Walchand College Of Engineering, Sangli.

(An Autonomous Institute)

Department of Computer Science and Engineering

Mini-Project II (6CS342)

Synopsis on

Chicken Disease Detection using Deep Learning

by

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2023-24
Even Semester

1. Problem statement

Design and implement a Chicken Disease Identification System using Convolutional Neural Networks (CNN) and deep learning techniques.

2. Abstract

This project focuses on the identification of chicken diseases, namely Newcastle disease, coccidiosis, and salmonellosis, using Convolutional Neural Networks (CNN) applied to fecal images of chickens. The poultry industry faces significant challenges in early disease detection, impacting both animal welfare and economic sustainability.

Leveraging CNNs, a deep learning approach was employed to analyze the unique visual patterns present in fecal images associated with each disease. A dataset comprising diverse images of chicken feces was used for this study and labeled for training and validation purposes. The CNN model demonstrated remarkable accuracy in distinguishing between healthy and diseased samples in medical science, achieving high precision and recall rates for each specific disease. This identification system holds promise for disease detection, facilitating prompt intervention.

The study underscores the potential of utilizing CNNs in veterinary diagnostics, offering a non-invasive and efficient means of monitoring poultry health through fecal image analysis.

3. Problem Domain

The problem domain for the project can be summarized in two key points:

3.1. Timely Disease Detection in Poultry:

- The poultry industry faces challenges in detecting diseases such as Newcastle disease, coccidiosis, and salmonellosis at early stages, affecting both the welfare of the chickens and the economic sustainability of the industry. Timely identification of these diseases is crucial to implementing effective interventions and preventing the spread of infections within flocks.

3.2. Automated Fecal Image Analysis:

- The project addresses the need for an automated and non-invasive method of disease identification using Convolutional Neural Networks (CNNs) applied to fecal images. Developing a robust CNN model capable of accurately classifying various diseases from visual patterns in fecal images is essential for creating a reliable tool for poultry health monitoring and management.

4. Literature Survey / Prior search carried out for problem identification

5. Objectives

1. Develop Convolutional Neural Network (CNN) model for identification of chicken diseases (Newcastle, coccidiosis, salmonellosis) through analysis of fecal images.

2. Evaluate and validate the CNN model's performance, ensuring high precision and recall rates.

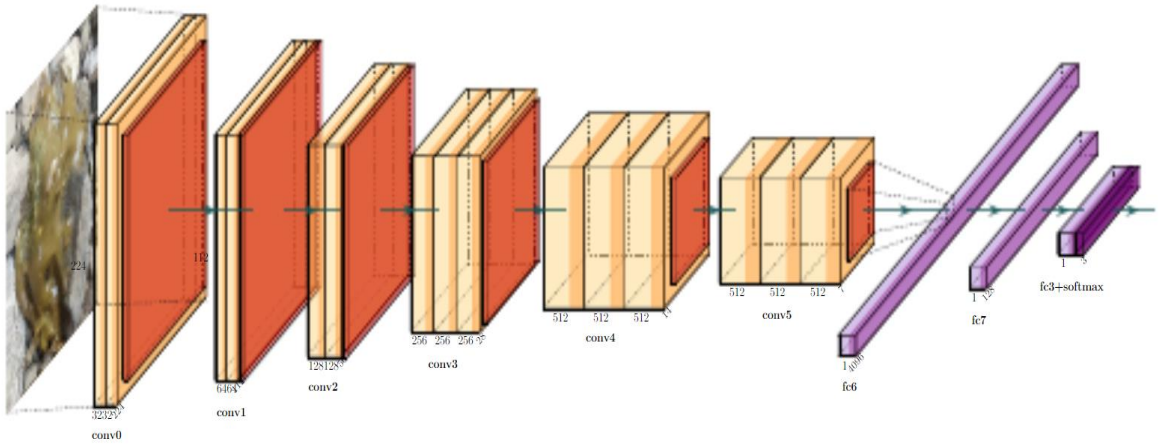
3. Develop a deployable web-based system utilizing a trained Convolutional Neural Network (CNN).

6. Functional Block Diagram

7. **UML diagrams** (Use-case, Class, Sequence, Activity, Deployment)

8. Methodology

1) CNN architecture: Our proposed CNN architecture involves stacking of multi convolution layers, and the whole architecture is given in Fig. 1. In the first layer, the image with size either 224x224 RGB or 512x512 is fed to the stack of convolution layer as input. The convolutional layers have filters with the small receptive fields of 3 x 3 and are followed by max-pooling layer, which performs over a 2 x 2-pixel window. These layers form a single block, and we repeatedly apply the block by increasing the depth of filters in the network in such as 32, 64, 64, 128, 128,256,256,512 for the full convolution blocks. In each block, the same padding is applied to maintain the height and the width shape of the output features maps matching the inputs features. ReLU activation is used for all layers. During training, normal stochastic gradient descent is used to minimize the error, and in evaluation, we leverage log loss and accuracy as the metrics. We have noticed that some of the images from the dataset may contain more than one disease; hence categorical cross- entropy loss function seems to fit our problem with the log loss as an evaluation metric. An output layer with three nodes and softmax activation is used since the problem is multi-class classification. Softmax is the right choice because the output from the node is the likelihood for the output to be either of the three classes.



2) TechStack :

Programming Languages:

Python(for backend and deep learning model implementation).

Development Tools:

IDE : Jupyter Notebook , Vs code, Google Collab etc.

9. Outcomes / Deliverables

1. Trained CNN Model:

- This deliverable involves developing a sophisticated Convolutional Neural Network (CNN) model specifically designed for the accurate identification of chicken diseases (Newcastle, coccidiosis, salmonellosis) based on visual patterns present in fecal images. The model should be thoroughly trained on a diverse dataset, ensuring it can generalize well to new and unseen data. The outcome will be a robust model with high accuracy and reliability in disease classification, meeting the project's objectives.

2. Web Application:

- The deployment of a user-friendly and accessible web application is crucial for the practical implementation of the CNN model. This component allows users, such as poultry farmers or veterinarians, to upload chicken fecal images through a user interface. The application should provide a seamless experience, guiding users through the process of submitting images and displaying real-time results of disease identification. The outcome is an interactive and intuitive platform that serves as a portal for users to leverage the trained CNN model for poultry health monitoring in a convenient and efficient manner.

10. Project Potentials

10.1 Early Disease Detection:

The project has the potential to significantly enhance early disease detection in poultry, allowing for timely intervention and preventing the rapid spread of diseases within flocks.

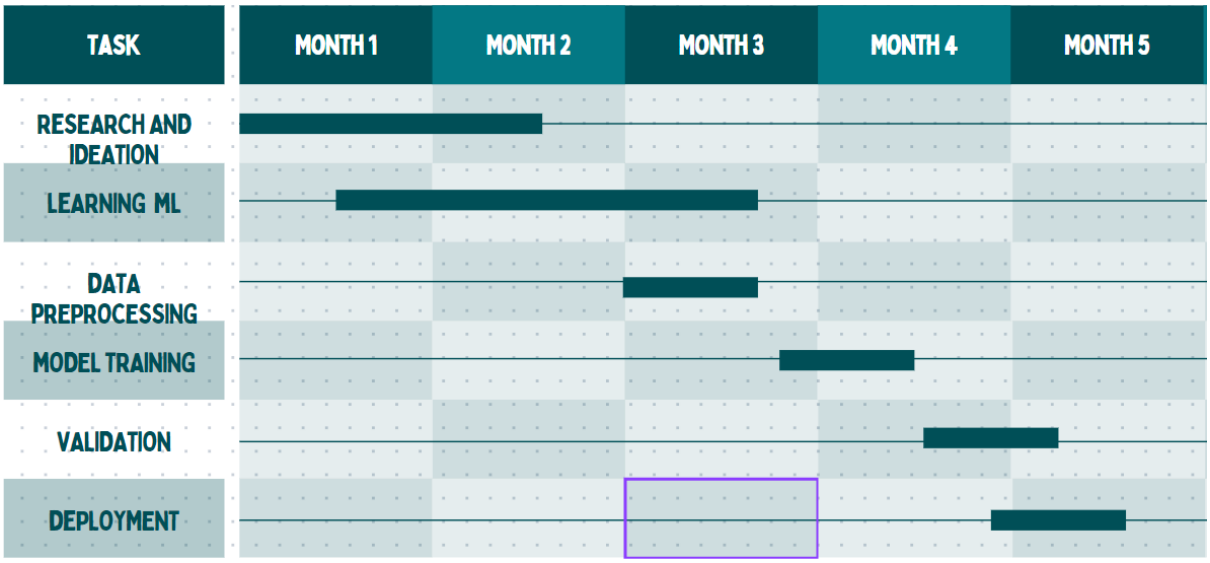
10.2. Improved Poultry Health Management:

By providing a non-invasive and efficient means of disease identification, the project contributes to enhanced poultry health management, minimizing economic losses and promoting animal welfare.

10.3. User-Friendly Monitoring Tool:

The web application or mobile app serves as a user-friendly monitoring tool for poultry farmers and veterinarians, enabling them to assess the health of their flocks conveniently.

11. Project plan



12.References

Blogs:

1) https://www.analyticsvidhya.com/blog/2021/05/convolutional-neural-networks-cnn/

2) https://www.superdatascience.com/blogs/the-ultimate-guide-to-convolutional-neural-networks-cnn

Research papers:

Poultry disease detection using deep learning
-Dina Machuve , Ezinne Nwankwo, Neema Mduma ,Jimmy Mbelwa
https://www.frontiersin.org/articles/10.3389/frai.2022.733345/full

Smartphone based detection and classification of poultry diseases from chicken
Fecal images
-Mizanu Zelalem Degu , Gizeaddis Lamesgin
https://www.sciencedirect.com/science/article/pii/S2772375523000515