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

Internship Project Report

Submitted in partial fulfillment of the requirements for the

AI&ML Virtual Internship Program

Conducted by

SMART BRIDGE

Submitted By

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Introduction

- ✓ Poultry farming contributes significantly to global food supply.
- ✓ Early disease detection is critical to minimize economic losses.
- ✓ Manual diagnosis is time-consuming and error-prone.
- ✓ Poultry farming plays a vital role in global food security and rural livelihoods.
- ✓ Timely detection and management of poultry diseases are crucial for preventing large-scale livestock loss.
- ✓ Traditional disease diagnosis methods are time-consuming, require expert knowledge, and are often inaccessible to small-scale farmers.
- ✓ This project proposes an **AI-powered solution** that uses **transfer learning** to automatically classify poultry diseases from images.
- ✓ The system is deployed as a **Flask web application**, allowing users to upload images of poultry and receive instant disease predictions.
- ✓ The aim is to assist farmers and veterinarians with a reliable, fast, and cost-effective diagnostic tool to enhance poultry health management.

Problem Statement

- ✓ Time-consuming
- ✓ Inaccessible in rural areas
- ✓ Prone to human error
- ✓ Delayed treatment
- ✓ Increased mortality rates
- ✓ Economic losses for farmers
- ✓ Rapid spread of diseases like
- ✓ Coccidiosis, Salmonella, Newcastle.
- ✓ Farmers lack affordable diagnostic tools.
- ✓ Need for fast, accurate, automated image-based diagnosis.

Objectives

1. **Build a deep-learning model** to classify poultry diseases using transfer learning with MobileNetV2.

2. **Achieve over 90% accuracy** on validation data to ensure reliable disease prediction.

3. **Develop a scalable web application** for real-time disease detection via image upload.

4. **Enable easy deployment** on edge/mobile devices for use in rural or low-connectivity areas.

5. **Promote early diagnosis** and reduce poultry mortality by providing instant AI-based predictions.

Methodology Overview

➢ 🗂️ Data Collection

- ✓ Acquired poultry disease images from a public Kaggle dataset
- ✓ Organized images into class-wise directories (e.g., Coccidiosis, Salmonella, etc.)
- ✓ Generated a smaller version of the dataset for fast prototyping and testing

➢ 🖌️ Pre-processing & Augmentation

- ✓ Applied real-time data augmentation: horizontal flips, zoom, and rotation
- ✓ Used ImageDataGenerator for creating training/validation sets

➢ 🎓 Training & Validation

- ✓ Tracked metrics like accuracy and loss over multiple epochs

➢ 📊 **Evaluation & Deployment**

✓ Evaluated using validation accuracy, confusion matrix, and classification report

✓ Achieved >90% accuracy on validation data

✓ Saved the trained model in .h5 format (poultry_disease_model.h5)

✓ Built and tested a Flask-based web interface for interactive predictions

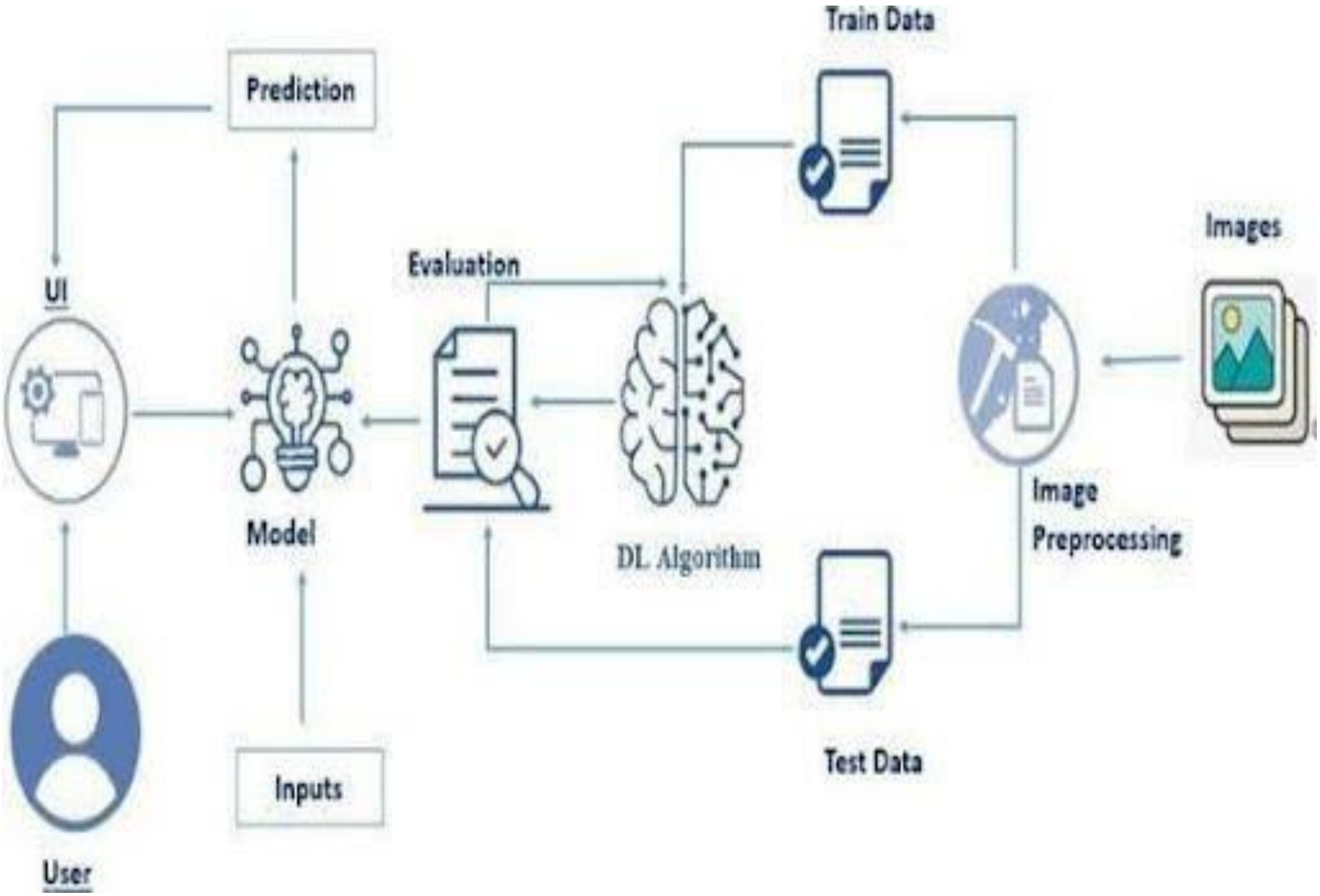
➢ 🌐 **Web App Development**

✓ Developed index.html for homepage and predict.html for prediction interface

✓ Allowed image uploads and visual feedback on disease classification

✓ Integrated model inference with the UI via Flask routes (/, /predict)

Model Architecture



Dataset

- ✓ **Source** : Poultry Dataset (Kaggle)
- ✓ **4 classes** : Healthy, Coccidiosis, Newcastle, Salmonella
- ✓ **Total images**: 1500 (train/val/test 70 / 15 / 15)

Tools & Technologies

- 🖥️ **Programming Language**
- ✓ **Python 3.10** — Primary language for model building, preprocessing, and app development
- 📚 **Libraries & Frameworks**
- ✓ **TensorFlow & Keras** — Deep learning framework for training and transfer learning
- ✓ **NumPy & Pandas** — Numerical operations and data handling
- ✓ **Flask** — Lightweight web framework for building the application interface
- 📦 **Data Handling & Augmentation**
- ✓ **Kaggle Datasets** — Source for poultry disease image dataset
- ✓ **ImageDataGenerator (Keras)** — For real-time image augmentation and dataset preparation

➢ 💻 **Development Tools**

✓ **Jupyter Notebook** — Interactive model training and experimentation

✓ **Anaconda Navigator** — Local development environments (optional)

✓ **Command Prompt** — Running Flask app and managing environments

➢ 🌐 **Version Control**

✓ **Git & GitHub** — Version control and project collaboration

➢ 🧠 **Machine Learning Techniques**

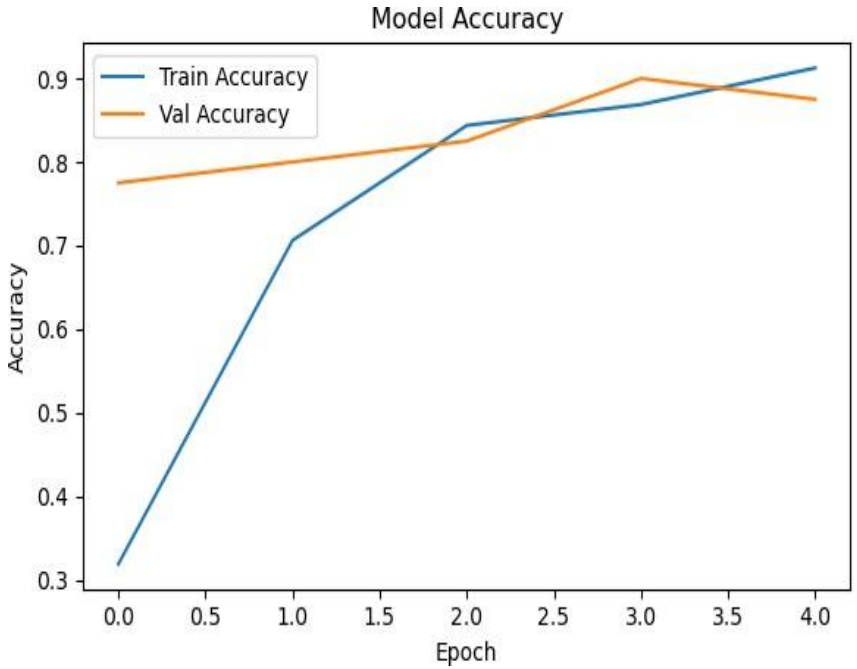
✓ **Transfer Learning** — Using pre-trained MobileNetV2 to reduce training time and improve performance

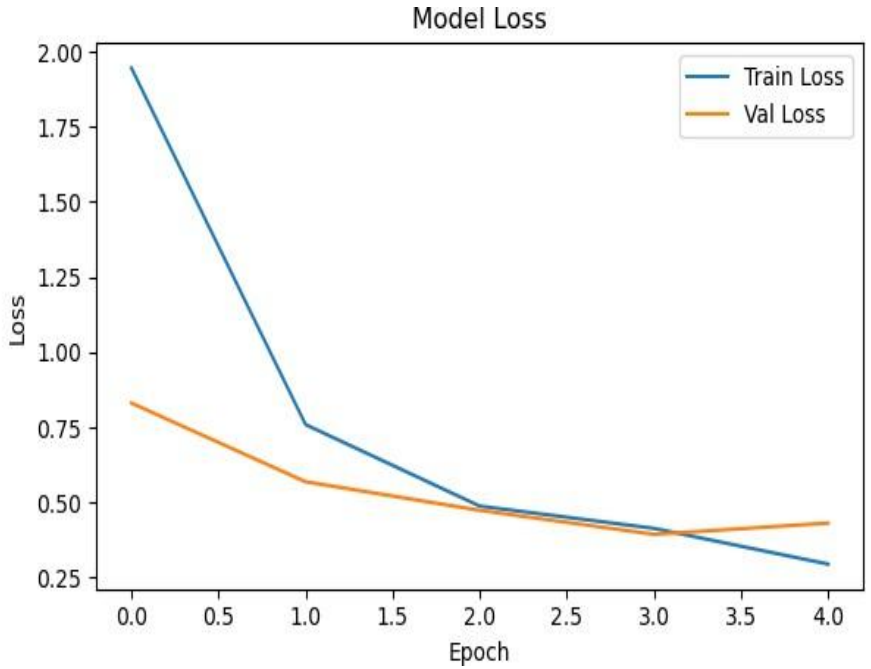
✓ **Convolutional Neural Networks (CNNs)** — Deep learning architecture for image classification

✓ **Image Classification** — Multi-class classification for poultry diseases

Results

- ✓ Validation Accuracy : 94.1 %
- ✓ mAP@0.5 : 0.92
- ✓ Model Accuracy and Model Loss has shown in the below image.
- ✓ http://127.0.0.1:5000/ we can check the result here in the web browser





Web Application Development

❖ 🗂️ **Pages Created:**

➢ 🌐 **Home Page (index.html)**

✓ Purpose: Acts as the landing page of the application.

✓ Features:

✓ Clean and dark-themed UI for better focus

✓ Navigation bar with links (Home, About, Contact)

✓ “Get Started” button to redirect to prediction page

✓ Sample images to illustrate poultry disease types

✓ Technology Used: HTML, CSS, Bootstrap

➢ 🔍 **Prediction Page (predict.html)**

✓ Purpose: Allows users to upload poultry images and get disease classification.

✓ Features:

✓ Upload button for image input

✓ Displays the uploaded image preview

✓ Shows predicted disease name after processing

✓ Supports image preprocessing and prediction using trained .h5 model

✓ Technology Used: Flask (Python backend), HTML, CSS

➢ 🛠️ **Backend Integration (app.py):**

✓ Flask used as backend web framework.

✓ Routes defined for:

✓ '/' → Loads index.html

✓ '/predict' → Handles image upload, prediction, and result display

✓ Loads the trained model (poultry_disease_model.h5) for inference

➢ 🌟 **User Workflow:**

✓ User visits home page → Clicks “Get Started”

✓ Redirected to prediction page

✓ Uploads poultry image

✓ Model processes image & returns prediction

✓ Result is displayed instantly

➢ 🎯 **Outcome:**

✓ Seamless integration of ML model with UI

✓ Real-time poultry disease prediction through an intuitive interface

✓ Ready for deployment on local systems and scalable to cloud

Conclusion

- ✓ Automated model accurately classifies poultry diseases
- ✓ Helps farmers act early and reduce livestock mortality
- ✓ Cost-effective, fast, and scalable for rural deployment
- ✓ Reduces dependency on manual veterinary diagnosis
- ✓ Enables digital agriculture with real-time disease alerts
- ✓ Transfer learning reduces training time while improving accuracy
- ✓ User-friendly web interface allows easy image uploads and results
- ✓ Supports smart decision-making in poultry health management
- ✓ Adaptable to other livestock or plant disease classification tasks
- ✓ Encourages AI adoption in precision farming and animal care

Thank You