Final Project Report

1. INTRODUCTION

Project Title

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

Team Members

👥Team ID : LTVIP2025TMID41509

Team Size : 3

Team Leader : Vaddimeyani Ajay Kumar

Team member : Vadlamudi Bavanchandu

Team member : Y Lavanya

1.1 Project Overview

The PoultryDetect project utilizes deep learning and transfer learning to classify common poultry diseases into four distinct categories: Salmonella, New Castle Disease, Coccidiosis, and Healthy. Our primary goal is to automate diagnostics in poultry farming using advanced computer vision techniques, providing farmers with a fast and accurate tool to analyze poultry health based on visual symptoms. This system aims to significantly reduce the manual effort and time typically required for disease identification.

1.2 Purpose

- To build a high-accuracy image classification model leveraging pre-trained CNN architectures (VGG16, VGG19, ResNet50).
- To develop a user-friendly web application where farmers can upload poultry images and receive instant disease diagnoses.
- To assist poultry farmers and veterinary professionals by reducing manual diagnostic effort and enabling swift health management actions, thereby minimizing economic losses.

2. IDEATION PHASE

2.1 Problem Statement

Manual diagnosis of poultry diseases is often time-consuming, prone to human error, and requires specialized veterinary expertise, which may not be readily available in all regions. With increasing demand for poultry products and the need for proactive health management, an efficient and accessible AI-based diagnostic system is crucial to prevent widespread outbreaks and ensure farm productivity.

2.2 Empathy Map Canvas

|

| **Perspective** | **Description** | | **Says** | "My birds are sick, but I don't know what's wrong." | | **Thinks** | "I hope this tool can accurately tell me what disease it is, quickly." | | **Does** | Uploads images of sick poultry for classification. | | **Feels** | Anxious about potential losses; hopeful for a rapid, reliable diagnosis. |

2.3 Brainstorming

- Leverage state-of-the-art transfer learning models (VGG16, VGG19, ResNet50) for superior image feature extraction.
- Develop a user-friendly web interface using Flask for easy accessibility.
- Consider future integration with mobile applications for on-the-go diagnostics.
- Plan for expanding classification to cover more poultry ailments (e.g., avian influenza, bronchitis).
- Implement robust error handling and user feedback mechanisms.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

| **Step** | **Description** | **System Response** | | **Upload Image** | Farmer selects and uploads an image of poultry. | Flask application receives and saves the image. | | **Run Prediction** | System preprocesses the image and feeds it to the trained model. | Model performs classification and returns the predicted disease type. | | **View Results** | Farmer sees the predicted disease type on screen. | Result (e.g., "Coccidiosis") and image preview are displayed. |

3.2 Solution Requirements

- **Pre-trained Base Models:** Utilization of pre-trained VGG16, VGG19, or ResNet50 models for efficient transfer learning.
- **Annotated Dataset:** Access to a diverse dataset of poultry images categorized into the four target classes (Salmonella, New Castle Disease, Coccidiosis, Healthy). (Demonstrated with subsets of 500 images per category).
- **Backend Server:** A Flask-based server to handle API requests for image uploads and predictions.
- **Frontend Interface:** Intuitive web user interface built with HTML, CSS (Tailwind CSS), and JavaScript for a seamless user experience.
- **Core Libraries:** TensorFlow, Keras, NumPy, Pandas, Matplotlib, PIL, Flask, OpenCV.

3.3 Data Flow Diagram

```
[Farmer Uploads Poultry Image]
        ↓
[Flask Web Application (app.py)]
        ↓ (Image Saved to static/uploads)
[Image Preprocessing (Resize, Convert to Array, Normalize)]
        ↓
[Trained Deep Learning Model (healthy_vs_rotten.h5)]
        ↓ (Prediction Output: Probability Scores)
[Identify Predicted Class (e.g., 'Coccidiosis')]
        ↓
[Result Sent to UI]
        ↓
[Displayed to Farmer on Web Page]
```

3.4 Technology Stack

- **Frontend:** HTML5, CSS3 (Tailwind CSS), JavaScript
- **Backend:** Python 3.x, Flask
- **ML Framework:** TensorFlow with Keras
- **Model:** VGG16 (or VGG19, ResNet50 based on performance) with fine-tuning
- **Deployment Platform:** Localhost (initial), Cloud (future: AWS/Heroku/GCP)

4. PROJECT DESIGN

4.1 Problem-Solution Fit

The prevalent challenge of timely and accurate poultry disease diagnosis in farming communities highlights a significant gap. PoultryDetect directly addresses this by providing an accessible, AI-powered image classification tool, enabling farmers to make informed decisions swiftly, thus mitigating disease spread and economic impact.

4.2 Proposed Solution

Our proposed solution is a Flask-integrated deep learning system that utilizes transfer learning on pre-trained Convolutional Neural Networks. This system facilitates real-time disease predictions through an intuitive web interface, making advanced diagnostics available directly to farmers.

4.3 Solution Architecture

```
[Poultry Disease Dataset] (Images: Coccidiosis, Healthy, New
Castle Disease, Salmonella)
```

```
        ↓
[Data Preprocessing & Augmentation]
        ↓
[Transfer Learning (VGG16/VGG19/ResNet50 Model Training)]
        ↓
[Saved Model (.h5 file - healthy_vs_rotten.h5)]
        ↓
[Flask Backend API] <----- [Web User Interface (HTML/CSS/JS)]
        ↓ (Prediction Request)
        ↑ (Prediction Result)
[Prediction Output to Farmer]
```

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning Timeline

Week	**Task Description**
1	Dataset download, initial data cleaning, and visualization.
2	Model training (VGG16, VGG19, ResNet50) and validation.
3	Flask application backend development and model integration.
4	Frontend UI design and connection with Flask routes.
5	Comprehensive system testing and documentation.

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- **Accuracy:** [Achieved Accuracy e.g., 90-95%] on the test dataset (specific value depends on training outcome).
- **Loss:** [Achieved Loss e.g., 0.15-0.25] during the final epoch (specific value depends on training outcome).
- **Hardware Used:** Google Colab GPU for model training.
- **Flask Test Cases:** Validated prediction output for all 4 poultry disease types using separate unseen images.

7. RESULTS

7.1 Output Screenshots

- **Home Interface:** Screenshot showing the "PoultryDetect" welcome page with the "GET STARTED" button and image gallery.
- **Prediction Interface:** Screenshot displaying the image upload section, chosen file, and the predicted cell type (e.g., "Hence, The infection type detected as Coccidiosis").
- *(Include image placeholders/screenshots as available in actual report)*

8. ADVANTAGES & DISADVANTAGES

Advantages

- **Quick and Reliable Predictions:** Provides immediate and accurate disease diagnoses, enabling rapid intervention.
- **Open-Source and Scalable:** Built with open-source technologies, allowing for easy expansion and adaptation.
- **Minimal Training Required:** Leverages transfer learning, significantly reducing the data and computational resources needed for training.
- **Remote Deployment Potential:** Can be deployed in remote agricultural settings with limited access to veterinary services.
- **Enhanced Productivity:** Helps farmers proactively manage flock health, reducing disease impact and improving overall farm output.

Disadvantages

- **Limited Classes:** Currently classifies only 4 specific categories (extendable in future scope).
- **Image Quality Dependency:** Accuracy is directly influenced by the quality and clarity of the uploaded images.
- **No History/Logging:** Current version lacks a feature to store prediction history for individual users or farms (addressable in future scope).
- **Static UI:** The current web interface is a basic Flask render; a more dynamic UI might be beneficial.

9. CONCLUSION

PoultryDetect demonstrates the significant potential of AI-based image classification using transfer learning to revolutionize poultry health management. By providing a fast, reliable, and accessible diagnostic tool, this system marks a crucial step toward smarter, more efficient, and sustainable poultry farming practices. It empowers farmers with immediate insights, leading to better disease control and enhanced productivity.

10. FUTURE SCOPE

- **Expanded Classification:** Integrate classification for additional poultry diseases and conditions (e.g., avian influenza, Marek's disease, nutritional deficiencies).
- **Prediction History & Database:** Implement a database (e.g., SQLite or MongoDB) for storing prediction history, allowing farmers to track trends and past diagnoses.
- **Mobile Application Interface:** Develop a dedicated mobile application to provide a more native and convenient user experience.

- **Cloud Deployment:** Deploy the system on cloud platforms (e.g., AWS, Heroku, Google Cloud) for wider accessibility and scalability.
- **User Authentication:** Add user authentication for multi-user access and personalized data management.
- **Real-time Monitoring Integration:** Explore integration with IoT sensors for environmental condition monitoring to provide more comprehensive health insights.

APPENDIX

- **Source Code:** [Insert GitHub Repository Link Here]
- **Dataset:** [Insert Kaggle/Dataset Link Here (e.g., for poultry diseases)]
- **Demo Video:** [Insert Link to Demo Video, if available]