Project Title:

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

Team ID: LTVIP2025TMID34795

Team Members:

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1. INTRODUCTION

1.1 Project Overview

The poultry industry plays a vital role in the global food supply chain. However, the sector often faces challenges due to the spread of diseases that can decimate livestock and impact public health. Traditionally, poultry disease diagnosis requires veterinary intervention, which is often delayed due to limited resources, lack of expertise, or unawareness.

This project proposes a deep learning-based solution using **Transfer Learning** to automatically classify poultry diseases using images. Leveraging powerful pre-trained models like **VGG16**, **VGG19**, and **ResNet50**, we trained a classification system on the Kaggle poultry disease dataset. The output is a web-accessible tool capable of accurately identifying diseases such as:

- **Coccidiosis**
- **Salmonella**
- **New Castle Disease**
- **Healthy birds**

1.2 Purpose

The aim is to enhance poultry health management by enabling early disease detection, reducing dependency on manual diagnostics, and empowering farmers with an intelligent, real-time, and cost-effective tool for disease classification.

2. IDEATION PHASE

2.1 Problem Statement

Poultry diseases cause significant economic losses. Farmers lack access to rapid diagnostic tools, and manual identification often results in late or incorrect treatment, increasing mortality rates and affecting meat/egg quality.

Key Issues:

- Limited access to veterinarians
- Time-consuming manual inspections
- No early-warning system for outbreaks

Need: A rapid, intelligent tool that classifies poultry diseases using images to guide immediate response.

2.2 Empathy Map Canvas

Thinks	Feels	Says	Does
"How do I know if my bird is sick?"	Worried, uncertain	"I don’t know what’s wrong."	Observes behavior but doesn’t act
"Can I afford a vet?"	Helpless, anxious	"This is too costly!"	Ignores signs until it's too late
"I need something quick!"	Frustrated by delays	"Wish I had help instantly."	Searches on Google or waits

2.3 Brainstorming

We generated several ideas:

- A chatbot that identifies symptoms from text (rejected: requires user input)
- Disease prediction using audio/sounds (rejected: less accurate)
- **Image-based disease classification using deep learning** (selected: scalable, reliable)

Final Idea: **Transfer Learning** using CNNs with fine-tuning for poultry disease classification.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

graph TD

A [User uploads poultry image] --> B [Backend pre-processes image]

B --> C [ML model predicts disease]

C --> D [Result displayed: Disease name]

D --> E [Farmer takes action]

3.2 Solution Requirements

Component	Requirements
Dataset	High-quality labelled images (Kaggle)
Input	JPG/PNG image of poultry
Output	Predicted disease label
Model	VGG16, VGG19, ResNet50
Accuracy Target	≥ 85%
UI	Simple Flask web app
Deployment	Google Colab (training), local Flask (inference)

3.3 Data Flow Diagram

User Image Input

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Image Preprocessing (resize, normalize)

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Model Inference (Res Net/VGG)

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Predicted Label (Disease class)

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Result Display on Web UI

3.4 Technology Stack

Layer	Technology
Frontend	HTML, CSS, Flask Templates
Backend	Flask (Python), TensorFlow
Model	VGG16, VGG19, ResNet50
Visualization	Matplotlib, Seaborn
Libraries	Pandas, NumPy, OpenCV
Environment	Google Colab, Jupyter Notebook

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Poultry farms, especially in rural areas, suffer from unmonitored disease outbreaks. This AI-based solution helps:

- Detect diseases early
- Reduce veterinarian dependency
- Prevent large-scale livestock deaths

4.2 Proposed Solution

Our application uses:

- **Image Upload Interface** via Flask
- **Preprocessing pipeline** (resize, colour conversion, normalization)
- **Model inference using fine-tuned CNNs**
- **Disease label output** rendered in under 2 seconds

This empowers farmers to:

- Get immediate results
- Identify the type of disease
- Take timely action (isolation, medication, culling)

4.3 Solution Architecture

[User Upload]

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[Flask Frontend]

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[Backend: Flask + Model]

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[Model Inference Engine (VGG/ResNet)]

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[Result Display (HTML Page)]

5. PROJECT PLANNING & SCHEDULING

Agile Sprint Plan

Task	Team Member	Duration
Dataset Handling	Prabhu Teja	2 Days
Model Training	Prasanth Kumar	3 Days
Flask Frontend	Dharma Prabhas	2 Days
Integration & Testing	All	1 Day
Documentation & PPT	Kinvesh Ramana Reddy	2 Days

6. FUNCTIONAL & PERFORMANCE TESTING

Testing Strategy

- Functional testing for input/output handling
- Performance testing on image prediction speed
- Hyperparameter tuning with **KerasTuner**
- Validation accuracy used to compare models

Results

Model	Accuracy	Inference Time
VGG16	89.7%	1.42 sec
VGG19	88.4%	1.36 sec
ResNet50	91.1%	1.39 sec

7. RESULTS

7.1 Output Screenshots

- Image input form
- Real-time disease prediction label
- Confusion matrix of predicted vs actual
- Graphs: Training vs Validation accuracy/loss
- Output of get_model_prediction() for sample images

Model Performance Visuals

- 📊 Accuracy vs Epochs
- 📉 Loss vs Epochs
- 🔥 Confusion matrix heatmap

8. ADVANTAGES & DISADVANTAGES

✅ Advantages

- High accuracy for 4 major disease types
- Fast, web-based, no extra hardware
- Empowers farmers and reduces losses
- Works on desktop and mobile

❌ Disadvantages

- Depends on image clarity and angle
- Needs good lighting for accurate results
- Not real-time for large-scale farm monitoring yet

9. CONCLUSION

This project demonstrates the effective use of **Transfer Learning** to classify poultry diseases using images. We built a tool that is not only accurate but also practical and scalable. With further improvements and deployment, it has the potential to revolutionize poultry farm health diagnostics, especially in underserved areas.

10. FUTURE SCOPE

- Build Android/iOS app with same backend
- Add more disease classes through dataset expansion
- Integrate with IoT cameras in smart farms
- Develop offline model inference
- Alert system to notify nearby vets/farmers

11. APPENDIX

Source Code

Available in the GitHub (link below)

Dataset

Kaggle Poultry Disease Dataset

GitHub Repository

https://github.com/dharmaRaavi/poultry

Demo Video

https://drive.google.com/file/d/1rdZ9eVUzNIeMxdHeXprd4_DoYBAMHAtZ/view?usp=sharing