Visvesvaraya Technological University, Belagavi – 590018

MINI-PROJECT REPORT
ON

CHICKEN DISEASE PREDICTION MODEL

Submitted in partial fulfillment for the award of degree of

BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE & ENGINEERING

Submitted by

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(Affiliated to VTU Belagavi, Recognized by AICTE, Accredited by NBA)
Vamanjoor, Mangaluru - 575028, Karnataka

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CERTIFICATE

Certified that the Mini-project work entitled **"Chicken Disease Prediction Model"** carried out by

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the bonafide students of VI semester Computer Science & Engineering in partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belagavi during the year 2023-2024. It is certified that all suggestions indicated during internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said degree.

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Abstract

The project "Chicken Disease Prediction Model" aims to address a significant issue in the poultry industry by developing a machine learning model for the early detection of Coccidiosis and Salmonella, a common parasitic disease in chickens. This disease, caused by protozoan parasites, leads to severe health problems and economic losses if not detected and treated promptly.Current methods for diagnosing Coccidiosis and Salmonella are often invasive, time-consuming, and costly, highlighting the need for a more efficient solution.

This project aims to develop a novel, non-invasive diagnostic tool using machine learning and image processing techniques to predict Coccidiosis and Salmonella in chickens from fecal images. Building on recent advancements in deep learning, particularly Convolutional Neural Networks (CNNs) for accurate and reliable detection.

Our methodology involves several key steps: data collection of fecal images from both healthy and infected chickens, data preprocessing to enhance image quality, feature extraction using image processing techniques, and model development using CNN concept. The model's performance is evaluated through metrics such as accuracy.

Preliminary results indicate that our model can provide quick and accurate detection of Coccidiosis and Salmonella. These include reduced diagnostic costs, decreased labor, and minimized need for invasive procedures.

Future work could focus on expanding the dataset, refining the model for greater accuracy, and exploring the application of similar techniques to other poultry diseases. This approach not only supports sustainable farming practices but also has the potential to significantly improve the economic and health outcomes for poultry farmers.

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Chapter 1

Introduction

1.1 Background

The project stems to address the limitations of traditional diagnostic methods for Coccidiosis and Salmonella, which are often invasive, time-consuming, and costly. By harnessing the power of machine learning and image processing, the project seeks to provide a more efficient and accessible solution. The use of the CNN model allows for accurate classification of fecal images, leveraging its proven performance in various image recognition tasks. The project also aims to improve the diagnostic process but also to enhance overall farm management by providing a tool that can be seamlessly integrated into existing systems, thereby supporting more effective and sustainable poultry farming practices.

The application of this project is primarily targeted at poultry farms and veterinary practices. The developed model can be integrated into farm management systems, providing real-time alerts and actionable insights to farmers and veterinarians. By analyzing fecal images of chickens, the model can quickly and accurately detect the presence of Coccidiosis and Salmonella, allowing for prompt treatment and management of the disease.

The scope of this project encompasses the development and implementation of a machine learning model to predict Coccidiosis and Salmonella disease in chickens using fecal images. By leveraging deep learning techniques, specifically the Convolutional Neural Network (CNN), the project aims to provide a non-invasive, cost-effective diagnostic tool. This tool is designed to enhance the health monitoring processes in poultry farms, enabling early detection and timely intervention to prevent the spread of the disease. The project holds significant real-world relevance, addressing a critical issue in the poultry industry and aiming to improve overall farm productivity and animal welfare.

1.2 Problem statement

Project aims to create a reliable and efficient method for early detection of Coccidiosis and Salmonella disease in chickens using fecal images. The aim is to improve the health monitoring processes in poultry farms and minimize the spread of the disease. The goal is to develop a predictive model that can analyze fecal images and accurately determine the presence of disease, thereby aiding in timely intervention and treatment.The expected outcome is a reliable model that can offer quick and accurate detection, aiding in timely intervention and treatment, ultimately reducing economic losses and enhancing the overall health and productivity of chicken flocks.

1.3 Scope

The main objective of this project is to develop an all-encompassing diagnostic tool for identifying disease in chickens using sophisticated image processing and deep learning methods. The project focuses on developing a machine learning model that can accurately analyze fecal images to identify the presence of disease, providing a non-invasive alternative to traditional diagnostic methods. This approach minimizes the need for labor-intensive sample collection and microscopic examination, significantly improving the efficiency and accuracy of disease detection in poultry farms.

Another key aspect of the project's scope is its emphasis on real-time monitoring and early detection. By integrating the developed model into farm management systems, the project enables continuous surveillance of chicken health. This real-time capability ensures that any signs of disease are detected at the earliest possible stage, allowing for prompt intervention and treatment. Early detection is crucial in preventing the spread of the disease, reducing the overall impact on the flock, and minimizing economic losses associated with decreased productivity and increased mortality.

The project also aims to provide a cost-effective and accessible diagnostic tool for poultry farmers. Traditional diagnostic methods for Coccidiosis and Salmonella are often expensive and require specialized laboratory infrastructure, which may not be feasible for all farmers. By leveraging machine learning and image processing, this project seeks to offer a more affordable solution that can be easily implemented on-site. This cost-effectiveness ensures that even small-scale poultry farms can benefit from advanced diagnostic capabilities, ultimately supporting more sustainable and profitable farming practices.

Chapter 2

Software Requirements Specification

2.1 Introduction

Coccidiosis and Salmonella are a widespread parasitic disease in chickens, caused by protozoan parasites belonging to the genus Eimeria. It affects the intestinal tract of chickens and can lead to severe health problems, including diarrhea, weight loss, and even death. The economic impact of Coccidiosis and Salmonella on the poultry industry is significant, resulting in substantial losses due to decreased productivity, increased mortality, and the costs associated with treatment and control measures.

2.2 Functional requirements

Project able to collect and preprocess fecal images from chickens, ensuring image quality is suitable for analysis. The system must extract relevant features from these images and input them into a trained deep learning model,Convolutional Neural Network (CNN). The model should accurately classify images to detect the presence of disease, providing results with high precision and recall. Additionally, the tool must feature a user-friendly interface that allows farm operators to upload images, view diagnostic results, and receive real-time alerts and recommendations for intervention.

2.3 Non-Functional requirements

Project ensuring the diagnostic tool is highly reliable, with consistent and accurate detection of Coccidiosis and Salmonella across various conditions. The system must be user-friendly, featuring an intuitive interface that allows easy operation by farm staff with minimal technical expertise. Performance is crucial, necessitating fast processing times to provide real-time or near-real-time results. Additionally, the system must ensure data security and privacy, protecting sensitive farm data and adhering to relevant regulations.

2.3.1 Performance Requirements

- **Accuracy and Loss**: The diagnostic model must achieve accuracy above 75 percent and loss between the range of 0-1.
- **Response Time**: The system should provide diagnostic results within a few seconds of analyzing the fecal images, ensuring prompt decision-making and intervention.
- **Scalability**: The solution must be scalable to handle large volumes of data, allowing it to process images from multiple poultry farms simultaneously without performance degradation.

2.3.2 Usability and Reliability Requirements

- **User-Friendly Interface**: The diagnostic tool should feature an intuitive and easy-to-navigate interface, allowing farm operators with minimal technical expertise to use it effectively.
- **System Availability**: The system should ensure high availability, with minimal downtime, to provide continuous monitoring and real-time diagnostics.
- **Data Security and Privacy**: The solution must comply with data security standards to protect sensitive information, ensuring that all collected data is stored and processed securely to prevent unauthorized access and breaches.

2.4 User Interface requirements

2.4.1 HTML

The user interface (UI) for the Salmonella disease detection system will be constructed using HTML (HyperText Markup Language) to structure the content and layout of the web pages. The HTML will include forms for user input, buttons for interaction, and sections to display the results of the disease detection process. The following HTML elements are critical for the UI design:

- **Forms:** For users to upload images of chicken feces for analysis.
- **Buttons:** For submitting the forms and triggering the detection process.
- **Display Sections:** To show the results of the detection process, including whether Salmonella was detected.

2.4.2 JavaScript

JavaScript will be utilized to handle the dynamic aspects of the UI, such as form validation, asynchronous communication with the server, and real-time updates. The following JavaScript functionalities will be implemented:

- **Form Validation:** To ensure that users provide valid input before submission.
- **AJAX Requests:** To send images to the server without reloading the page.
- **Real-Time Updates:** To update the UI with detection results as soon as they are available.

2.4.3 Tailwind CSS

Tailwind CSS will be employed to style the UI components and ensure a modern and responsive design. Tailwind's utility-first approach will enable rapid styling directly within the HTML, ensuring a consistent and attractive appearance across different devices. The key aspects of the Tailwind CSS implementation include:

- **Responsive Design:** Ensuring the UI looks good on both desktop and mobile devices.
- **Utility Classes:** Using Tailwind's utility classes to style buttons, forms, and display sections.
- **Customization:** Customizing the color palette and typography to match the branding of the detection system.

2.4.4 Interface Design

- **Intuitive Layout**: The user interface should have a clear and intuitive layout, making it easy for users to navigate through different sections without confusion.
- **Consistent Design**: The design should maintain consistency in terms of color schemes, fonts, and button styles to provide a cohesive user experience.
- **Accessibility**: The interface should be accessible to all users, including those with disabilities, by adhering to accessibility standards .

2.4.5 Functionality

- **Real-Time Data Display**: The interface should display diagnostic results in real-time.

- **Error Handling**: The UI should include error handling mechanisms to inform users of any issues during the diagnostic process and guide them on how to resolve these issues.

2.5 Software Requirements

- Python (with libraries such as TensorFlow, Keras)
- Jupyter Notebook
- HTML, CSS, JavaScript
- IDE

2.5.1 Development Environment

- **Python**: The primary programming language for developing the machine learning model and image processing algorithms.
- **Jupyter Notebook**: An interactive development environment for writing and testing Python code.

2.5.2 Libraries and Frameworks

- **TensorFlow/Keras**: Deep learning libraries used for building and training the Convolutional Neural Network (CNN) model.
- **Matplotlib**:A library to generate a wide variety of plots and charts, making it essential for data analysis and visualization.
- **NumPy**: A library for numerical computations, essential for handling arrays and matrices in image processing.
- **FastApi**: A web framework for building APIs

2.6 Hardware Requirements

- High-performance computer with GPU support
- Camera for capturing fecal images
- Storage for dataset

Chapter 3

System Design

The system design for the Chicken disease detection project involves a multi-layered architecture that integrates data collection, image processing, machine learning, and user interaction. At the core of the system is a Convolutional Neural Network (CNN) model, chosen for its proven effectiveness in image classification tasks. The system begins with the collection of fecal images from chickens, which are then preprocessed to enhance quality and remove noise. These preprocessed images are fed into the CNN model for feature extraction and classification. The model's predictions are evaluated using various metrics to ensure high accuracy and reliability. The diagnostic tool is designed to be user-friendly, featuring an intuitive interface that displays real-time diagnostic results and provides actionable insights. This interface is integrated with farm management systems, enabling continuous monitoring and timely interventions. The entire system is designed to be scalable, ensuring it can handle large volumes of data from multiple farms without performance degradation, and secure, adhering to data privacy standards to protect sensitive information.

3.1 Architecture Design

This Figure 5.1 describes the several interconnected components to ensure efficient and accurate disease diagnosis. The system begins with data collection, which high-resolution images of chicken feces. These images are then preprocessed to enhance quality and remove noise, using techniques like resizing, normalization, and augmentation. The core of the system is a deep learning model based on the Convolutional Neural Network (CNN), which is trained on labeled datasets to identify features indicative of Chicken disease. This model is deployed on a server, where it processes incoming images and generates predictions in real-time. The results are then sent to a user-friendly interface accessible via web or mobile applications, providing farm operators with immediate diagnostic feedback. The system is designed to be scalable, allowing it to handle large volumes of images from multiple sources, and incorporates data security measures to protect sensitive information.

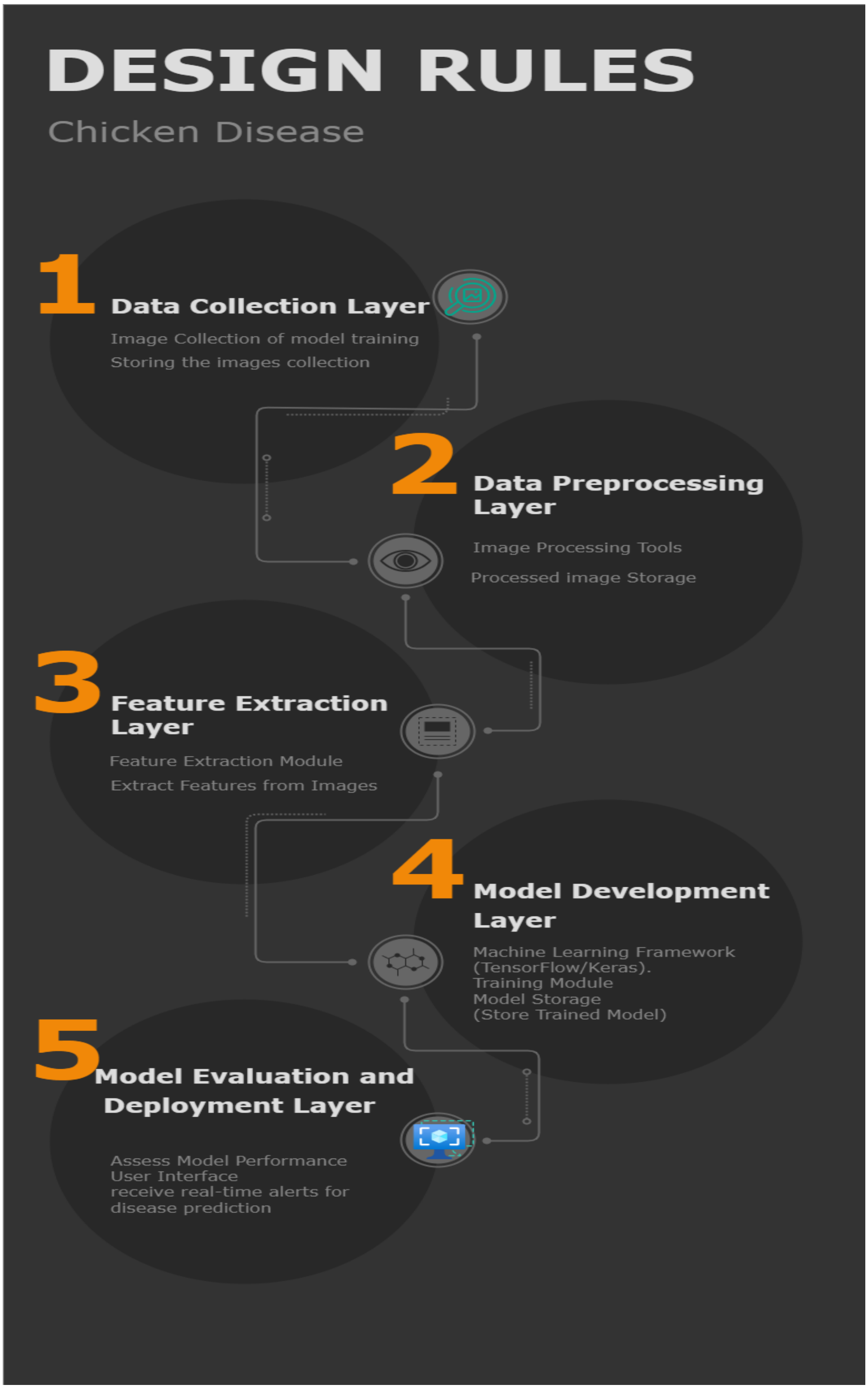

Figure 3.1: System Architecture Diagram

Overall, the architecture ensures seamless integration of data acquisition, processing, analysis, and user interaction to support effective disease management in poultry farms.

3.2 Decomposition Description

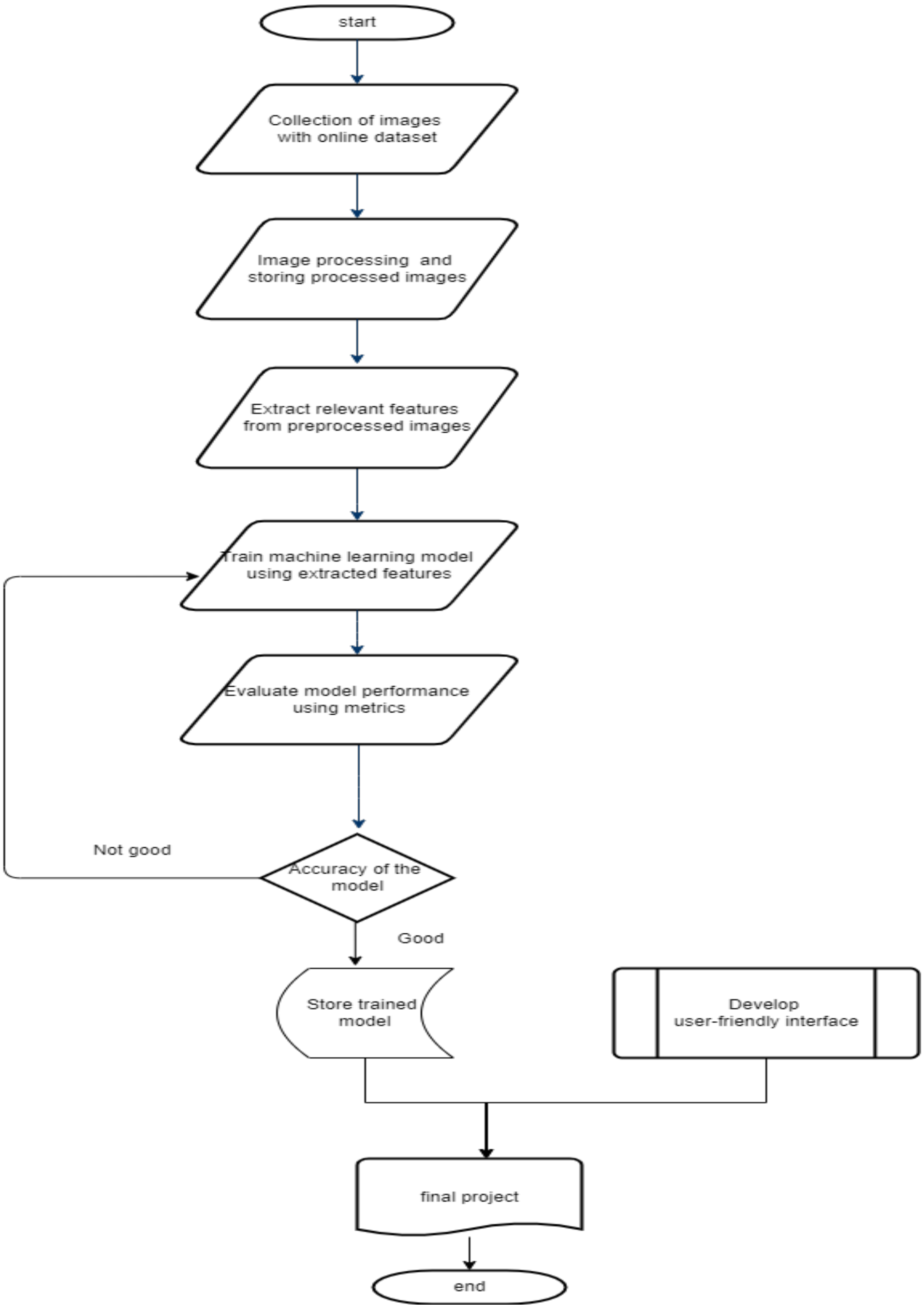

Figure 3.2: Flow chart

Figure 5.2, The flow chart outlines the step-by-step process for developing a comprehensive system to detect disease in chickens using their fecal images and training a CNN model on these images. The process begins with the collection of images from an online dataset, which forms the basis for the subsequent steps. These collected images undergo image processing which is crucial for accurate disease detection. The processed images are then used to extract relevant features, a critical step for training the machine learning model. Following feature extraction, the machine learning model is trained using these extracted features to learn and recognize patterns indicative of disease. The trained model's performance is evaluated using various metrics to ensure its accuracy and reliability. Once the model achieves the desired accuracy, it is stored for future use. Concurrently, a user-friendly interface is developed to make the diagnostic tool accessible and easy to use for farm operators. The final project integrates the trained model and the user interface, providing a robust system for real-time detection of Coccidiosis and Salmonella Disease in poultry farms. The process culminates in the deployment of the final project, ensuring the system is ready for practical use in monitoring and managing chicken health.

3.3 Data Flow Design

The provided dataflow diagram for the "Chicken-Disease Prediction" project begins with the user entering in to the application and user interface (UI) of the application, whereuser can upload fecal images of chickens. These images are taken through the UI and then given to the backend system via an API. The backend system processes these images by feeding them into a pre-trained machine learning model, which has been developed and saved previously. The model analyzes the images to predict the presence of disease in the chickens.

After processing the images through the model, the results are evaluated. If there is an error during this process, it is flagged and managed accordingly. If the process is successful, the prediction results are sent back through an API to the application's UI. The final outcome is displayed to the user, showing whether the chickens are likely infected with disease or not. This dataflow ensures that the entire process, from image capture to disease prediction, is seamless and efficient, providing timely insights to farmers and veterinarians for better disease management.

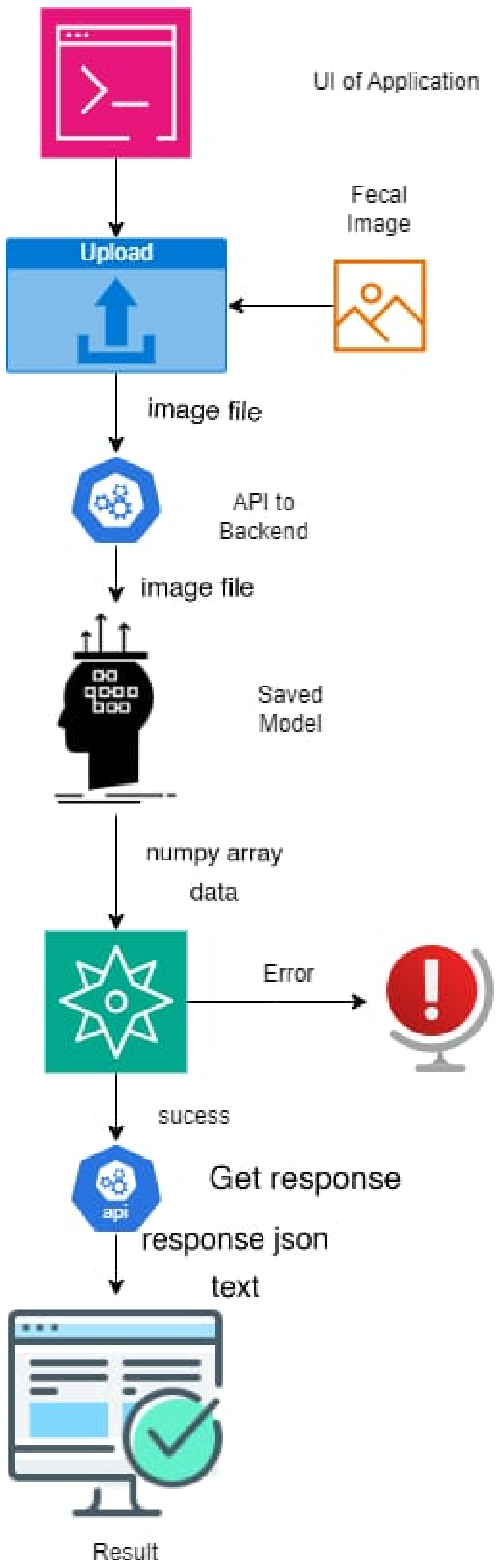

Figure 3.3: Dataflow design

Chapter 4

Implementation

the chapter contains paragraph contents.(Pseudocode, Algorithm etc), for ex: Check the following data

4.1 Data Collection and Preprocessing

DataSet is an extracted from online Kaggle Database,and later preprocessed using Tensorflow/Keras.

4.2 Deep Learning Model Development

Feature extraction is done and CNN Model is developed and trained with Training set images got by the online datastore.

4.2.1 Detection of Coccidiosis Disease in Chicken

The model for Coccidiosis disease detection in chickens is based on a Convolutional Neural Network (CNN), a deep learning architecture well-suited for image classification tasks. The model is specifically designed to analyze images of chicken feces to detect the presence of Coccidiosis, a common and harmful parasitic disease. The CNN is trained using a large dataset of labeled images, enabling it to learn the distinguishing features of infected versus non-infected samples. The training process involves multiple layers of convolution and pooling operations, which help the model to automatically extract and learn relevant features from the images. After training, the model undergoes rigorous evaluation using the accuracy metric to ensure its effectiveness and reliability. The final model is capable of processing new images in real-time, providing accurate diagnostic results.

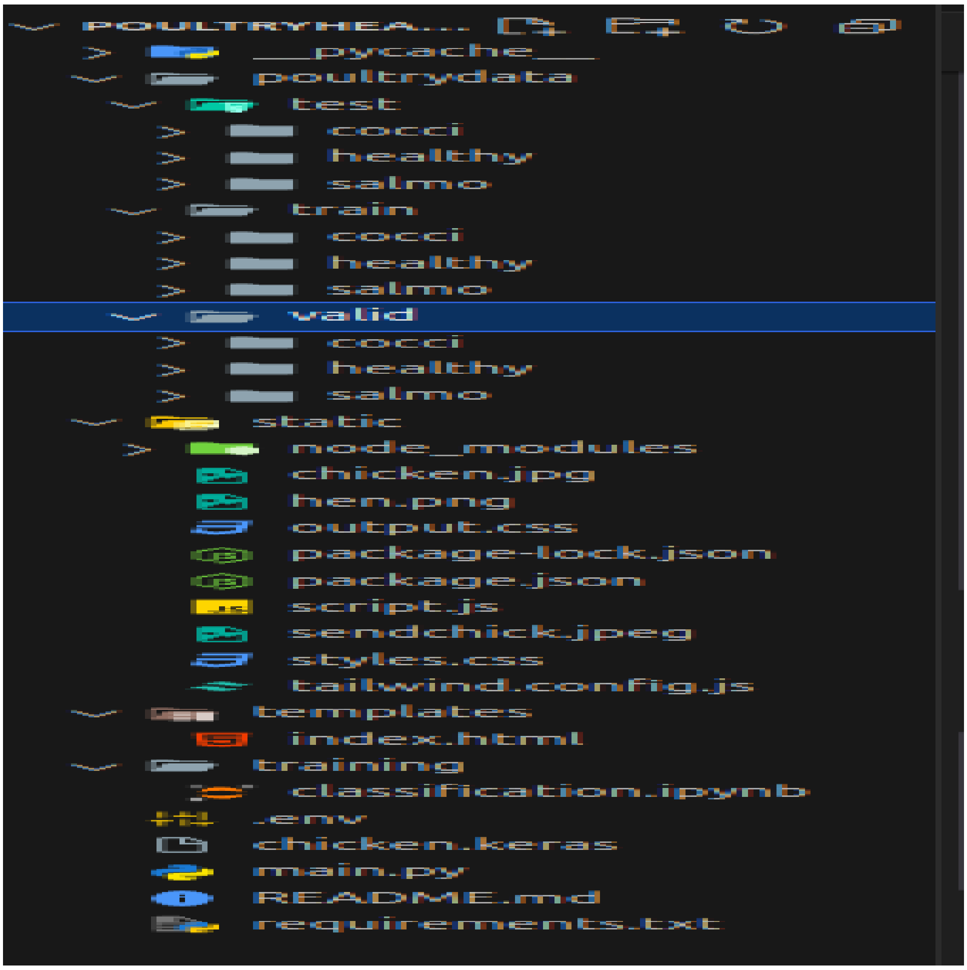

Figure 4.1: folder structure with dataset

Figure 4.2: code snippet for chicken Disease detection by Model

```python
from dotenv import load_dotenv
from fastapi import FastAPI, File, UploadFile, HTTPException
from fastapi.middleware.cors import CORSMiddleware
from fastapi.responses import HTMLResponse, JSONResponse
from fastapi.staticfiles import StaticFiles
import uvicorn
import numpy as np
from io import BytesIO
from PIL import Image
import tensorflow as tf

app = FastAPI()

load_dotenv()

origins = [
    "http://localhost",
    "http://localhost:3000",
    "http://127.0.0.1:8000",
]

app.add_middleware(
    CORSMiddleware,
    allow_origins=origins,
    allow_credentials=True,
    allow_methods=["GET", "POST"],
    allow_headers=["*"],
)

app.mount("/static", StaticFiles(directory="static"), name="static")

# Retrieve environment variables
MODEL_PATH = os.getenv('MODEL_PATH')
CLASS_NAMES = os.getenv('CLASS_NAMES').split(",")

MODEL = tf.keras.models.load_model(MODEL_PATH)

@app.get("/", response_class=HTMLResponse)
async def read_index():
    with open("templates/index.html") as f:
        return f.read()

def read_file_as_image(data) -> np.ndarray:
    image = Image.open(BytesIO(data)).convert("RGB")
    image = image.resize((256, 256))
    return np.array(image)

@app.post("/predict")
async def predict(file: UploadFile = File(...)):
    try:
        contents = await file.read()
        image = read_file_as_image(contents)
        img_batch = np.expand_dims(image, 0)

        predictions = MODEL.predict(img_batch)
        predicted_class = CLASS_NAMES[np.argmax(predictions[0])]
        confidence = float(np.max(predictions[0]))

        return JSONResponse({
            'class': predicted_class,
            'confidence': confidence
        })

    except Exception as e:
        raise HTTPException(status_code=500, detail=str(e))

if __name__ == "__main__":
    uvicorn.run(app, host="127.0.0.1", port=8000)
```

Figure 4.3: Code Snippet of MiddleWare Connection

4.2.2 Detection of Salmonella Disease in Chicken

The model for detecting Salmonella disease in chickens leverages Convolutional Neural Networks (CNN) to accurately identify infected samples from images of chicken feces.It is mainly in very young chickens aged up to two weeks that salmonella can cause disease and death. The symptoms may vary and include weakness, loss of appetite and poor growth. The animals are crowded close to heat sources and sit with drooping wings and their eyes closed. Watery diarrhoea may also occur. Initially, a large dataset of labeled images, indicating the presence or absence of Salmonella, is collected and preprocessed to ensure uniformity in size and quality. These images are then fed into the CNN, where the convolutional layers automatically learn to detect patterns and features associated with Salmonella infection, such as color variations and texture anomalies. The pooling layers help reduce the dimensionality of the feature maps, making the model computationally efficient. The fully connected layers at the end of the network use these extracted features to classify the images.

4.3 Model Evaluation

4.3.1 CNN Chicken Disease Prediction Model Evaluation

The evaluation of the Convolutional Neural Network (CNN) model for chicken disease detection in chickens involves several steps to ensure its accuracy, reliability, and robustness. The process begins with dividing the dataset into training, validation, and test sets. The training set is used to train the model, the validation set helps tune hyperparameters, and the test set evaluates the model's performance on unseen data.

Key performance metrics such as accuracy is used calculated to measure the model's

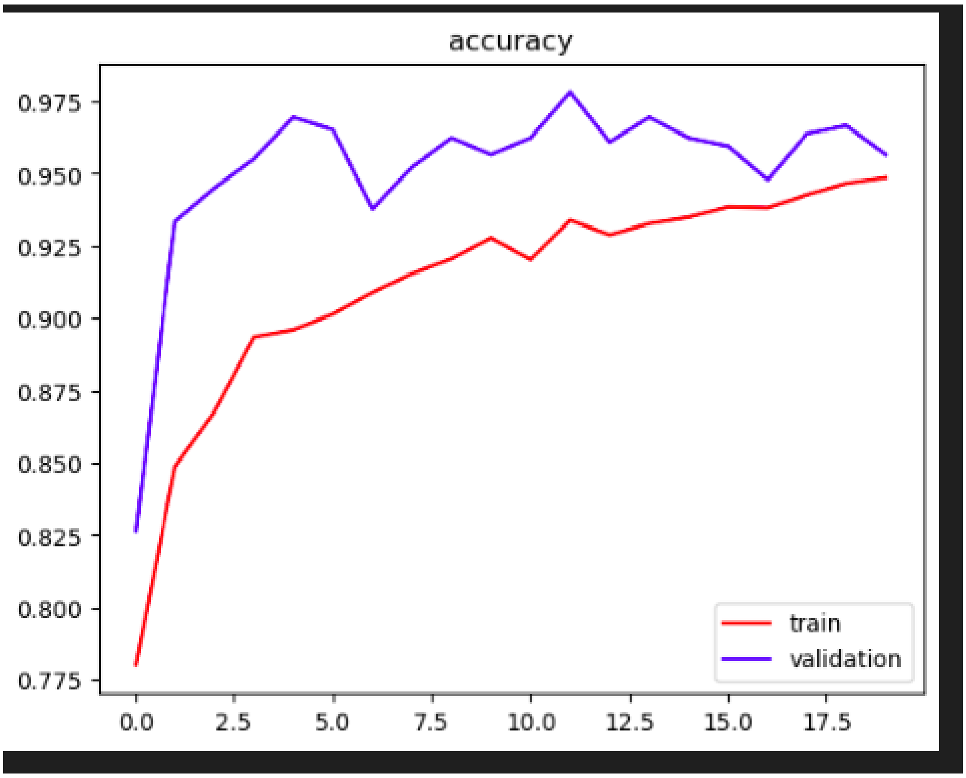

Figure 4.4: Graph plot of model accuracy on training and validation data

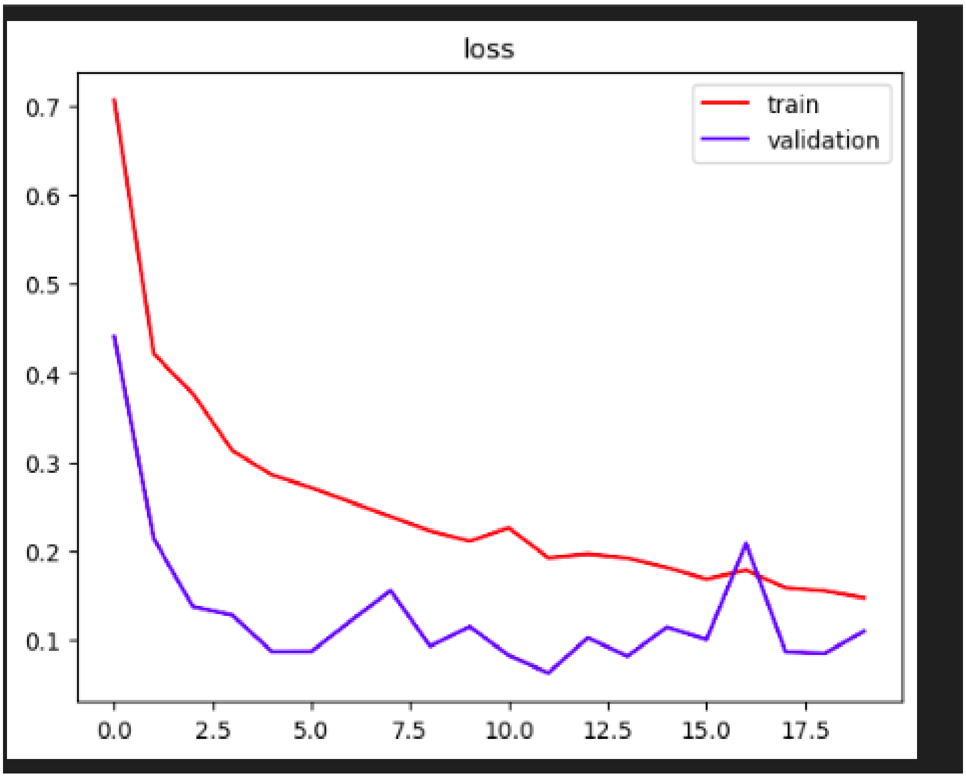

Figure 4.5: Graph plot of model loss on training and validation data

effectiveness. Accuracy measures the overall correctness of the model by dividing the number of correct predictions by the total number of predictions.

Overall, a comprehensive evaluation process ensures that the CNN model for Coccidiosis,Salmonella disease detection in chickens is accurate, reliable, and ready for practical deployment in monitoring and managing poultry health.

4.4 FeedBack Form Design

The feedback form for the Chicken disease detection project is designed to gather comprehensive input from users regarding their experience with the diagnostic tool. This form includes several sections to capture detailed feedback, beginning with basic user information such as name, contact details, and affiliation with a poultry farm or research institution. The core of the feedback form focuses on the usability and functionality of the diagnostic tool, asking users to rate aspects such as ease of navigation, clarity of results, and overall satisfaction with the interface. Additionally, there are sections dedicated to the accuracy and reliability of the disease detection, where users can report any discrepancies or false positives/negatives they encountered. The form also includes open-ended questions to allow users to provide suggestions for improvements, report any technical issues, and share their overall impressions and experiences. By collecting this feedback, the project team can identify areas for enhancement, ensuring the tool meets the needs of its users and continuously improves in accuracy and usability.[5] [4] [3] [2] [1] [8] [7] [6]

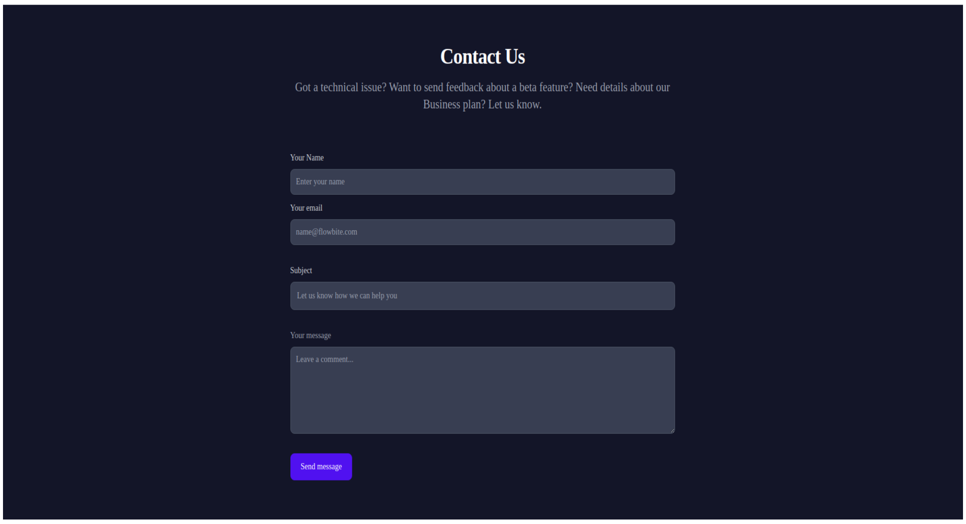

Figure 4.6: Interface design of FeedBack Form

Chapter 5

Results and Discussion

this chapter contains the paragraphs as shown below

5.1 User Interface Creation

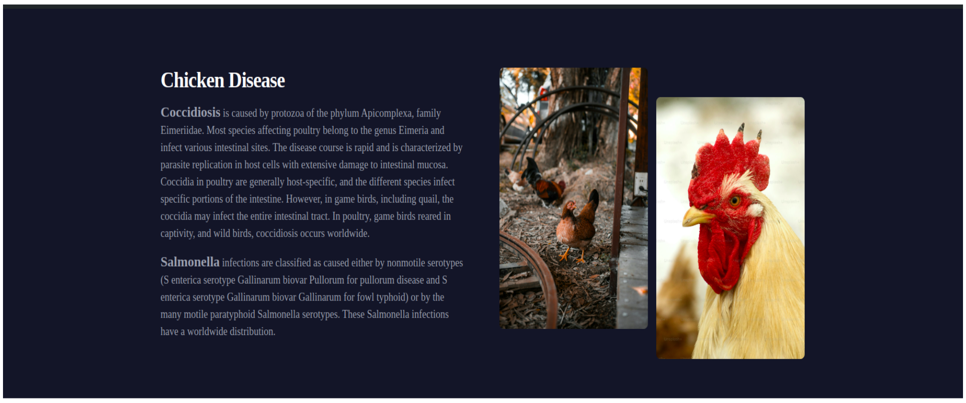

Figure 5.1: Application Interface designe

Above figure 8.1 shows Interface designed to view and get images uploaded from the user, The model designed for leverages Convolutional Neural Networks (CNN) to accurately identify infected samples from images of chicken feces. The CNN model is designed to process and analyze visual data, making it particularly well-suited for image classification tasks.

5.2 Fronted Connected With Trained Model

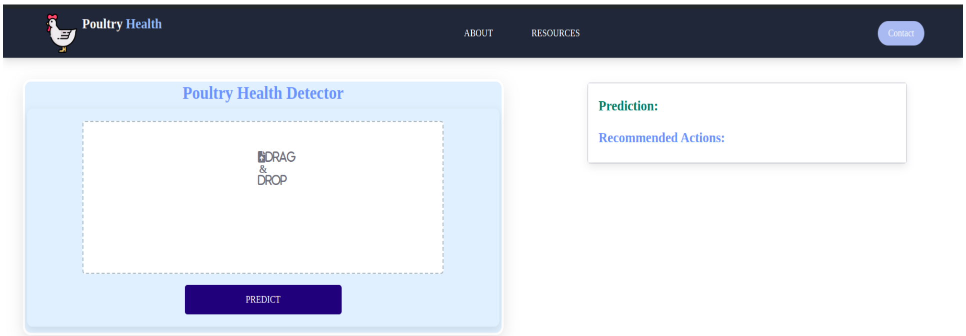

Figure 5.2: Uploading the Images for Prediction

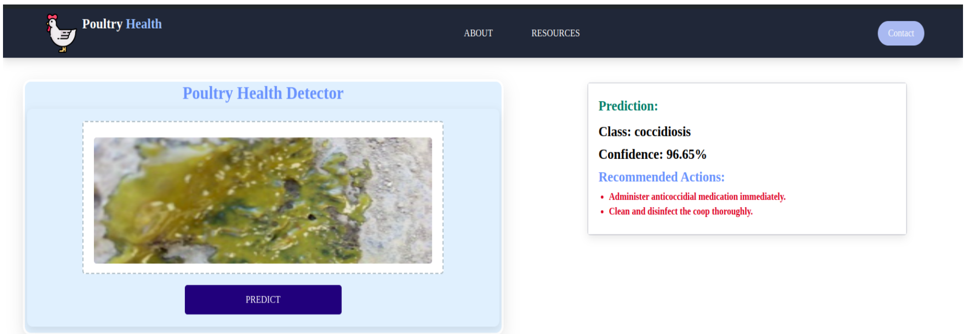

Figure 5.3: Accurately predicted a chicken having Coccidiosis disease

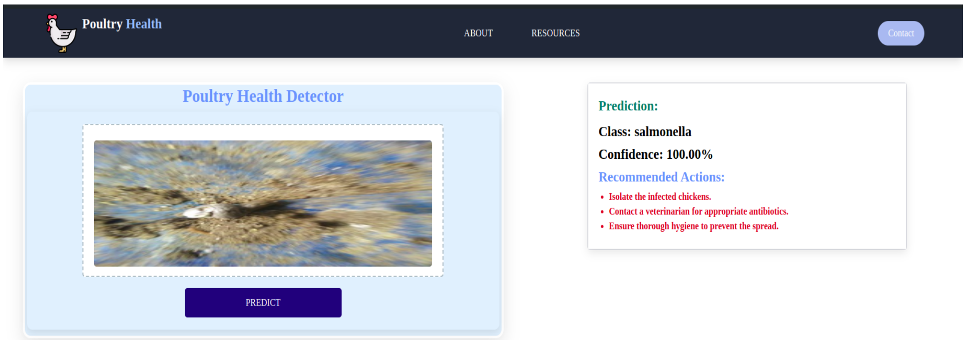

Figure 5.4: Accurately predicted a chicken having Salmonella Disease

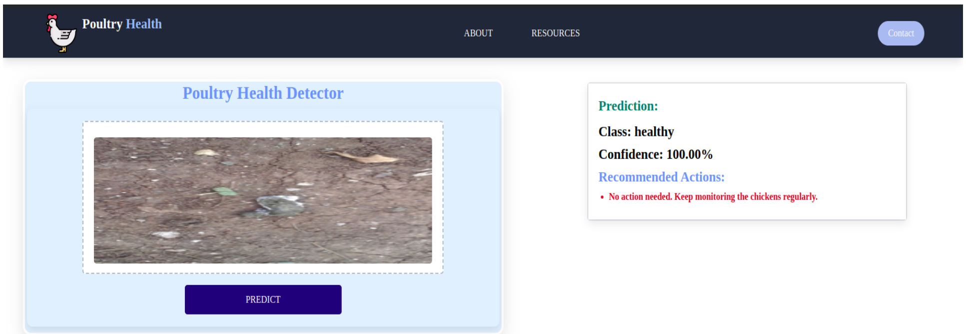

Figure 5.5: Accurately predicted a Healthy Chicken

Chapter 6

Conclusion and Future Work

This study presents a poultry disease detection and classification system using chicken fecal images. After experimenting with various hyperparameters, the number of layers, and the number of neurons in each layer, the best-fit model was found. Additionally, various techniques were employed to prevent overfitting, and optimization was performed throughout the process. The developed chicken disease detection and classification system has a capability to identify three common poultry diseases in high accuracy and can be used in farms to assists poultry farmers and veterinarians.
This project can be further developed as:

- Rapid identification of diseases can prevent the spread of infections and reduce mortality rates in poultry farms.
- Continued advancements in deep learning techniques can improve the accuracy and reliability of disease detection, minimizing false positives and negatives.

This project has a great potential to make a positive impact on prediction and accuracy detection. Its continuous improvement will be important to make this impact even greater.

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