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Poultry-Diseases Recognition System with Deep Learning

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ABSTRACT

Poultry farming is an important part of agriculture that provides food and income to many people. But poultry birds often suffer from diseases like Coccidiosis, Salmonella, and Newcastle Disease. These diseases spread quickly and can cause big losses for farmers. Traditional methods to detect these diseases, like lab tests, are slow, expensive, and not available in rural areas. So, there is a need for a fast and affordable way to detect diseases early.

In this project, we used deep learning techniques to build a model that can detect poultry diseases from images of chicken feces. We used CNN models like Xception, EfficientNetB0, and EfficientNetB3 with transfer learning. The models were trained using a large dataset of over 500,000 images divided into four classes: Healthy, Coccidiosis, Newcastle Disease, and Salmonella. After testing all models, Xception gave the best results with an accuracy of 92.78% and balanced performance across all classes.

This system can be used in real-time through mobile apps or IoT devices. It helps farmers and veterinarians detect diseases quickly, even in remote areas. This not only reduces the cost and time for testing but also helps control the spread of diseases early. In the future, this system can be improved further by adding more disease types, real-time alerts, and explanations for its prediction

The global agricultural sector includes poultry farming as its major subsector which produces essential protein resources consisting of meat and eggs for international populations. India as well as other developing nations depend on this sector to create essential livelihood opportunities mainly through small-scale farms. The poultry sector deals with continuous risks posed by Newcastle Disease together with Coccidiosis and Salmonella which lead to severe losses in poultry numbers while damaging the supply network. The current methods of disease detection and diagnosis through physical symptoms and manual inspections and laboratory-based testing prove to be costly slow and unavailable to remote areas.

Deep learning and computer vision technologies within artificial intelligence allow scientists to completely transform the procedures used for poultry disease identification and management. Deep learning models analyze visual images of fecal matter automatically to identify illness patterns that remain invisible to

human observation. The Poultry Diseases dataset on Kaggle provides real-life images of chicken feces that are categorized into disease group labels. Through the training of an advanced deep learning model, we generate a diagnostic system to assist poultry industry professionals with quick and precise disease monitoring services which increases animal welfare alongside production levels and minimizes outbreak costs.

Figure 1. Parasitic Diseases in Poultry

The poultry sector stands as a central initiative in agricultural activity because it produces substantial protein resources used worldwide by human populations. The poultry farming business meets numerous problems among which diseases create severe harm to both bird health and farm profitability. The poultry industry requires immediate disease detection methods that lead to precise diagnoses to achieve efficient disease control alongside outbreak prevention and prevent economic damage from spreading.

Multiple factors such as viruses and bacteria together with fungi parasites alongside environmental elements serve as disease causes for poultry populations. The common problems affecting poultry birds include Newcastle disease together with avian influenza and infectious bronchitis and coccidiosis and Marek's disease and several other diseases. The diseases cause respiratory problems as well as reduced egg production in addition to serious symptoms that include lameness followed by possible death in critical cases.

Veterinarians detect poultry diseases through a combination of ambient visual assessments performed by expert personnel and specific laboratory tests and paper records that monitor disease varieties. The traditional methods require significant time and worker effort but generate insufficient speed in identifying newly emerging outbreaks. The diagnostic process accuracy depends on how experienced the handling personnel are.

Systematic innovations in technology have triggered increased interest in automated solutions supported by artificial intelligence (AI) for detecting diseases in poultry operations. The combination of computer vision and deep learning and machine learning algorithms examines poultry images through which systems recognize disease indications through visual indicators. The automated detection methods available in

these systems would allow faster more precise and more efficient disease monitoring within poultry farming operations.

The project focuses on building software for inspecting poultry diseases by implementing EfficientNet and Xception deep learning algorithms. Pictures of poultry taken with mobile cameras will be examined by the software through deep learning models which detect disease indicators based on visual information from images. The software detects early disease indicators to prompt farmers about potential health issues which permits them to control disease outbreaks more effectively and preserve both their flock health and minimize financial losses.

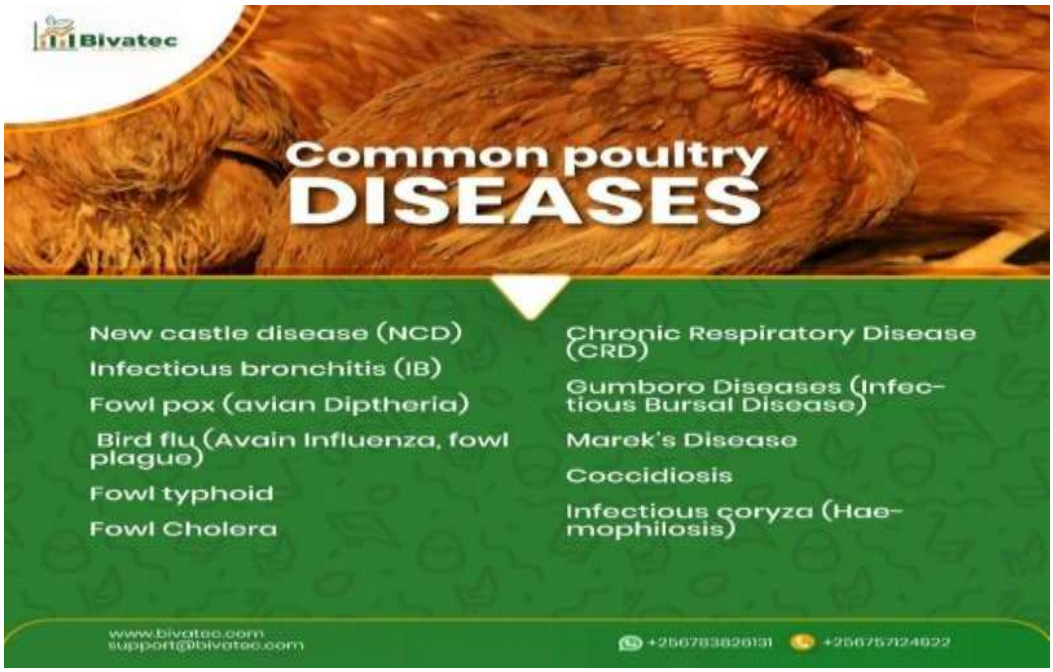

Figure 2. Common Poultry diseases

The domain of this project is Deep Learning in Agriculture, with a specific focus on Poultry Disease Diagnosis using Deep Learning and Computer Vision. It combines several interdisciplinary fields: Agricultural Informatics – applying AI techniques in agriculture for sustainable farming.Computer Vision – extracting meaningful insights from poultry fecal images. Deep Learning – using CNNs and transfer learning for image classification tasks.

This project contributes to the growing trend of smart agriculture and precision livestock farming, where AI-powered tools assist farmers in making informed decisions, reducing economic losses, and improving the health and productivity of livestock. By targeting diseases through non-invasive image analysis, the system promotes animal welfare and enhances biosecurity in poultry farms.

1.1 Problem Statement

Poultry farming is an important part of agriculture and provides food and income for many people. But poultry birds often suffer from diseases like Coccidiosis, Salmonella, and Newcastle Disease. These diseases spread quickly and are difficult to identify in the early stages.

Many small farmers in villages and remote areas do not have access to proper veterinary services or lab testing. Traditional methods of disease detection are slow, costly, and not available everywhere.

Because of this, farmers are unable to take action in time, which leads to the death of birds and big financial losses.

There are some AI tools to detect diseases, but they are complex, expensive, or require internet and high-end computers. They are not easy to use on farms or mobile phones. Also, many of them do not explain how the results are given, so farmers may not trust them.

This project aims to solve these problems by building a deep learning model that detects poultry diseases from images of chicken feces. It is trained using CNN models like Xception and EfficientNet on a large dataset. The goal is to create a fast, low-cost, and mobile-friendly tool that helps farmers detect diseases early and protect their poultry.

1.2 Purpose

The purpose of this project is to develop a smart and easy-to-use system that helps farmers detect poultry diseases early using deep learning. Poultry farming is a major source of food and income, especially in rural areas. However, it is often affected by diseases like Coccidiosis, Salmonella, and Newcastle Disease, which spread quickly and are hard to identify in the beginning.Many small-scale farmers do not have access to veterinary doctors or proper laboratory tests. Traditional methods of disease detection are slow, costly, and require expert knowledge. Because of this, diseases often remain unnoticed until they cause serious damage, including the death of birds and huge financial losses. There is a need for a fast, low-cost, and accurate disease detection system that does not require lab testing or expert help.

This project uses deep learning and image processing to solve this problem. It trains computer models like Xception, EfficientNetB0, and EfficientNetB3 to study images of chicken feces and identify signs of disease. The goal is to make this model work on mobile phones or IoT devices, so that even farmers in remote areas can use it easily. The system helps farmers take quick action to control the disease, avoid big losses, and maintain the health of their poultry.

1.3 Scope

This project focuses on using deep learning and computer vision to detect poultry diseases by analyzing images of chicken feces. The main aim is to develop a system that can accurately identify diseases like Coccidiosis, Salmonella, and Newcastle Disease from visual datausing pre-trained CNN models such as Xception, EfficientNetB0, and EfficientNetB3.

scope includes:

1. **Data Collection and Preprocessing:**

Using a large dataset of poultry fecal images from open sources (like Kaggle), the project resizes, augments, and prepares images for training deep learning models.

2. **Model Training and Evaluation:**

The system trains multiple CNN models using transfer learning, evaluates their performance using accuracy, precision, recall, and F1-score, and compares which model performs best for disease classification.

3. **Image-Based Detection System:**

The project creates a detection system that can analyze an image and classify it into one of four categories: Healthy, Coccidiosis, Salmonella, or Newcastle Disease.

4. **Mobile and IoT Deployment:**

The models, especially EfficientNetB0, are optimized to work on mobile devices or IoT systems, making it possible to use the system in real-time, even in rural or remote locations without lab facilities.

Supporting Farmers and Veterinarians:

The final product is intended to help farmers detect diseases early, reduce losses, improve poultry health, and reduce dependency on lab testing or expert consultations.

1.4 Overview

Poultry farming is an essential part of agriculture that provides meat and eggs to millions of people. However, it faces serious challenges due to the spread of infectious diseases like Coccidiosis, Salmonella, and Newcastle Disease. These diseases can spread quickly, especially in rural and small-scale farms, causing a high number of bird deaths and huge financial losses. Detecting these diseases early is very important, but traditional methods like lab tests are slow, expensive, and not always available in remote areas.

This project aims to solve that problem by using deep learning and computer vision to build an AI- based system that can detect poultry diseases from images of chicken feces. The project uses pre- trained models such as Xception, EfficientNetB0, and EfficientNetB3, along with transfer learning techniques to identify diseases with high accuracy. The models are trained on a large dataset

containing over 500,000 labeled images and tested to ensure they give reliable results. Among the models tested, Xception performed best, with an accuracy of 92.78%.

The final goal is to make the system easy to use on mobile phones or smart devices, even without internet access, so that farmers can detect diseases early and take action immediately. The project supports smart farming and precision agriculture, offering a non- invasive, cost-effective, and fast solution that can save poultry, protect livelihoods, and ensure better food safety. In the future, this system can be expanded to detect more diseases, integrate sensor data, and support real-time farm monitoring through IoT and cloud-based tools.

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Mrs.G. vijaya lakshmi working as an Assistant professor and Head of the Department in Department of CSE in sanketika vidya parishad engineering college, Visakhapatnam, AP with 5 yrs teaching experience and member of IAENG, accredited by Naac with her areas of interests in C, Data warehousing and data mining, Design and analysis of algorithm, python, formal languages and automata theory, compiler design.

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