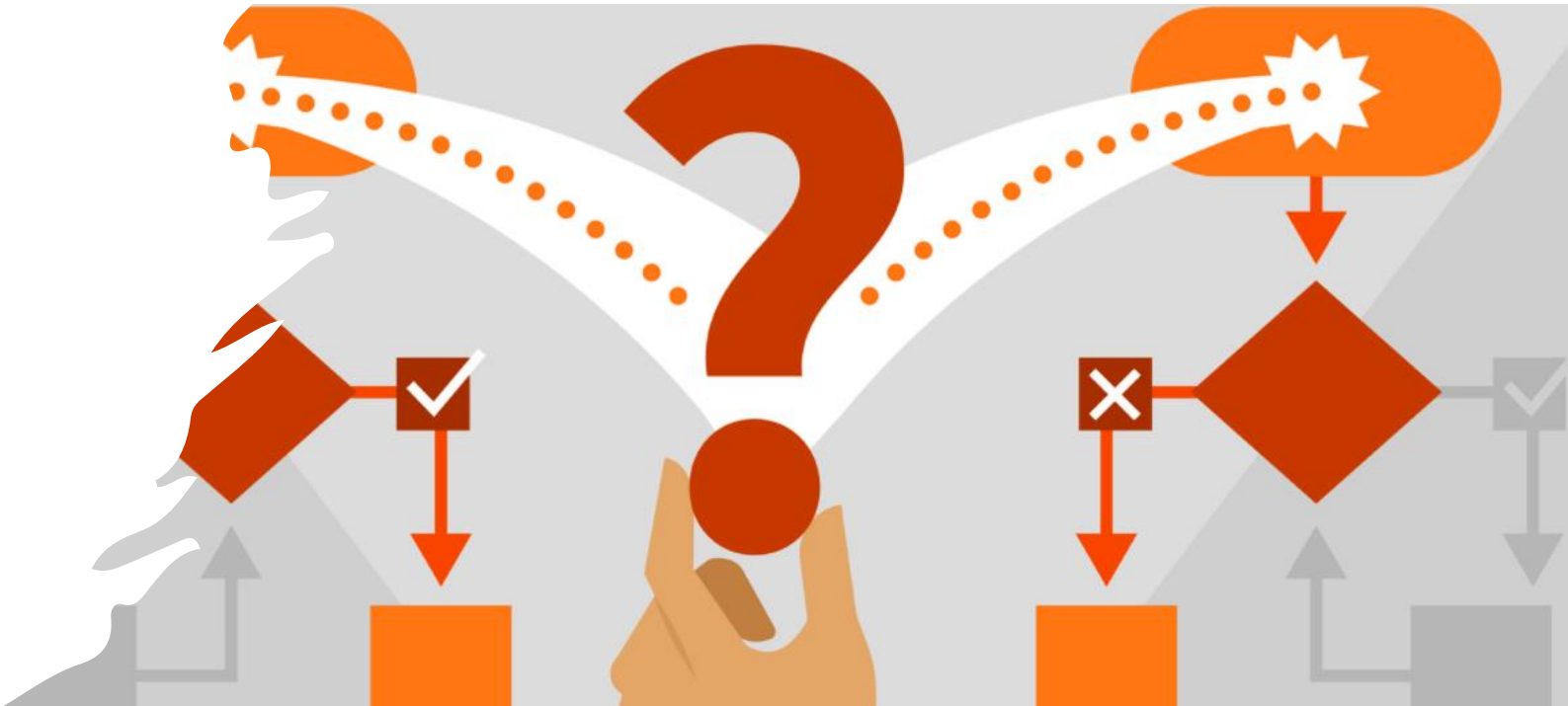
TEACHABLE MACHINE

IMAGE CLASSIFICATION SYSTEM



TEAM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Project Overview

Title

Building a Teachable Machine-Like Image Classification System.

Objective

Develop a web application allowing users to upload images Classes, set training parameters, train a classification model, and test it with new images.

Tech Stack

- **Frontend:**
  - Image Classification.html # UI for uploading images, training, and testing
  - Image Classification.css # Frontend styles
  - Image Classification.js # Frontend logic (JS/React/Vue.js)
- **Backend:**
  - App.py # FlaskI for server-side logic
  - Model.py # Machine learning model training and testing logic
- **Deployment**: Heroku/AWS/Google Cloud

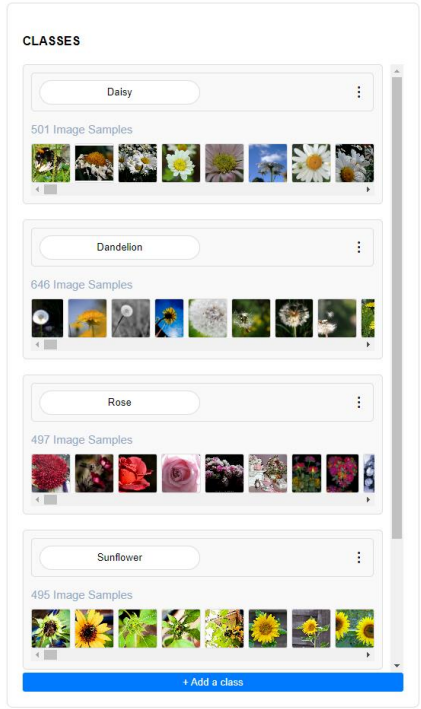
Frontend Setup

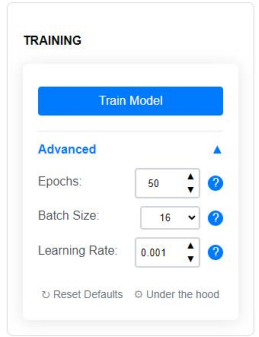
UI Components

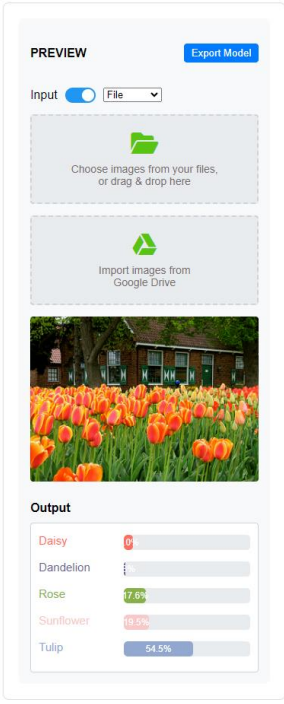
- **Class creation & Image Upload:**
  - Add Classes name.
  - Add Class image samples by upload or Webcam .
  - Use **JavaScript** to preview images and track uploads.
- **Training Parameters:**
  - Include fields for:
    - **Number of epochs** (number of training iterations).
    - **Batch size** (how many images to process at once).
    - **Learning rate** (how quickly the model learns).
- **Buttons:**
  - Add a "Train Model" button that triggers the backend /train endpoint.
- **Testing Section:**
  - Add another file upload input to let users upload images for model testing after training.

Apps/Tools:

Visual Studio Code for code editing.







Backend Development

set up APIs to manage the image uploads, model training, and testing.

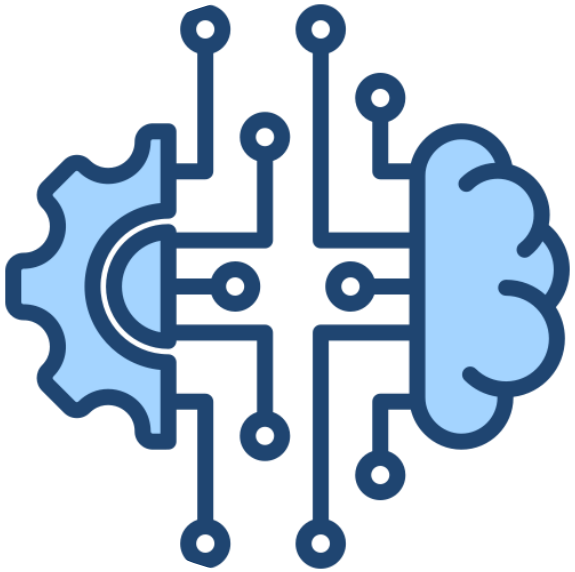
- **Endpoints**:
  - **/upload**: This endpoint should handle file uploads. Store images in a directory or cloud storage (e.g., AWS S3).
  - **/train:** This endpoint initiates the training of the CNN model using the uploaded images.
    It will take parameters like (epochs, learning rate , batch size.) .
  - **/predict**: This endpoint loads the trained model and makes predictions on new images.

- **Model Training:**
  - Use **TensorFlow/Keras** to create a CNN model:
    - Start with Conv2D layers, MaxPooling2D, and Dense layers.
    - Make the model configurable by user inputs (epochs, learning rate , batch size.).
  - Implement callbacks like early stopping to prevent overfitting.

Apps/Tools:

- **Flask** (for building APIs)
- **Postman** (to test API endpoints).

Model Training Process



The training logic needs to:

1. Preprocessing: Resize images, normalize data.
2. Model Creation: Build the CNN model architecture using TensorFlow/Keras.
3. Training: Customize training with epochs, batch size, learning rate.
4. Callbacks: Implement early stopping and model checkpoints.
5. Compile the model with a loss function (categorical cross-entropy for classification) and optimizer (like Adam).
6. Train the model and store it.

Store the trained model in:

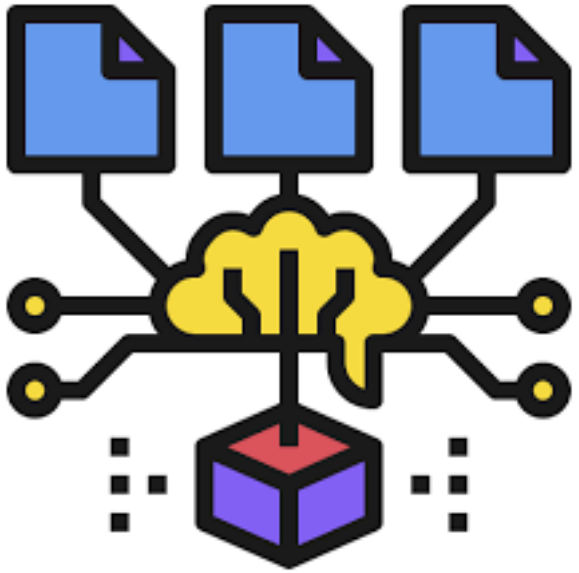
HDF5 format for TensorFlow.

Load and save model checkpoints during training.

Apps:

Google Colab for running Python and TensorFlow

Testing and Predictions



Once the model is trained, the /predict endpoint can:

- Load the trained model.
- Preprocess the test image to match the model input.
- Predict on new images uploaded by users using model.predict() .
- Display confidence scores and class predictions on the frontend.

User Interaction

- Simple drag-and-drop for image uploads.
- Real-time display of results on the application interface.

Deployment and Accessibility

After everything is set, package the application for deployment:

1.Backend:

1. Set up a Procfile (for Heroku) or an AWS Elastic Beanstalk environment for deployment.
2. Use Docker for more flexible and consistent deployment environment.

2.Frontend:

1. Host frontend on a service like Netlify or include it in the backend deployment (using Flask or FastAPI to serve static files).

Apps/Tools:

Docker (for containerized deployments).
Heroku CLI, AWS CLI, or Google Cloud CLI (for cloud deployment).

Future Enhancements:

Adding more complex models.
Enabling model export for use outside the web app.
Expanding to more types of machine learning tasks.