Chicken Disease Classification Based on Feces

Savitha M

Assistant Professor, Department of Computer Science and Engineering, VCET, Puttur, Karnataka, India
Email: *savitham.cse[at]vcetputtur.ac.in*

Abstract: *The poultry sector is facing significant challenges due to the spread of diseases such as Coccidiosis, Salmonella, and Newcastle, which can have a significant impact on production. Traditional farming practices and a lack of reliable information and proper methods of farming have contributed to the spread of these diseases. Poultry farmers rely on experts to diagnose and detect diseases, but access to experts is limited due to the shortage of extension officers. Artificial intelligence and machine learning tools can help semi - automate the diagnostics process for the most common diseases in chickens. This study proposes a solution for predicting diseases in chickens using chicken fecal images, and deep Convolutional Neural Networks (CNN). The proposed CNN model can classify healthy and diseased chicken fecal images as Coccidiosis, Salmonella, Newcastle, or healthy. Also, it gives some information about it.*

Keywords: Convolutional Neural Networks (CNN), Chicken disease classification

1. Introduction

Poultry farming stands as a cornerstone of global agriculture, providing a vital source of protein through the production of chicken meat and eggs. However, the industry is confronted with a myriad of challenges, with diseases posing a substantial threat to both poultry health and the economic viability of farms. Timely and accurate diagnosis of these diseases is crucial for effective disease management, yet traditional diagnostic methods often prove to be time - consuming and resource - intensive.

In recent years, the convergence of agriculture and technology has paved the way for innovative solutions to address challenges in the poultry sector. One such promising avenue is the application of machine learning techniques. This study focuses on the unique approach of utilizing machine learning, particularly Convolutional Neural Networks (CNN), for the classification of chicken diseases based on chicken images and fecal images.

The choice of fecal samples as a diagnostic medium is grounded in the recognition that feces can provide valuable insights into the health status of chickens. Many poultry diseases manifest symptoms that are detectable in fecal matter. By leveraging machine earning algorithms, this study aims to develop a robust model capable of accurately identifying and classifying diseases prevalent in poultry.

The specific diseases targeted in this study include Coccidiosis, Salmonella and New castle disease. Each of these diseases poses a significant threat to poultry health, and their early detection is critical to minimizing the economic losses associated with treatment and mortality.

This paper proposes a mobile application that uses machine learning and image recognition to identify diseases affecting chicken. The application will be trained using a large dataset and will provide detailed information about each disease. It will classify the chicken is healthy or diseased based on chicken fecal images taken/uploaded. This application has the potential to identify the various chicken diseases such as Coccidiosis, Newcastle, Salmonella based on fecal images, and also give description, symptoms, treatment, prevention methods to the user in a friendly way.

2. Literature Survey

Md Shakhwat Hossain and Umme Sadia Salsabil [1] "Smart Poultry: Early Detection of Poultry Disease from Smartphone Captured Fecal Image" published in the IEEE Conference Publication, which proposes an AI - assisted automated system for detecting chicken diseases at an early stage from smart - phone captured fecal images. The proposed method utilized an ensemble network of four fine - tuned convolutional neural networks that were selected through an exhaustive literature search. The proposed method outperformed existing methods, achieving 99.99% accuracy and we demonstrated its practical usability in terms of time, robustness, user friendliness and cost.

S. Suthagar and G. Magesh Kumar [2] "Faecal Image - Based Chicken Disease Classification Using Deep Learning". This paper proposes a deep learning method based on convolutional neural networks (CNN) to predict whether chicken fecal image belongs to any of the four categories, namely healthy chicken, Coccidiosis, Salmonella, and Newcastle.

Moch Kholil and Heri Priya Waspada [3] "Classification of Infectious Diseases in Chickens Based on Feces Images Using Deep Learning" published in the IEEE Conference Publication which proposes a deep learning - based method to identify the types of infectious diseases that attack chickens based on feces images.

Ivan Roy S. Evangelista and Lenmar T. Catajay [4] "Exploring Deep Learning for Detection of Poultry Activities—Towards an Autonomous Health and Welfare Monitoring in Poultry Farms": This paper explores the use of deep learning for detecting poultry activities such as feeding, drinking, and resting.

Fujie Wang and Jiquan Cui [5] "Application of deep learning methods in behavior recognition of laying hens": This paper compares four deep learning methods for recognizing four behaviors of laying hens, such as standing, lying, feeding and grooming. The paper uses Efficientnet -

YoloV3, YoloV4 - Tiny, YoloV5, and Faster - RCNN, and evaluates their performance using mean average precision (mAP) and frames per second (FPS).

Dina Machuve and Ezinne Nwankwo [6] "Poultry diseases diagnostics models using deep learning": This paper presents a deep learning - based approach for diagnosing poultry diseases by classifying healthy and unhealthy fecal images.

P. Hepworth and A. Nefedov [7] "Broiler chickens can benefit from machine learning": The article discusses the use of support vector machine learning to identify the features associated with hock burn on commercial broiler farms, using routinely collected farm management data. Hock burn, dermatitis of the skin over the hock is an important indicator of broiler health and welfare. The classifier developed by the authors can predict the occurrence of high hock burn prevalence with an accuracy of 0.78 on unseen data, as measured by the area under the receiver operating characteristic curve.

Hope Mbelwa and Jimmy Mbelwa [8] "Deep Convolutional Neural Network for Chicken Diseases Detection" is a paper published in the International Journal of Advanced Computer Science and Applications in 2021. The authors propose a deep learning solution based on Convolution Neural Networks (CNN) to predict whether the feces of chicken belong to either of the three classes: healthy chicken, Coccidiosis, Salmonella, and Newcastle.

3. Proposed System

This paper proposes a mobile application that utilizes machine learning and image recognition technology to identify diseases affecting chickens. This innovative solution will be trained on a large dataset, enabling it to accurately classify chickens as healthy or diseased based on fecal images uploaded by users. Our application has the potential to detect various chicken diseases such as Coccidiosis, Newcastle and Salmonella, providing detailed information about each disease, including descriptions, symptoms, treatment options and prevention methods in a user - friendly manner.

4. Methodology

The components of the proposed system include data acquisition, data pre - processing, feature extraction, fine tuning, classification, results, and analysis. These are shown in Fig.1.
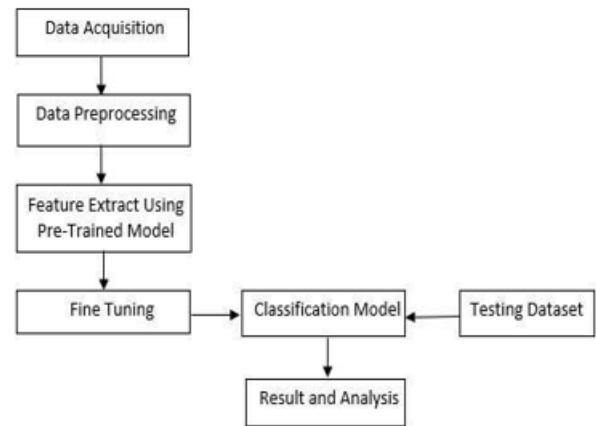

Figure 1: Architecture of the System

4.1 Data Acquisition

The dataset consists of diseased fecal images such as Coccidiosis, Salmonella, Newcastle and healthy fecal images. The dataset can be collected from Kaggle.

4.2 Data Preprocessing

Data preprocessing is a required task for preparing the raw input data and making it appropriate for a constructing and training deep learning model which also increases the accuracy and efficiency of a model. In the collected dataset all the images have RGB coefficients in the range 0 - 255 and different dimensions. So image rescales and resize is done.

4.3 Feature Extraction

The process of converting unprocessed data into numerical features that may be handled while keeping the information in the original data set is known as feature extraction. Compared to directly applying CNN or machine learning to the raw data, it produces superior outcomes. CNNs are a type of deep neural network that are mainly employed in tasks related to image recognition and classification.

4.4 Fine Tuning

Fine tuning involves taking weights of a trained neural network and using it as initialization for a new model being trained on data from the same domain. It is used to speed up the training and overcome small dataset sizes.

4.5 Classification

Input fecal images are classified into 4 categories i. e., Coccidiosis, Salmonella, Newcastle disease and healthy. Based on this classification further analysis is done.

4.6 Result and analysis

It will classify the chicken is healthy or diseased based on chicken fecal images taken/uploaded. This application has the potential to identify the various chicken diseases such as Coccidiosis, Newcastle, Salmonella based on fecal images.

5. Results

A chicken fecal image is given into the model by the user. As illustrated in Fig.2, the user either takes the picture using a camera or uploads it from their collection.
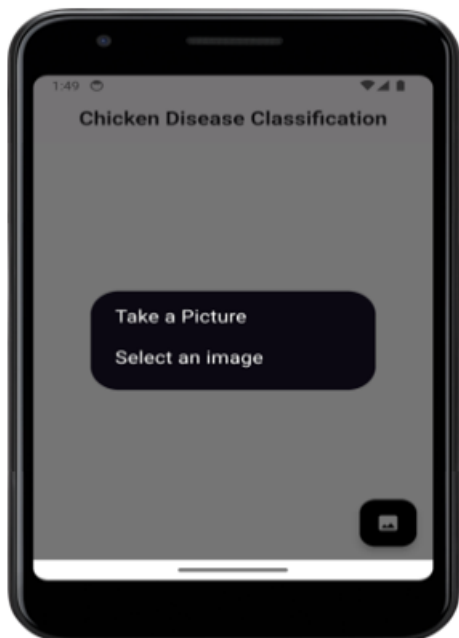

Figure 2: Image Upload Page

Figure 3: Result Page of Coccidiosis

The model will process the input image, extract the feature and predict the disease. And the output will be disease name, description, symptoms, treatment and prevention as shown in Fig.3 and Fig.4.
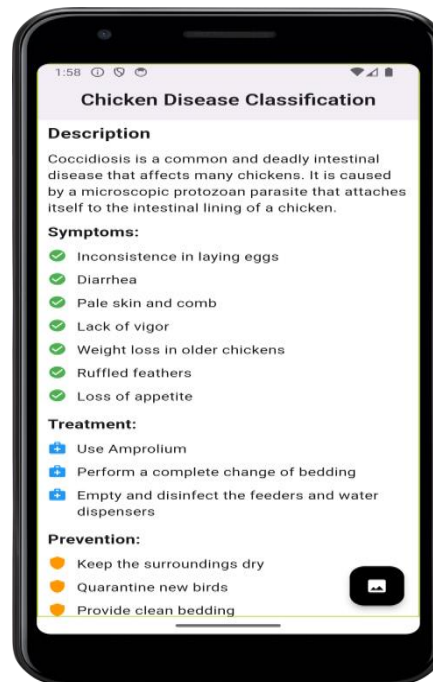

Figure 4: Result Page of Coccidiosis

6. Conclusion and Future Works

In conclusion, the development of a mobile application utilizing machine learning and image recognition for the identification of chicken diseases represents a significant advancement in poultry health management. By harnessing the power of advanced technologies, such as deep learning, user - friendly tool is created that empowers poultry farmers and enthusiasts to effectively diagnose diseases in their flocks.

Through the analysis of fecal images, this application can accurately classify chickens as healthy or diseased, with the ability to identify specific diseases such as Coccidiosis, Newcastle, and Salmonella. This real - time disease detection capability enables prompt intervention, minimizing economic losses and promoting the overall well - being of poultry populations.

Furthermore, this application provides detailed information about each identified disease, including descriptions, symptoms, treatment options, and prevention methods. By equipping users with comprehensive knowledge, we can empower them to make decisions and take proactive measures to safeguard the health of their chickens.

Looking forward, there are several avenues for future work to enhance the capabilities and impact of this mobile application. Firstly, expanding the dataset used to train the machine learning models can improve their accuracy and generalization capabilities. This includes adding more diverse images of healthy and diseased chickens, as well as including images of additional diseases that commonly affect poultry.

References

[1] Md Shakhwat Hossain and Umme Sadia Salsabil. "Smart Poultry: Early Detection of Poultry Disease

from Smartphone Captured Fecal Image". IEEE Conference Publication.2023.

[2] S. Suthagar and G. Magesh Kumar. "Faecal Image - Based Chicken Disease Classification Using Deep Learning". Conference paper, 563, 903–917.2023.

[3] Moch Kholil and Heri Priya Waspada. "Classification of Infectious Diseases in Chickens Based on Feces Images Using Deep Learning. " IEEE Conference Publication, 2023.

[4] Ivan Roy S. Evangelista and Lenmar T. Catajay. "Exploring Deep Learning for Detection of Poultry Activities—Towards an Autonomous Health and Welfare Monitoring in Poultry Farms. "2023.

[5] Fujie Wang and Jiquan Cui. "Application of deep learning methods in behavior recognition of laying hens. "Frontiers in Physics, 11, 11399761.2023.

[6] Dina Machuve and Ezinne Nwankwo. "Poultry diseases diagnostics models using deep learning". Frontiers in Artificial Intelligence, 5, 733345.2022.

[7] P. Hepworth and A. Nefedov. "Broiler chickens can benefit from machine learning". Journal of Poultry Science, 36, 87–102.2022.

[8] Hope Mbelwa and Jimmy Mbelwa. "Deep Convolutional Neural Network for Chicken Diseases Detection". International Journal of Advanced Computer Science and Applications, 23, 123–138.2021.