Project Documentation: Transfer Learning-Based Classification of Poultry Diseases for Enhanced Health Management

1. Project Overview

This project aims to develop a deep learning-based poultry disease classification system using transfer learning techniques. The goal is to help farmers and veterinary practitioners identify common poultry diseases early, using a simple web-based interface powered by Streamlit. The system classifies images into four categories: Healthy, Newcastle Disease, Salmonella, and Coccidiosis.

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2. Objectives

- Build a multi-class image classifier using transfer learning (MobileNetV2).
- Deploy a user-friendly web application for real-time prediction.
- Improve disease monitoring and reduce diagnostic time for poultry health management.

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3. Tools and Technologies Used

- **Programming Language:** Python
- **Deep Learning Framework:** TensorFlow / Keras
- **Web Interface:** Streamlit
- **Image Processing:** Pillow, NumPy

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4. Dataset Structure

The dataset is organized as follows:

```
data/train/
├── Healthy/
├── Newcastle Disease/
├── Coccidiosis/
└── Salmonella/
```

Each folder contains images of chickens affected by the corresponding condition.

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5. Model Architecture

- **Base Model:** MobileNetV2 (pretrained on ImageNet)
- **Input Size:** 224x224x3
- **Top Layers Added:**
- Global Average Pooling
- Dense Layer (64 units, ReLU activation)
- Dropout Layer (0.3)
- Output Layer (Softmax, 4 classes)

The model is compiled using the Adam optimizer and categorical crossentropy loss.

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6. Training Configuration

- **Image Augmentation:** ImageDataGenerator (with rescaling and validation split)
- **Batch Size:** 16
- **Epochs:** 3
- **Validation Split:** 20%
- **Steps per Epoch:** 50
- **Validation Steps:** 20

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7. Streamlit Application Features

- Upload an image using file uploader.
- Automatically resize and preprocess the image.
- Display the uploaded image on screen.
- Show the predicted class and confidence score.

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8. File Structure

```
project/
├── app.py                  # Streamlit web app
├── model/
│   └── multiclass_model.h5 # Saved trained model
├── data/
│   └── train/              # Dataset
├── requirements.txt        # Required Python libraries
```

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9. Requirements

```
streamlit==1.35.0
tensorflow==2.15.0
numpy==1.26.4
Pillow==10.2.0
```

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10. Limitations

- Trained on a limited dataset.
- Accuracy can improve with more data.
- Currently supports image-based prediction only.

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11. Future Enhancements

- Add support for audio and video-based diagnosis.
- Increase dataset diversity.
- Deploy as a mobile app or on edge devices.

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12. Conclusion

The project successfully demonstrates a practical implementation of transfer learning for poultry disease classification. It provides a useful tool for rapid, accessible, and non-invasive disease detection, especially beneficial for rural and remote farming communities.