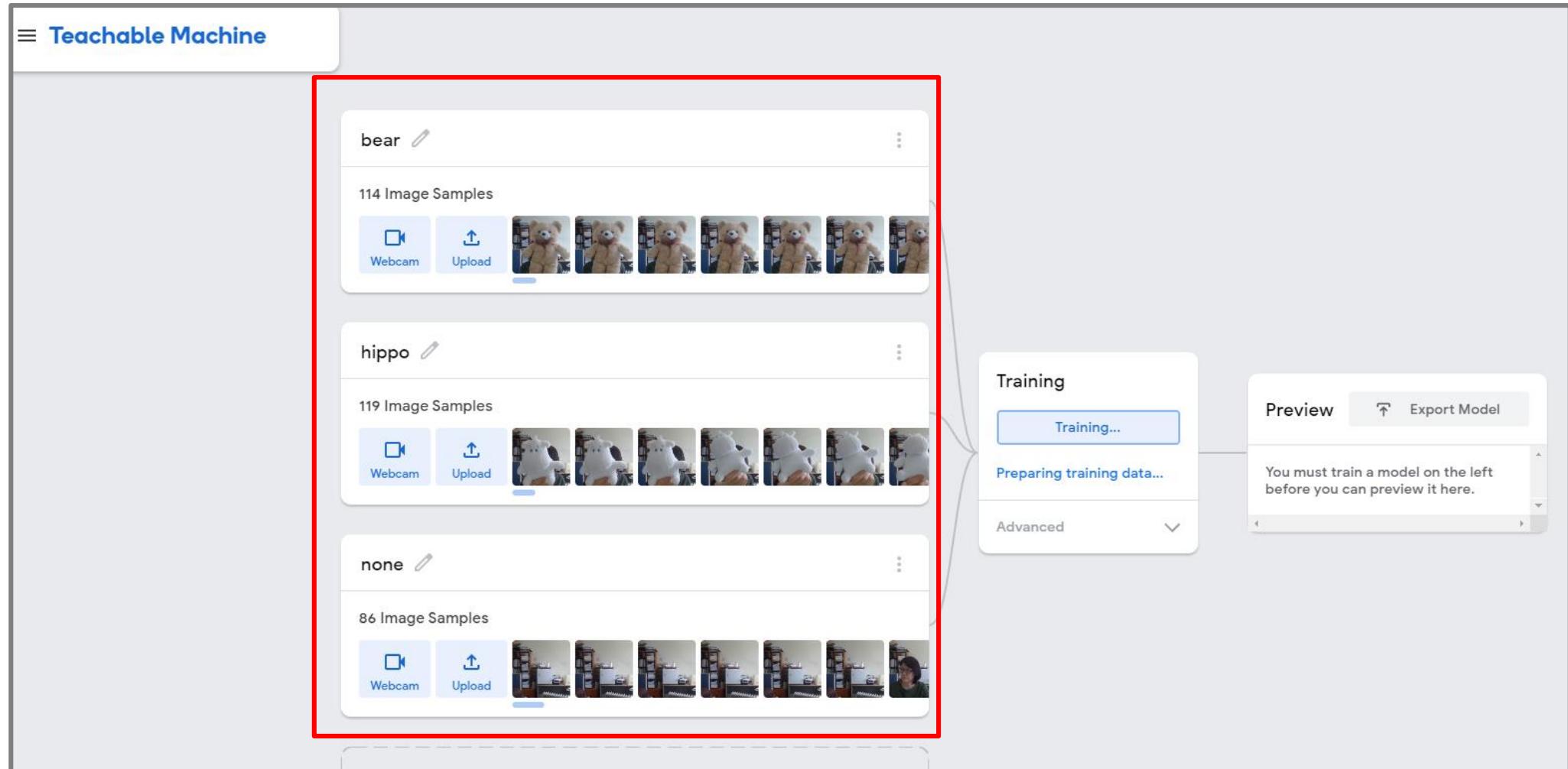
<https://teachablemachine.withgoogle.com/models/kiswcso30/> [Copy](#)

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

✓ Your cloud model is up to date.

# 1. 이미지 인식 모델

## 1. 곰과 하마 인형 자료 수집



# 1. 이미지 인식 모델

학습하기 전에 잘못 들어간 영상, 흔들린 영상 등 부정확한 영상은 제거한다.

## 2. 곰과 하마 인형 자료 학습

Teachable Machine

Don't switch tabs!  
You must leave this tab open to train your model. [Don't show again](#) [OK](#)

bear

103 Image Samples

Webcam Upload

hippo

109 Image Samples

Webcam Upload

none

80 Image Samples

Webcam Upload

Add a class

Training

Training...

00:08 - 34 / 50

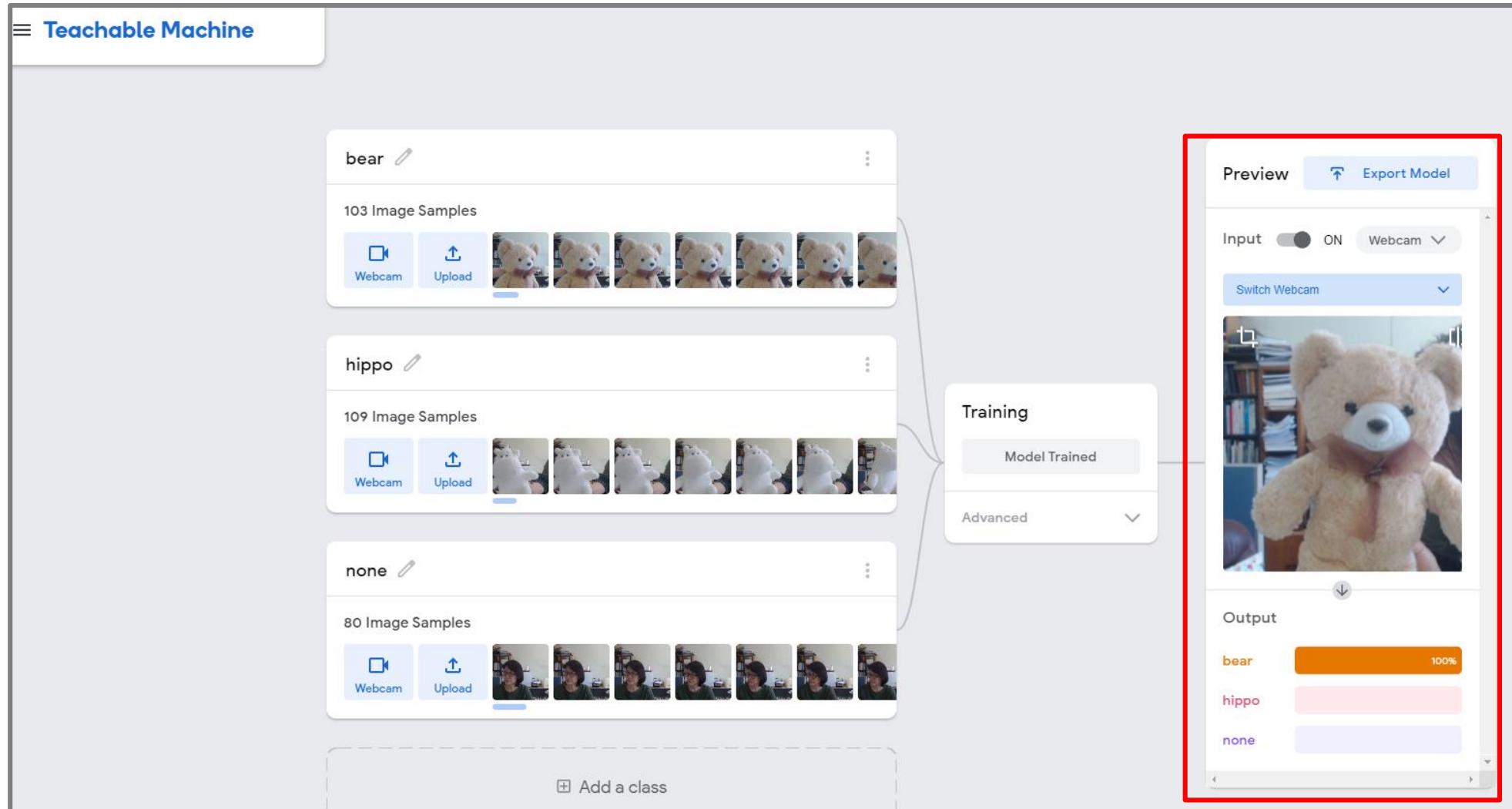
Advanced

Preview Export Model

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

# 1. 이미지 인식 모델

## 3. 곰과 하마 인형 이미지 인식(판별)



# 1. 이미지 인식 모델

## 4. 곰과 하마 이미지 인식 모델 저장 및 웹 게시

The image shows two screenshots of the Teachable Machine web interface side-by-side, illustrating the process of exporting a trained model.

**Left Screenshot:** Shows the 'Export your model to use it in projects.' section. It has three tabs: Tensorflow.js (selected), Tensorflow, and Tensorflow Lite. Under 'Export your model:', there are two options: 'Upload (shareable link)' (selected) and 'Download'. A red box highlights the 'Upload my model' button. Below it, the 'Your sharable link:' field contains the URL [https://teachablemachine.withgoogle.com/models/\[...\]/](https://teachablemachine.withgoogle.com/models/[...]/). A red arrow points from this URL to the corresponding field in the right screenshot.

**Right Screenshot:** Shows the same 'Export your model to use it in projects.' section. It also has three tabs: Tensorflow.js (selected), Tensorflow, and Tensorflow Lite. Under 'Export your model:', there are three options: 'Upload (shareable link)' (selected), 'Download', and 'Update my cloud model'. Below it, the 'Your sharable link:' field contains the URL <https://teachablemachine.withgoogle.com/models/bxHAcppmb/>, which is also highlighted with a red box. To the right of this URL is a 'Copy' button with a clipboard icon.

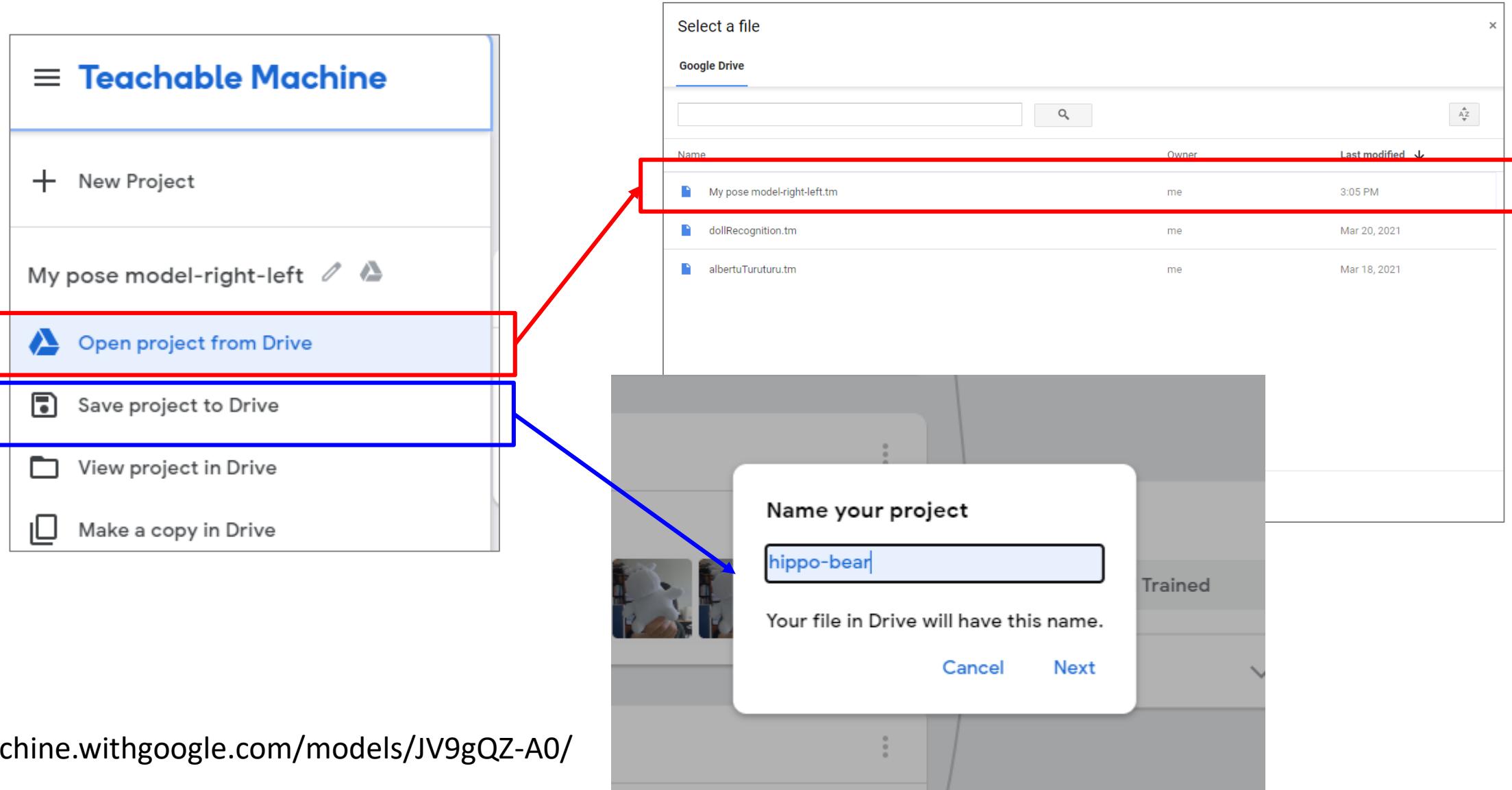
**Code Snippets:** Both screenshots show code snippets for using the model in a p5.js Web Editor. The left snippet is for 'Javascript' and the right one is for 'p5.js'. Both snippets include CDN links for p5.js and p5.dom.js, and a script block defining a classifier variable and setting the imageModelURL to the sharable link.

```
<div>Teachable Machine Image Model - p5.js and ml5.js</div>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/p5.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/addons/p5.dom.min.js"></script>
<script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
<script type="text/javascript">
  // Classifier Variable
  let classifier;
  // Model URL
  let imageModelURL = './my_model/';
  
  // Video
  let video;
  let flippedVideo;
```

```
<div>Teachable Machine Image Model - p5.js and ml5.js</div>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/p5.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/addons/p5.dom.min.js"></script>
<script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
<script type="text/javascript">
  // Classifier Variable
  let classifier;
  // Model URL
  let imageModelURL = 'https://teachablemachine.withgoogle.com/models/bxHAcppmb/';
```

<https://teachablemachine.withgoogle.com/models/bxHAcppmb>

# 구글 드라이버에 프로젝트 저장하고 불러오기



모델 확인

프로젝트에서 모델을 사용하려면 모델을 내보내세요. X

Tensorflow.js i Tensorflow i Tensorflow Lite i

모델 내보내기:

업로드(공유 가능한 링크) 다운로드 모델 다운로드

모델에서 사용할 코드 스니펫:

Javscript p5.js Github에 참여 i

Learn more about how to use the code snippet on [github](#).

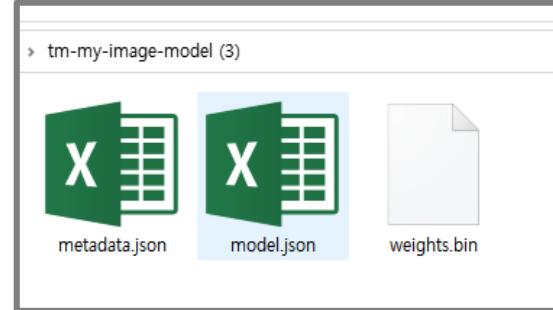
```
<div>Teachable Machine Image Model</div>
<button type="button" onclick="init()">Start</button>
<div id="webcam-container"></div>
<div id="label-container"></div>
<script src="https://cdn.jsdelivr.net/npm@tensorflow/tfjs@1.3.1/dist/tf.min.js"></script>
<script src="https://cdn.jsdelivr.net/npm@teachablemachine/image@0.8/dist/teachablemachine-image.min.js">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

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

    let model, webcam, labelContainer, maxPredictions;

    // Load the image model and setup the webcam
    async function init() {
        const modelURL = URL + "model.json";

```



모델을 다운로드하여 확인해 본다.

# github 웹에 게시하기

<https://teachablemachine.withgoogle.com/models/bxHAcmpb>

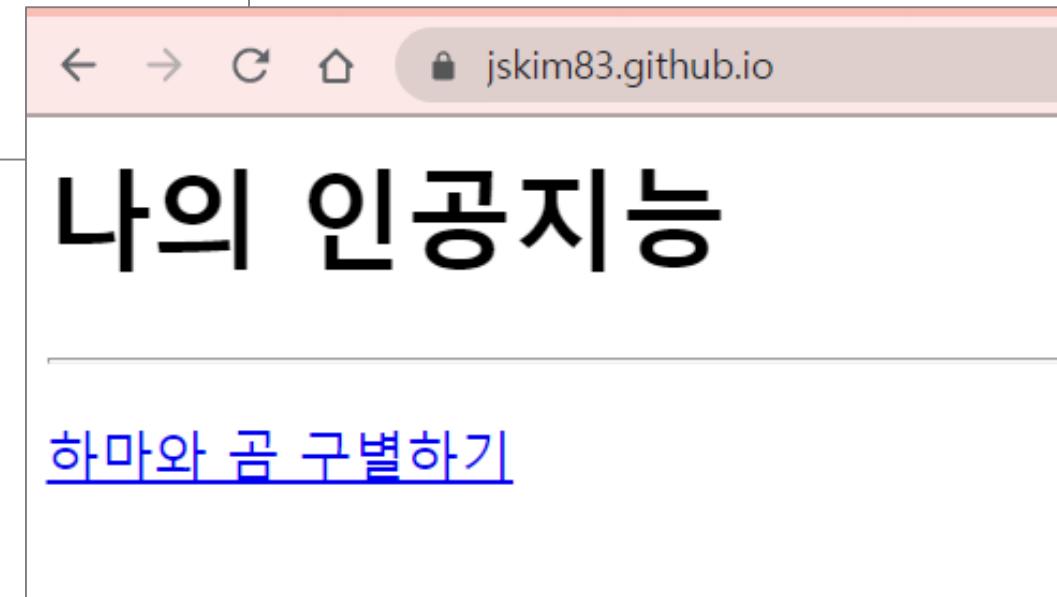
jskim83.github.io / index.html in main

<> Edit file Preview changes

```
1 <html>
2   <head>
3     <title>나의 AI </title>
4     <meta charset="utf-8">
5   </head>
6   <body>
7     <h1>나의 인공지능</h1>
8     <hr>
9     <p>
10       <a href ="https://teachablemachine.withgoogle.com/models/bxHAcmpb">하마와 곱 구별하기</a>
11     </p>
12   </body>
13 </html>
14
```

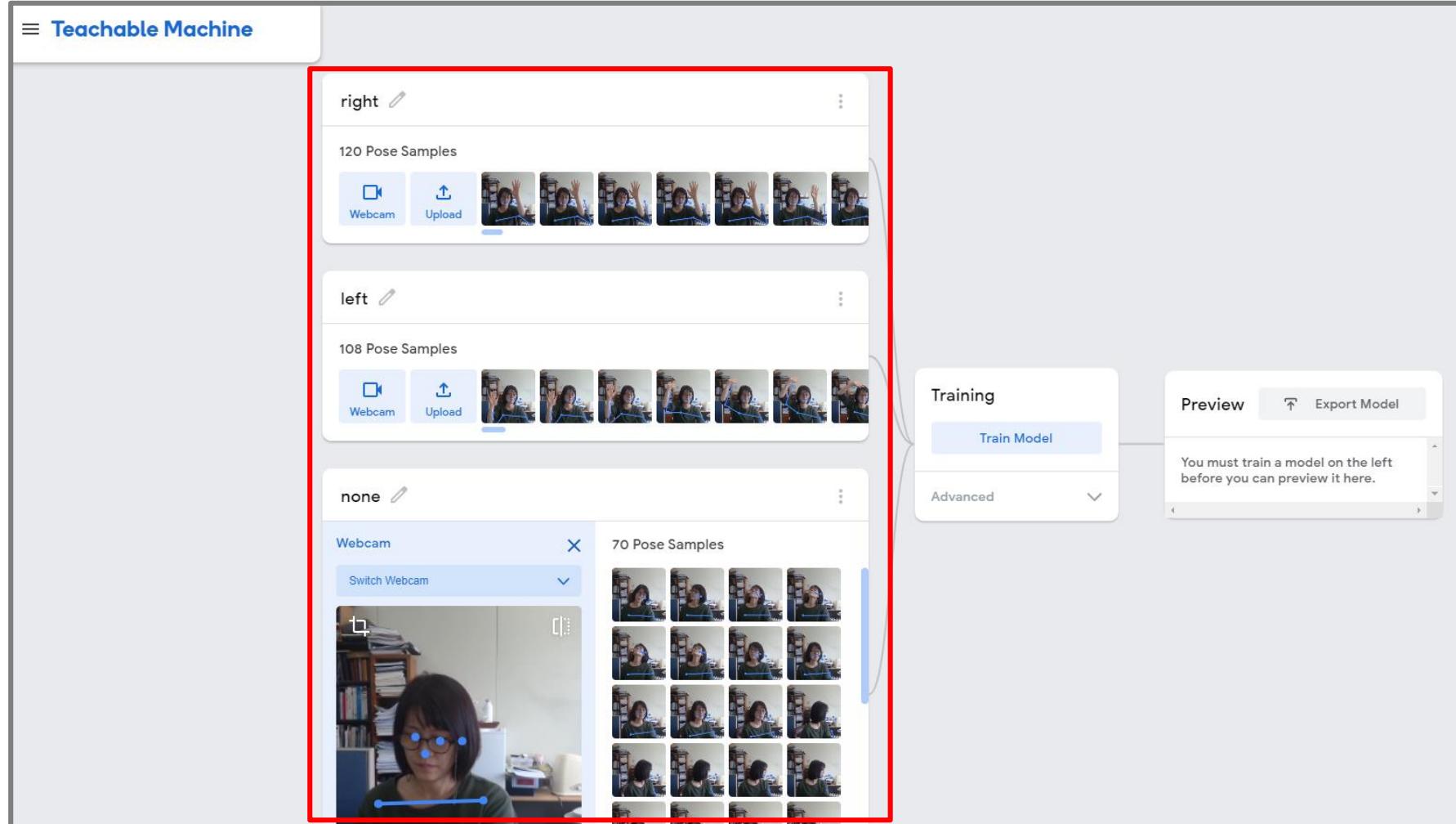
**HTML 파일 작성**

**Commit new file**



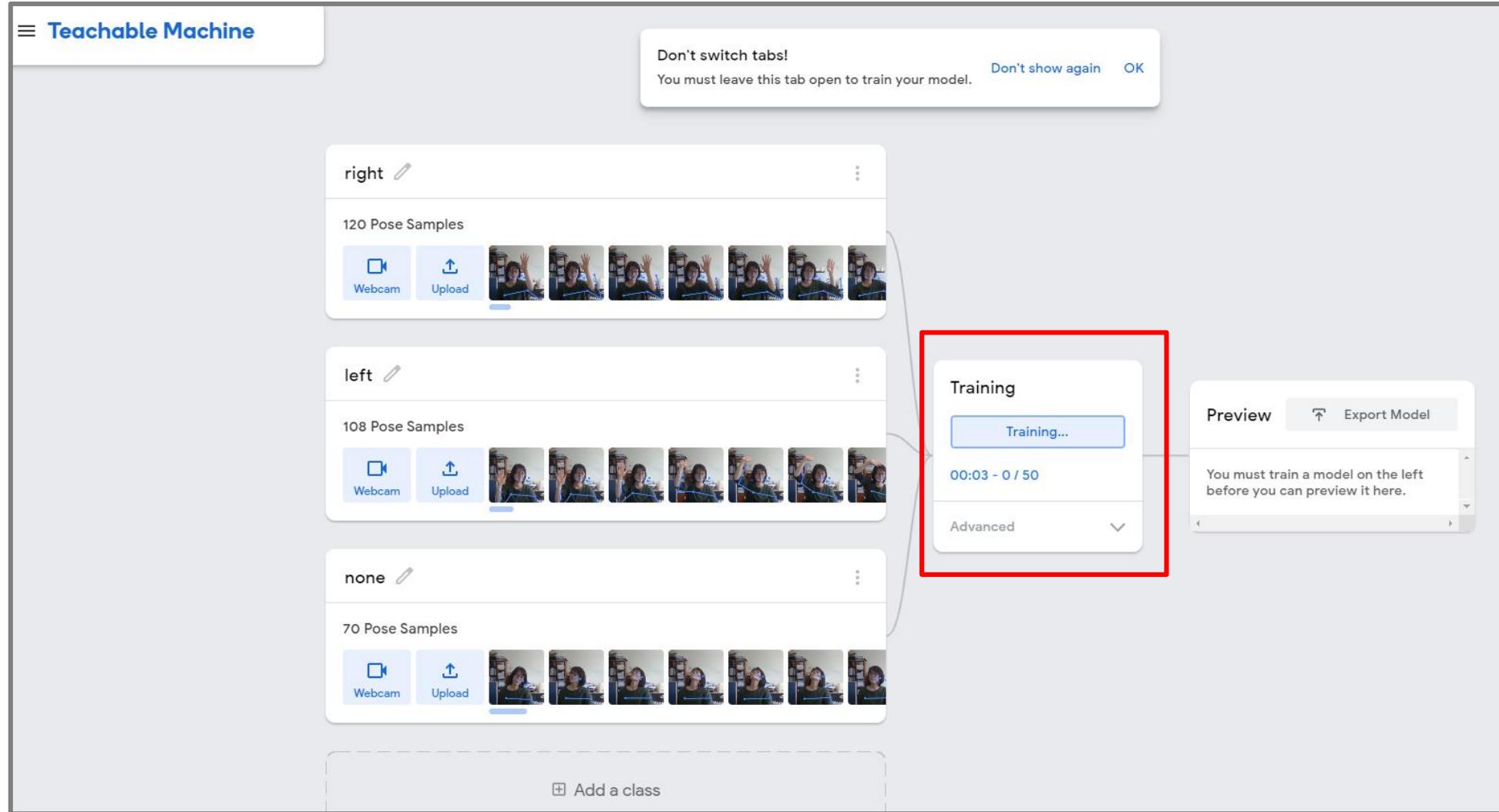
## 2. 포즈 인식 모델

### 1. 오른손 왼손 포즈 자료 수집



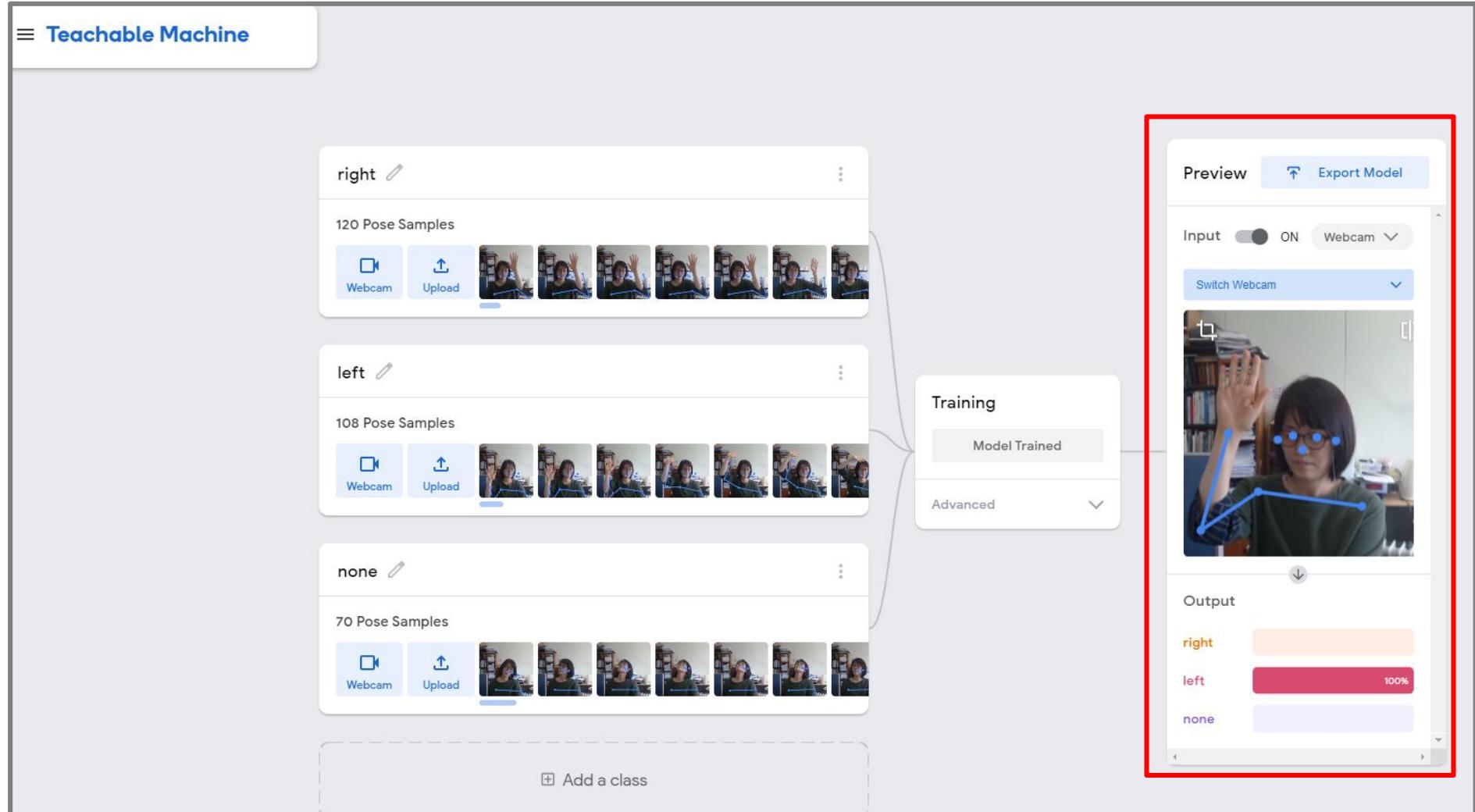
## 2. 포즈 인식 모델

### 2. 오른손 왼손 포즈 자료 학습



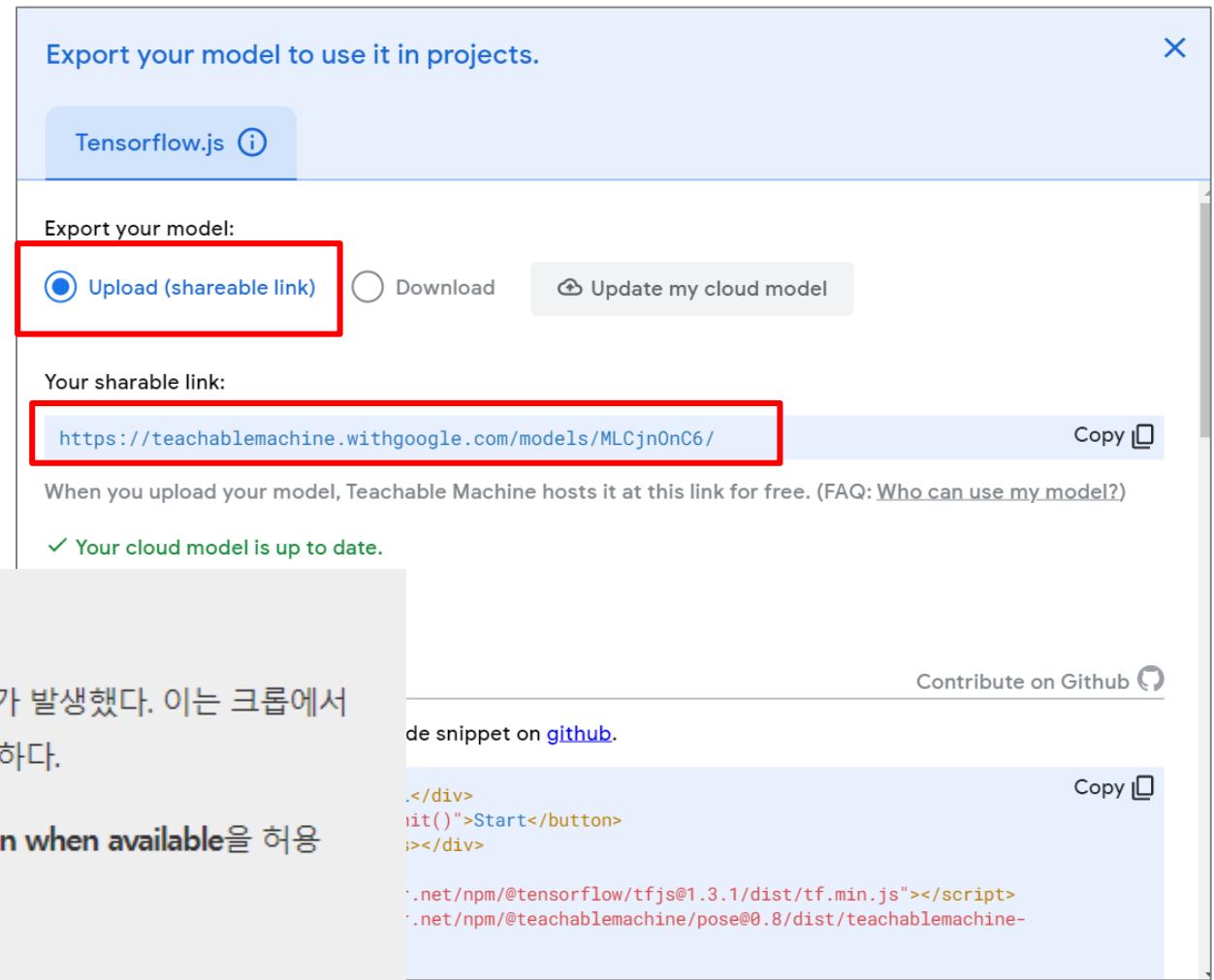
## 2. 포즈 인식 모델

### 3. 오른손 왼손 포즈 인식



## 2. 포즈 인식 모델

### 4. 모델 링크 github에 게시



<https://teachablemachine.withgoogle.com/models/MLCjnOnC6/>

### 3. 소리 인식 모델

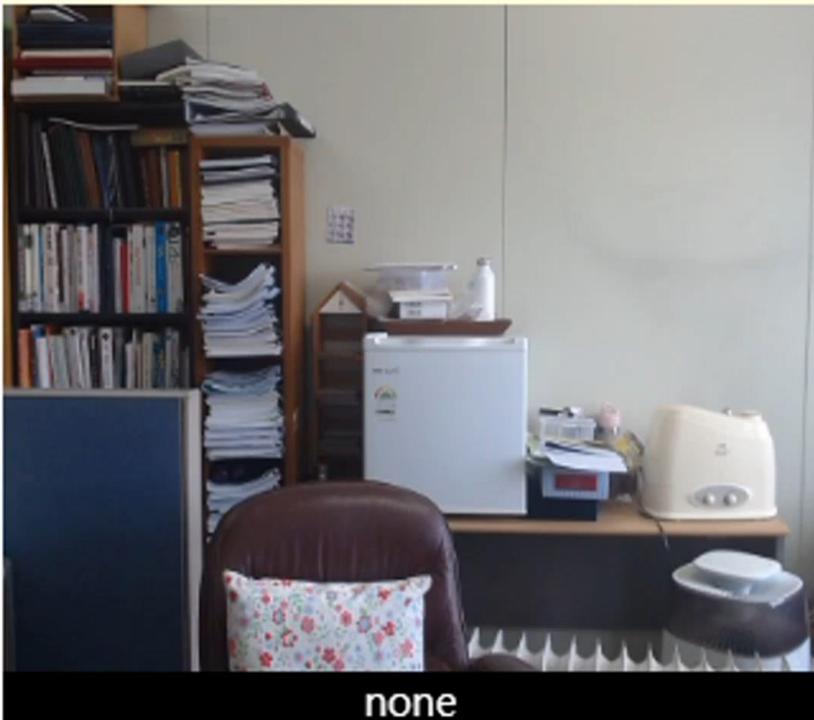
- 다음의 순서로 소리 인식 모델 만들기
  1. 박수 소리와 '안녕'을 말하는 목소리 자료 수집
  2. 소리 자료 학습
  3. 소리 인식

마이크가 활성화되어 있어야 하고 소리에 잡음이 너무 들어가면 안되기 때문에  
모두 조용한 장소에서 실험해 보시기 바랍니다.

# 이미지 인식 모델 활용

## Teachable Machine Image Model coded by me

아무도 없네요!!?



# 이미지 인식 모델 활용

Export your model to use it in projects.

Tensorflow.js ⓘ Tensorflow ⓘ Tensorflow Lite ⓘ

Javascript p5.js

Contribute on Github ↗

Open up the code snippet below directly in the [p5.js Web Editor](#).

`<div>Teachable Machine Image Model - p5.js and ml5.js</div>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/p5.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/addons/p5.dom.min.js"></script>
<script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
<script type="text/javascript">
 // Classifier Variable
 let classifier;
 // Model URL
 let imageModelURL = 'https://teachablemachine.withgoogle.com/models/bxHAcmpb/';
 ...
 // Video
 let video;
 let flippedVideo;
 // To store the classification
 let label = "";
 ...
 // Load the model first
 function preload() {
 classifier = ml5.imageClassifier(imageModelURL + 'model.json');
 }
 ...
 function setup() {
 createCanvas(320, 260);
 // Create the video
 video = createCapture(VIDEO);
 video.size(320, 240);
 video.hide();
 ...
 flippedVideo = ml5.flipImage(video);
 // Start classifving
 }
 ...
</script>`

Copy ⌂

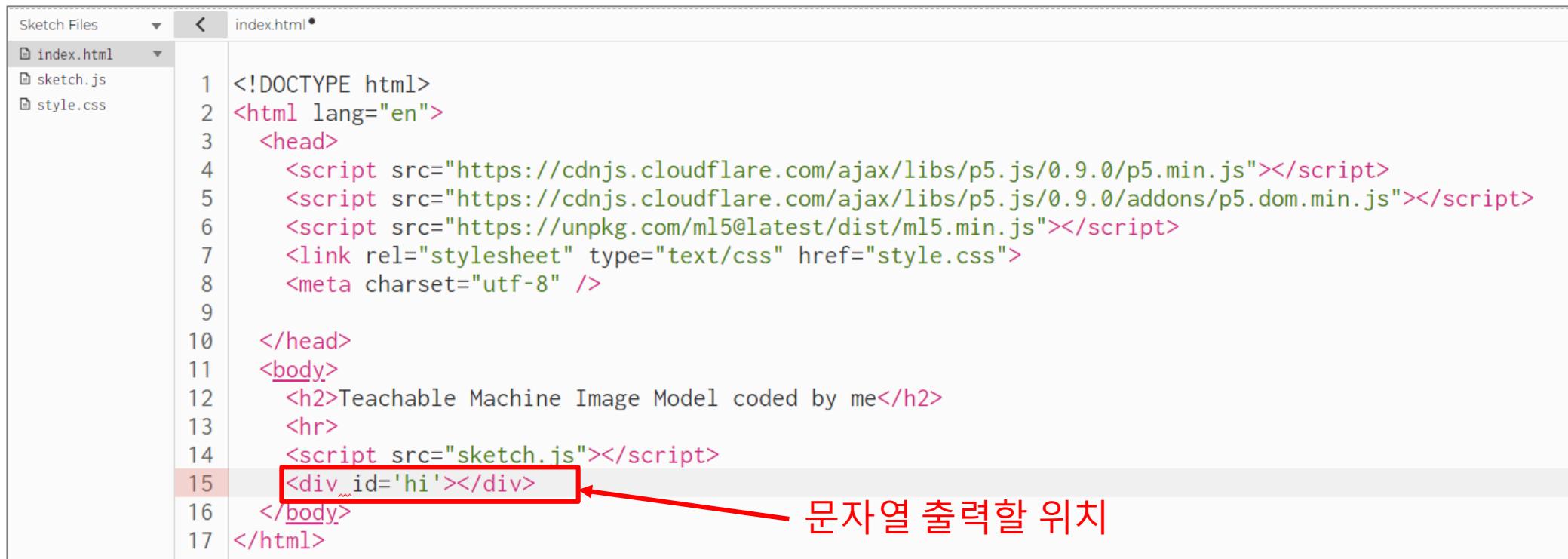
**p5.js로 작성된 기본 템플릿 있음**

**복사하여 index.html에 붙여 넣기**

**복사하여 sketch.js에 붙여 넣기**

# 이미지 인식 모델 활용

- 웹 에디터 열기
  - <https://editor.p5js.org/> 가입을 하게되면 프로젝트 저장 등 다양한 작업이 가능
- 파일 변경하기
  - index.html



Sketch Files < index.html\*

index.html

```
1 <!DOCTYPE html>
2 <html lang="en">
3   <head>
4     <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/p5.min.js"></script>
5     <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/0.9.0/addons/p5.dom.min.js"></script>
6     <script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
7     <link rel="stylesheet" type="text/css" href="style.css">
8     <meta charset="utf-8" />
9
10    </head>
11    <body>
12      <h2>Teachable Machine Image Model coded by me</h2>
13      <hr>
14      <script src="sketch.js"></script>
15      <div id='hi'></div>
16    </body>
17  </html>
```

문자열 출력할 위치

# 이미지 인식 모델 활용

## ■ 파일 변경하기

### ■ sketch.js :

```
Sketch Files < sketch.js*
```

```
index.html
sketch.js
style.css
```

```
function draw() {
    background(0);
    // Draw the video
    image(flippedVideo, 0, 0);

    // Draw the label
    fill(255);
    textSize(16);
    textAlign(CENTER);
    text(label, width / 2, height - 4);
}
```

```
function draw() {
    background(0);
    // Draw the video
    image(flippedVideo, 0, 0);

    // Draw the label
    fill(255);
    textSize(16);
    textAlign(CENTER);

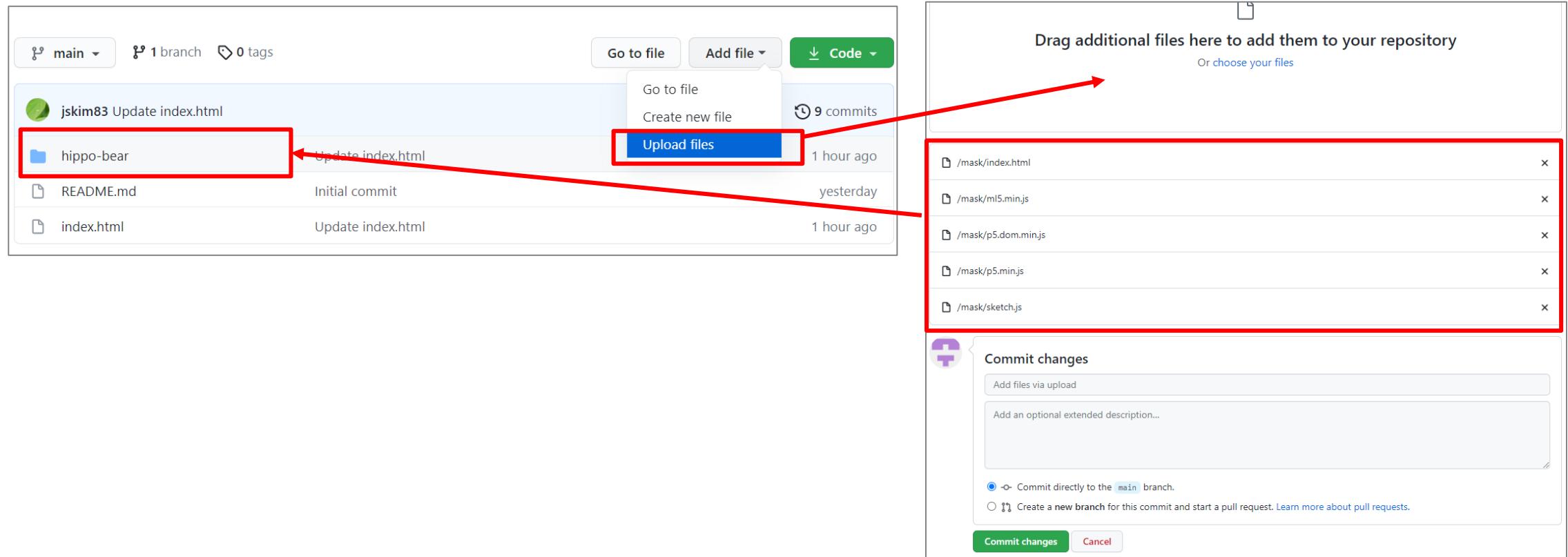
    //인식된 레이블에 따라 다른 메세지가 화면에 출력됨
    if(label=='bear'){
        document.getElementById("hi").innerHTML="곰이네요^^ 반가워요!";
        text(label, width / 2, height - 4);
    }else if(label=='hippo'){
        document.getElementById("hi").innerHTML="하마네요^^ 반가워요!";
        text(label, width / 2, height - 4);
    }else{
        document.getElementById("hi").innerHTML="다들 어디가셨나요!!";
        text(label, width / 2, height - 4);
    }
}
```

30

# 이미지 인식 모델 활용

- 변경한 파일들을 다운로드하여 github에 게시
  - github에 폴더 업로드

p5.js 에디터에서 다운로드한 폴더를 업로드

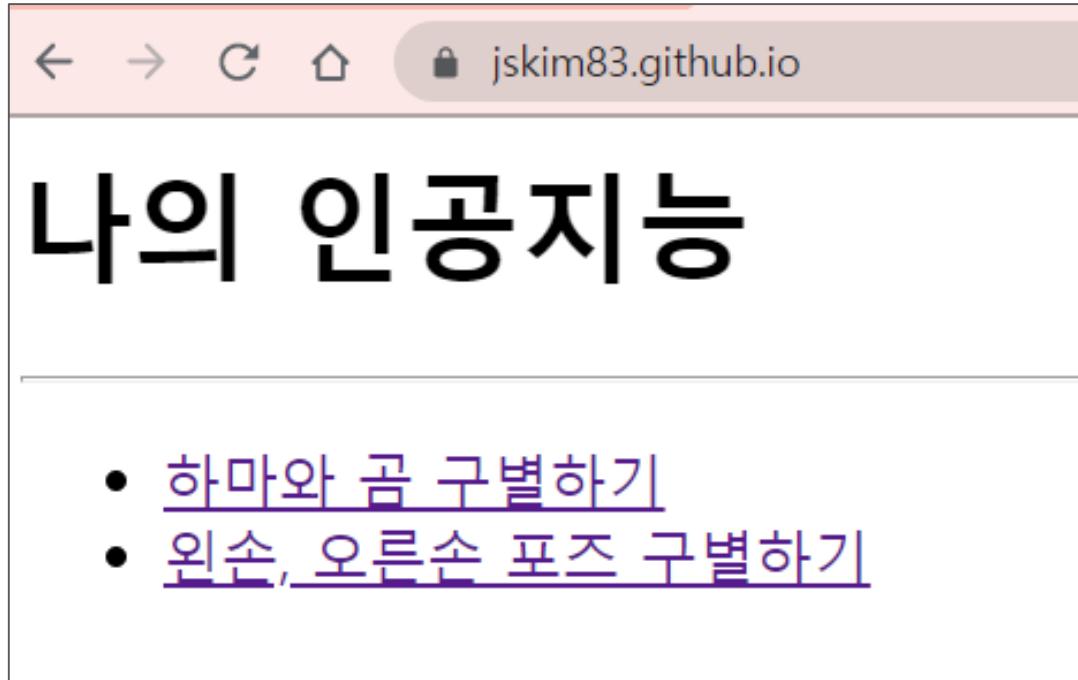


# 이미지 인식 모델 활용

## ■ index.html 파일 변경

```
6  <body>
7      <h1>나의 인공지능</h1>
8      <hr>
9      <ul>
10     <li><a href ="hippo-bear/index.html">하마와 곰 구별하기</a></li>
11     <li><a href ="https://teachablemachine.withgoogle.com/models/MLCjnOnC6/">왼손, 오른손 포즈 구별하기</a></li>
12     </ul>
13 </body>
```

# github 웹페이지에서 확인



# 실습-1

- 자신이 가지고 있는 물건 2가지 이상을 인식하는 모델 작성해 보세요!

# 실습-2

- 자신의 포즈 중 2가지 이상을 인식하는 모델 작성해 보세요!

**Thank you for your  
attention!!**