Declaration

I, hereby declare that the research work presented in this Summary entitled “AI and IoT based deep learning approach for monitoring the production, health, and welfare status of the Poultry birds”, was carried out by me under the supervision of Dr. Deepika A Ajalkar, HOD, Department of CSE (Cyber Security and Data Science), GHRCM, Pune Associated with G. H. Raisoni University, Amravati from 01-June-2021 to 29 November 2024. This work is based on original research and has not been submitted to any other University/Institution for the award of any diploma or degree.

Date:
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Certificate

This is to certify that the research work presented in this thesis entitled "AI and IoT based deep learning approach for monitoring the production, health, and welfare status of the Poultry birds", is the own work of Ajay Gopichand Barsagade conducted in the Computer Science & Engineering G H Raisoni University, Amravati under my supervision. I further certify that this work has not been submitted earlier in any University / Institution for any research degree to the best of my knowledge.

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This is to certify that **Mr. Ajay Gopichand Barsagade** has submitted the thesis on 01/06/2024 and presented his seminar successfully on the topic titled "AI and IoT based deep learning approach for monitoring the production, health, and welfare status of the Poultry birds" in the Computer Science & Engineering, G H Raisoni University, Amravati.

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Abstract

The poultry business in contemporary India is one of the most important and rapidly expanding sectors of the country's agricultural economy. Increases in chicken production can be attributed to better manufacturing methods and more efficient agricultural methods. The importance of automation in the current world cannot be overstated, and neither can the rapid development of the Internet of Things (IoT) idea with Artificial Intelligence (AI). Using a certain method, manual tasks may be made fully automatic. Poultry farms can benefit from IoT-based operations when remote monitoring and repair are required, transforming them from traditional to cutting-edge operations that make extensive use of automation. Also, the poultry industry is a critical component of global food production, contributing significantly to food security and the economy. To maintain and enhance chicken health, it is necessary to constantly check for changes in several variables. However, challenges such as inefficient production monitoring, delayed detection of health issues, and inadequate welfare management hinder its growth and sustainability.

This research introduces an innovative AI and IoT-based framework that integrates deep learning, data analytics, and image analysis to monitor and optimize the production, health, and welfare of poultry birds. The proposed system also incorporates a sensor data predictive analytics model for Smart Poultry Farm Management to predict requirements for environmental adjustments by controlling the actuators emphasizing behavioral control and a disease diagnostic model for classifying chicken fecal images to enhance the precision and effectiveness of poultry farm management using deep learning approach. A low-cost Internet of Things (IoT)-based system proposed for monitoring environmental factors in a chicken farm in real-time, including temperature, humidity, ammonia levels, and light intensity. Information gleaned via sensors and continuous monitoring. By putting the planned system into action, system was able to evaluate its viability. Temperature and humidity levels, as well as their management, are the most important climatic parameters for a poultry farm's output. The purpose of this research is to automate the operation of a chicken farm by utilizing IoT technologies. Chicken health is maintained by careful monitoring of environmental conditions like temperature, humidity, light, and ammonia gas, as well as through the supervision of routine tasks like feeding, watering, and cleaning. Chicks' cycles are tracked and owners are notified when there is a problem. A deep learning

approach is offered that uses a pre-trained Convolution Neural Networks (CNN) model to determine which of the three categories best describes chicken excrement and offers a method for identifying and categorizing poultry illnesses. The EfficientNet-B3 model was utilized in the development of the system. Coccidiosis, Salmonella, New Castle Disease, and Healthy were the four health problems that were classified using the segmented picture by the deep learning model. The models were trained using standard benchmark database images of excrement from chickens. The outcomes of the experiment demonstrate that the proposed method for identifying and categorizing chicken illnesses may accurately identify three prevalent poultry diseases. Consequently, this approach has the potential to be an invaluable resource for farm veterinarians and poultry producers.

This research not only advances the capabilities of smart poultry farm management but also sets a benchmark for the application of AI and IoT in precision agriculture. By combining sensor data analytics for large-scale monitoring with image analysis for detailed disease diagnostics, the proposed framework offers a scalable, cost-effective, and ethically sound solution for the poultry industry.

Keywords: Artificial Intelligence, Chicken Disease, Convolutional Neural Network, Deep Learning, Fecal Images, Internet of Things, Image Classification, Machine Learning, Wireless Sensor Network.

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List of Abbreviations

Sr. No	Abbreviation	Meaning
1	ML	Machine Learning
2	SVM	Support Vector Machine
3	IoT	Internet of things
4	DL	Deep Learning
5	KNN	K-Nearest Neighbour
6	NB	Naive Bayes
7	CNN	Convolutional neural network
8	Bi-LSTM	Bidirectional long short-term memory
9	AI	Artificial Intelligence
10	CV	Computer Vision

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