PROBLEM STATEMENT:

The given problem is a Multiclass Image Classification Task with 131 Classes of fruits and vegetables. The goal is to create a model to classify the given images correctly.

APPROACH:

In this case we are using PyTorch for the implementation of the models. Here are the steps being followed:

1. **Preliminaries:**
   Import all dependencies required for the project

2. **Global Configuration:**
   Define the global configuration which contains the hyperparameter values along with the dataset file paths.

3. **Seed:**
   Set the seed for reproducibility of results.

4. **Transforms:**
   Define the transforms to be applied to the training and test images.

5. **Dataset:**
   Load the dataset using Pytorch *datasets.ImageFolder* method and create DataLoaders.

6. **Define Model:**
   Set the model to be used. In our case we run the experiment with 2 different models:
   VGG-16 and ResNet-18

7. **Set Criterion:**
   The criterion is set as *CrossEntropyLoss* because it minimizes the distance between two probability distributions - predicted and actual.

8. **Set Optimizer:**
   The optimizer is set to *Adam* because it is an adaptive learning rate method, which means, it computes individual learning rates for different parameters.
   It uses the squared gradients to scale the learning rate and uses the moving average of the gradient instead of gradient.

9. **Training:**
   Once everything is set up, we define the training loop for a selected number of epochs (here 10). This step is timed.

10. **Model Save:**
    Upon training completion, we save the model using *joblib*.

11. **Inference:**
    Finally we run the inference loop on the test dataset and obtain the final model accuracy.

RESULTS:

Observations/Models	VGG16	ResNet-18
Training Time (mins)	183	43
Test Accuracy	93.75	96.8
Epochs	10	10

FURTHER IDEAS:

- Mixed Precision Training - Use fp16 during training
- Multi GPU Training
- Hydra Configuration - Use Hydra for making the config files
- Model Ensembles - Train more models and ensemble them together
- LR Finder - Use PyTorch LR Finder to find the Learning Rate

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