Image Classification Project (Apple, Orange, Banana)

Project Overview

In this project, you will build an image classification pipeline that involves collecting images from online sources, performing data augmentation, and training various machine learning models such as Neural Networks (NN), Convolutional Neural Networks (CNN), and Random Forest classifiers. Additionally, the project will include logging during the training phases and sending notifications via Telegram, Discord, or Email when certain milestones are reached.

This project will help you understand the following key concepts:

- Image data collection from free online sources.
- Data augmentation to enhance the variety of the training data.
- Training different classification models (NN, CNN, Random Forest).
- Logging important events during training.
- Sending notifications when training is completed.

Key Components:

1. Data Collection: You will collect images from free online sources.
2. Data Augmentation: Using techniques like rotation, shifting, and flipping to expand the dataset.
3. Classification Models:
    - Neural Network (NN)
    - Convolutional Neural Network (CNN)
    - Random Forest
4. Logging: Training logs will be written to a log file.
5. Notifications: You will receive notifications when key phases (e.g., completion of training) are reached.

Project Workflow

1. Data Collection You will use the URLs of free images from various sources (e.g., Unsplash, Pexels) and download them into a specified folder. The project will handle:

    - Fetching images from URLs provided in a configuration file.
    - Storing them locally for processing.

2. Data Augmentation To improve the generalization of your models, you will apply data augmentation using the ImageDataGenerator from Keras. Augmentation techniques include:

    - Rotation
    - Width and height shifts
    - Shear and zoom operations
    - Horizontal flipping

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1. Model Training You will train three types of classifiers:

    - Neural Network (NN): A basic Multi-Layer Perceptron (MLP) classifier will be built and trained.
    - Convolutional Neural Network (CNN): A more advanced CNN model will be trained for image classification.
    - Random Forest Classifier: A traditional machine learning model will be trained on image features. The models will be trained using the augmented image data, and performance will be logged.

2. Logging Throughout the training process, key information such as training completion, accuracy scores, and model performance will be logged into a file named training.log.

3. Notifications Once the training of a model is completed, you will receive a notification via:

- Telegram: The bot sends a message to a specified chat ID.
- Email: You will receive an email with the training completion details. These notifications are triggered after each model training session (NN, CNN, Random Forest).

Configuration File

All configurations for the project will be stored in a config.json file. This file includes:

- The folder for storing images.
- URLs for downloading images.
- Augmentation settings.
- Model training preferences.
- Notification settings for email or Telegram.

```
{
    "image_folder": "images",
    "image_urls": ["https://example.com/image1.jpg",
"https://example.com/image2.jpg"],
    "augment_data": true,
    "augmentation": {
        "rotation": 20,
        "width_shift": 0.2,
        "height_shift": 0.2,
        "shear": 0.2,
        "zoom": 0.2,
        "horizontal_flip": true
    },
    "train_nn": true,
    "train_cnn": true,
    "train_rf": true,
    "epochs": 10,
    "num_classes": 10,
    "notification_mode": "telegram",
    "telegram_token": "your-telegram-bot-token",
    "telegram_chat_id": "your-chat-id",
    "email_from": "your-email@gmail.com",
    "email_to": "recipient-email@gmail.com",
    "smtp_server": "smtp.gmail.com",
    "smtp_port": 587,
```

```
    "email_password": "your-email-password"
}
```

Example JSON FIle

```
{
    "image_folder": "fruits_images",
    "image_urls": [
        "https://www.pexels.com/photo/red-apple-39803/",
        "https://www.pexels.com/photo/bananas-on-table-5645/",
        "https://www.pexels.com/photo/fresh-oranges-52530/"
    ],
    "augment_data": true,
    "augmentation": {
        "rotation": 20,
        "width_shift": 0.2,
        "height_shift": 0.2,
        "shear": 0.2,
        "zoom": 0.2,
        "horizontal_flip": true
    },
    "train_nn": true,
    "train_cnn": true,
    "train_rf": true,
    "epochs": 10,
    "num_classes": 3,
    "notification_mode": "telegram",
    "telegram_token": "your-telegram-bot-token",
    "telegram_chat_id": "your-chat-id",
    "email_from": "your-email@gmail.com",
    "email_to": "recipient-email@gmail.com",
    "smtp_server": "smtp.gmail.com",
    "smtp_port": 587,
    "email_password": "your-email-password"
}
```