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How to train an image classifier?

Purpose → An image classifier is designed to distinguish between different types of images. like rose, Sunflower, so on.

Classifier as a function → Fundamentally, a classifier is a function, $f(x) = y$. In the context of images, x represent 2D array of pixels from the images, and y is the corresponding label, such as rose.

Input features → Unlike traditional ML where feature might be manually extracted (measuring flower dimension in the iris dataset), deep learning classifiers do not require manual

feature extraction for images. they use raw pixels of the image as features. This is a major advantage because it's incredibly difficult to write code to manually extract useful features like texture.

Types of classifier → When discussing deep learning for image classification, the classifier used is called a neural network. While it's just another type of classifier. It can learn more complex functions.

Training data → The primary requirement is training data, which consist of directories filled with images. Each directory represents a different category or type, with the directory name acting as the label for the images within it.

Why data matters?

Diversity → Including different color, angles, lighting
Quantity → more images = better learning.

Limitations

It can only classify what it has seen. like if you try to predict image outside of its data still it can but low confidence.

Using Tensorflow

It is open source ML Library, great for deep learning like image classification.

Tensorflow setup

- A simplified setup using pre written codes
- Make it easier to train model without writing complex code.

TF Learn ML or library

- A high level API (like scikit-learn) built on TensorFlow
- easier to use & more beginner friendly.

Transfer Learning (Retraining)

- instead of training from scratch, reuse a powerful existing model like Inception → google best image classifier
- just retrain the last ~~layer~~ layer with your own images.
- fast & efficient takes ~ 20 minutes vs weeks for full training.