**Fruit Classification Project Documentation**

**Project Overview**

This project is a multi-class image classification system designed to identify different types of fruits using a Convolutional Neural Network (CNN) model built on top of MobileNetV2. The model is trained on a dataset consisting of 5 classes of fruits({'Apple': 0, 'Banana': 1, 'Grape': 2, 'Mango': 3, 'Strawberry': 4}), and the trained model is deployed using FastAPI for backend inference and Gradio for a simple user interface. The final deployment is containerized using Docker for easy scalability and distribution.

### **Technologies Used**

* **Python**
* **TensorFlow / Keras**
* **MobileNetV2**
* **FastAPI**
* **Gradio**
* **Docker**
* **Google Colab**
* **Ngrok**

### Model Training

### **1.1. Model Architecture**

The model is based on the MobileNetV2 architecture, a lightweight and efficient convolutional neural network pre-trained on the ImageNet dataset. The final layers are customized to adapt the model to the specific task of fruit classification.

### **1.2. Data Preprocessing**

Data augmentation is applied to the training dataset using ImageDataGenerator to improve the model's generalization capability.

### **1.3. Model Training and Evaluation**

The model is trained for 10 epochs and evaluated on a validation set.

### **1.4. Saving the Model**

The trained model is saved for later use.

## ****2. Model Deployment with FastAPI****

### **2.1. FastAPI Setup**

FastAPI is used to create an API that serves the model predictions. The API accepts image files and returns the predicted fruit label.

### **2.2. Running the FastAPI App in Colab**

To run FastAPI in Google Colab, you use ngrok to expose the local server to the internet.

## ****3. Gradio Interface****

### **3.1. Gradio Setup**

Gradio provides a simple web interface for the model, making it easier to interact with the model without writing custom frontend code.

## ****4. Dockerization****

### **4.1. Dockerfile**

To containerize the application, a Dockerfile is created. This file specifies the environment and dependencies required to run the FastAPI app.

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FAST API LINK = [https://4037-34-27-224-169.ngrok-free.app](https://4037-34-27-224-169.ngrok-free.app/)