Hands-on

Title: Image Classification using Google Teachable Machine

Problem Statement:

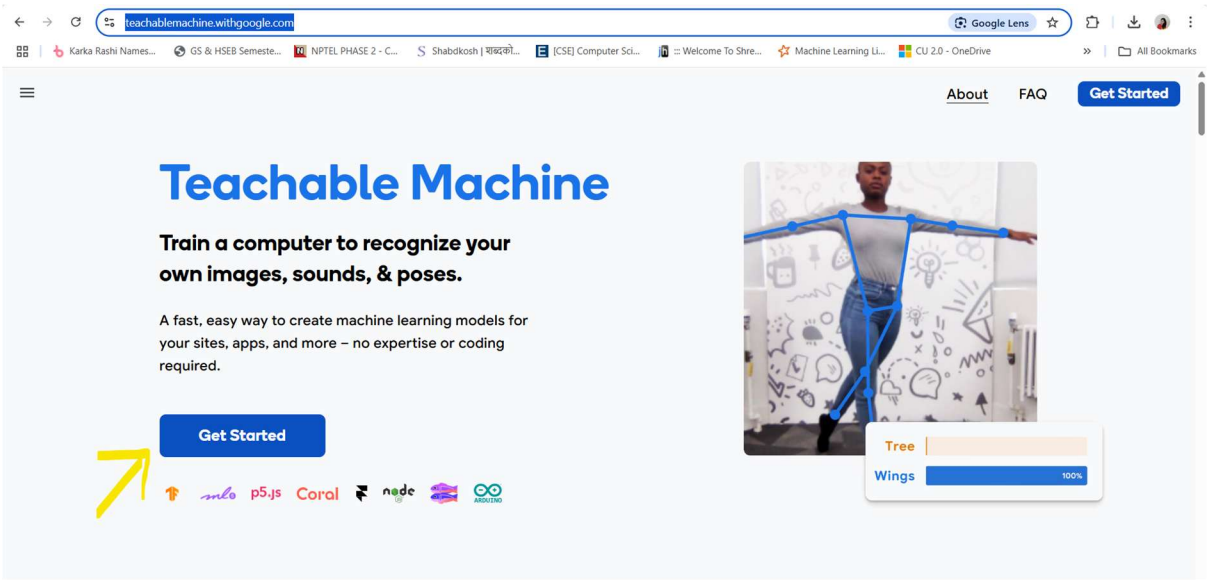
Can a machine learning model accurately distinguish between two facial expressions — such as *happy* and *sad* — using image data captured from a webcam or uploaded files? This activity explores how ML models learn visual patterns and highlights the impact of training data quality and quantity.

Tools Used:

- **Tool Name:** Google Teachable Machine
- **URL:** https://teachablemachine.withgoogle.com/
- **Type:** No-code, browser-based ML training platform
- **Model Type:** Image Classification

Implementation in Detailed Manner:

- **Step 1: Launch Teachable Machine**
  - Visit: https://teachablemachine.withgoogle.com/
  - Click **“Get Started”**, then choose **“Image Project”** under the "Standard Image Model".


teachablemachine.withgoogle.com
Google Lens
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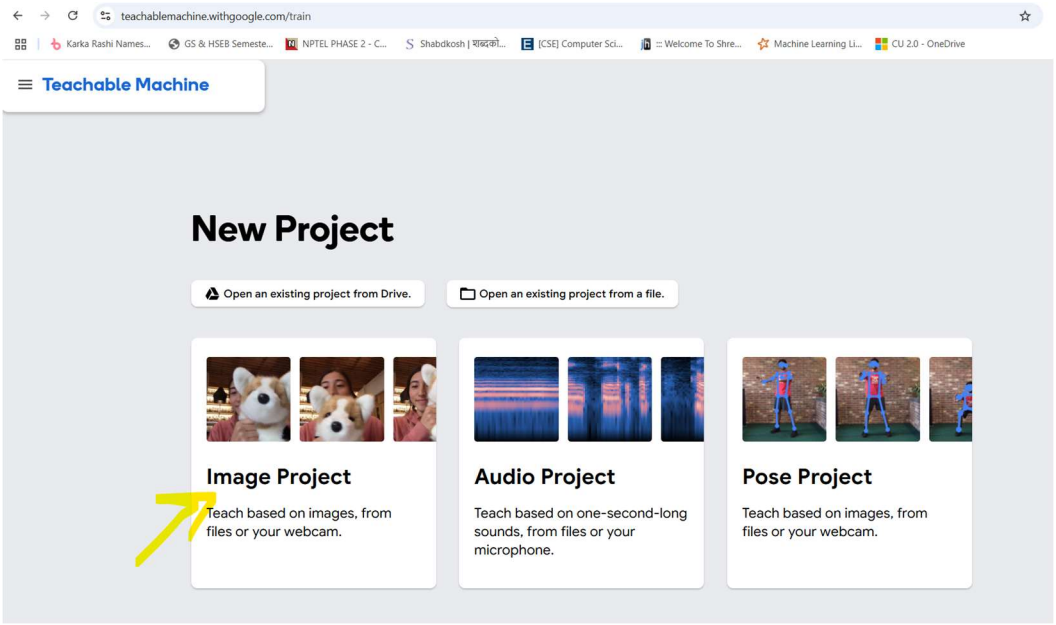
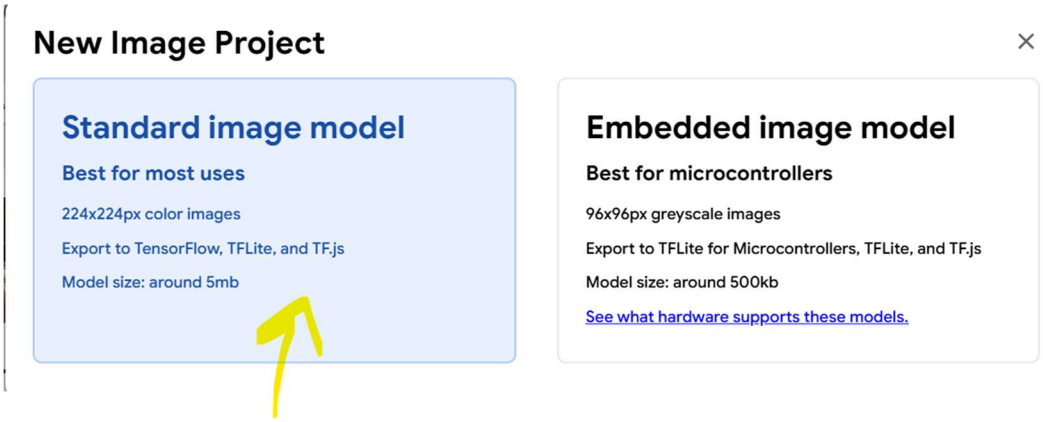
Teachable Machine
Train a computer to recognize your own images, sounds, & poses.
A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.
Get Started
p5.js
Coral
Tree
Wings
100%


teachablemachine.withgoogle.com/train
Teachable Machine
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.

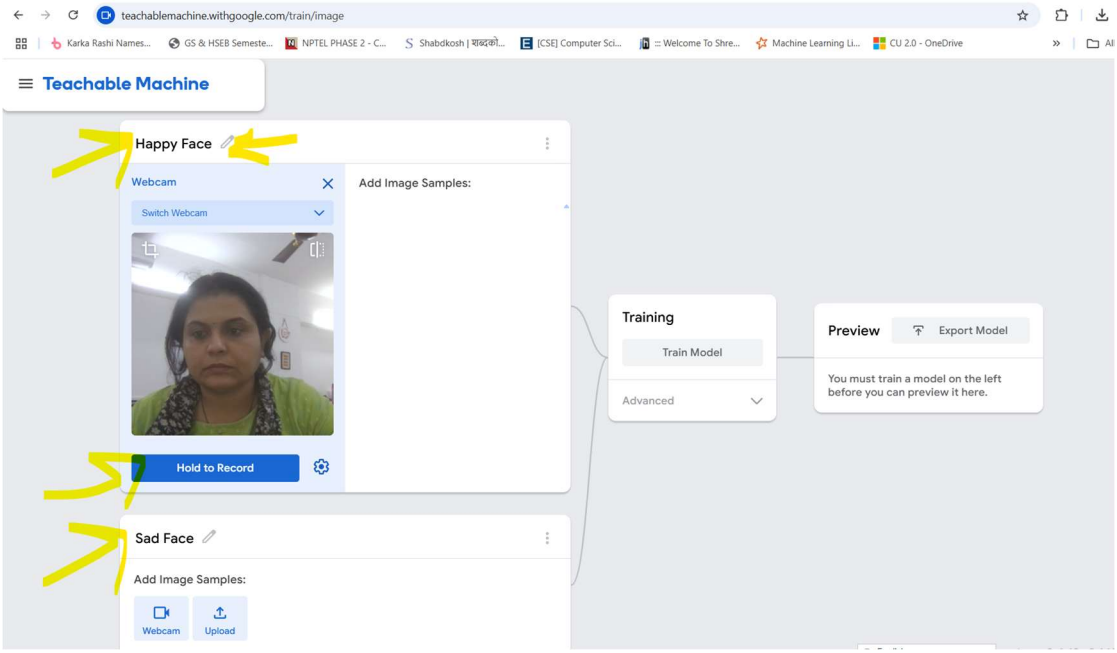

New Image Project
Standard image model
Best for most uses
224x224px color images
Export to TensorFlow, TFLite, and TF.js
Model size: around 5mb
Embedded image model
Best for microcontrollers
96x96px greyscale images
Export to TFLite for Microcontrollers, TFLite, and TF.js
Model size: around 500kb
See what hardware supports these models.

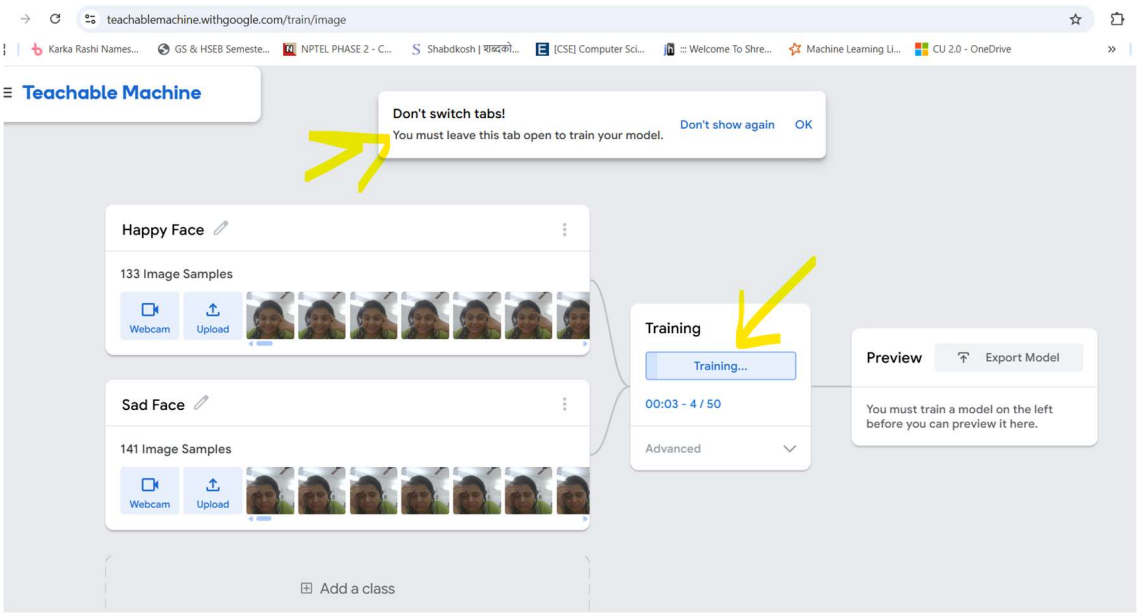
🔹 Step 2: Create Two Classes

- By default, two classes appear as *Class 1* and *Class 2*.
- Rename them to something meaningful, such as:
    - **Class 1 → Happy Face**
    - **Class 2 → Sad Face**

🔹 Step 3: Add Training Data

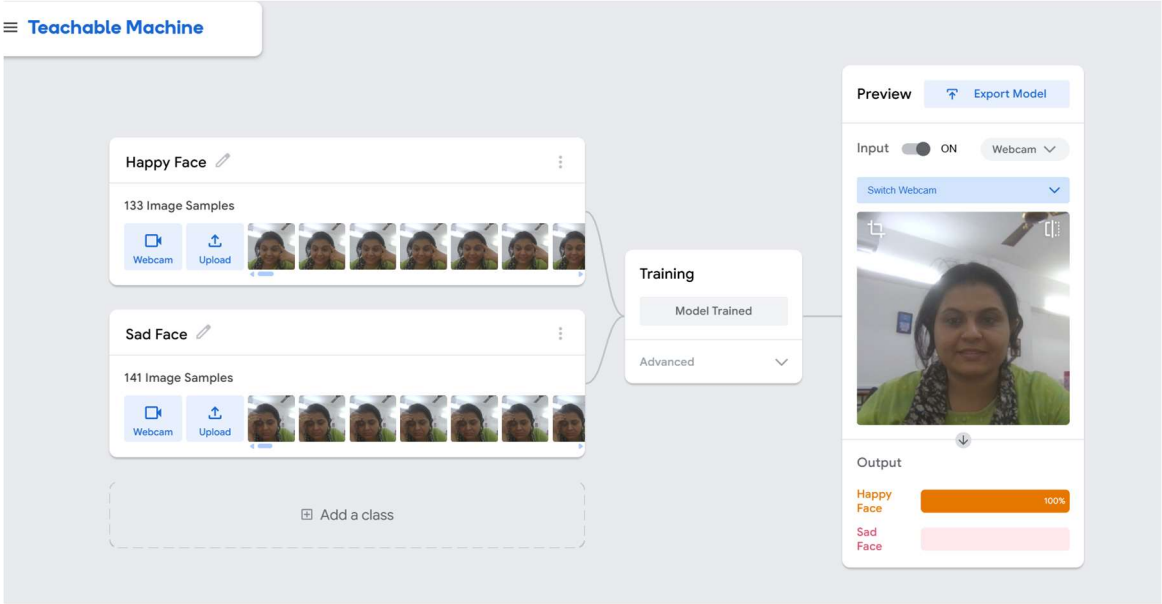
- For each class:
    - Use **“Webcam”** to take multiple photos of your face with the desired expression.
        - Take at least **30–50 images per class** for better accuracy.
    - Alternatively, click **“Upload”** to add images from your computer.
- Try to vary angles, lighting, and background to simulate real-world conditions.





- **Step 4: Train the Model**
  - Click **“Train Model”**.
  - Teachable Machine will:
    - Preprocess the images
    - Train a lightweight neural network in the browser
  - The process may take **30–60 seconds**, depending on data volume.

- **Step 5: Test the Model**
  - After training, switch to the **“Preview”** panel.
  - Use the **webcam** live to show different expressions.
  - Observe:
    - Whether the model accurately classifies “Happy” and “Sad” faces.
    - The **confidence score** (%) given for each prediction.



🔹 **Step 6: Analyze Model Behavior**

- **Misclassifications:**
  - What happens if the lighting is poor or expressions are subtle?
  - How does the model respond to neutral or mixed expressions?
- **Learning Point:**
  - Misclassification highlights the **importance of diverse and sufficient data**.
  - Adding more varied images improves model generalization and reduces overfitting.

✅ **Discussion Points:**

- How did the model decide between Happy and Sad?
- What happens when you test with a face it hasn't seen before?
- What if you add a third class, like "Neutral Face"?
- How does model performance change with **more data**, **better lighting**, or **clearer expressions**?