Revolutionizing Poultry Health: AI-Powered Real-Time Disease Detection Using YOLO v7 and IQR for Enhanced Farm Productivity

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ABSTRACT

Prompt and accurate detection of poultry diseases is crucial to prevent outbreaks and reduce economic losses. Conventional monitoring systems based on manual inspections are inefficient and prone to error, delaying timely interventions. This study proposes an AI-driven early warning system that integrates YOLO v7 for real-time image detection with Hampel Filters for anomaly recognition. The model specifically targets two critical health indicators: rooster combs and eyes. Over a period of 53 days (combs) and 44 days (eyes), image datasets were collected and analyzed. The Hampel Filter detected an average abnormality ratio of 16.64% in combs and 3.94% in eyes, demonstrating its ability to filter outliers and highlight disease symptoms. Compared with conventional manual monitoring, this AI-assisted method provides superior reliability and automation. The system can be further scaled by integrating automated alarm outputs (green, yellow, red) to support farm management decisions. Overall, the results demonstrate that AI-powered detection offers a practical tool for precision livestock farming, enhancing animal welfare, minimizing disease spread, and improving farm productivity.

Keyword: AI-driven early warning system, YOLO v7, real-time surveillance, poultry health monitoring, interquartile range (IQR)

INTRODUCTION

Poultry production is a cornerstone of global agriculture, yet it remains vulnerable to disease outbreaks that significantly reduce productivity and profitability. Traditional health monitoring relies on manual inspections, which are subjective, labor-intensive, and often unable to detect early disease symptoms. To address these limitations, computer vision and machine learning techniques have been increasingly applied in precision livestock farming.

This research aims to design and evaluate an **AI-powered early warning system** that leverages deep learning (YOLO v7) and statistical filtering (Hampel Filters) to detect

abnormalities in poultry combs and eyes. The objective is to enhance poultry disease surveillance and provide farmers with timely, actionable insights.

MATERIALS AND METHODS

High-resolution images of poultry were collected in two datasets: **53 days for rooster combs (March–May 2024)** and **44 days for eyes (July–August 2024)**. YOLO v7 was employed to detect the targeted regions (combs and eyes) in each image. After detection, the **Hampel Filter method** was applied to quantify abnormalities by identifying statistical outliers in the dataset.

- **Comb dataset:** Average abnormality ratio = 16.64%
- **Eye dataset:** Average abnormality ratio = 3.94%

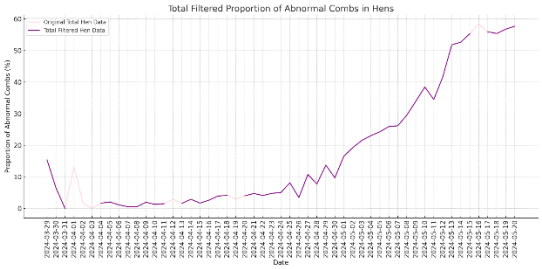

Figure 1. results for rooster combs.

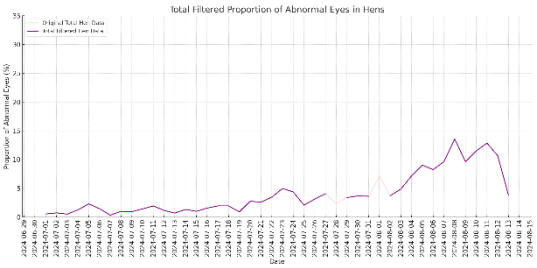

Figure 2. results for rooster eyes.

RESULTS & DISCUSSION

The experimental results demonstrate that the combination of YOLO v7 and Hampel Filters provides effective anomaly detection in poultry health monitoring. The relatively high abnormality ratio in combs (16.64%) reflects their sensitivity as early disease markers, while eyes showed lower abnormality rates (3.94%). Compared to manual inspection, this method ensures higher consistency and scalability. The findings align with previous studies that highlight the potential of AI in livestock monitoring (Shao et al., 2023; Rakhshandehroo et al., 2022). Unlike conventional statistical tools such as the interquartile range (IQR), the Hampel Filter is more robust against noise and outliers, making it suitable for real-time monitoring in farm environments.

CONCLUSIONS

An AI-driven poultry health monitoring system combining YOLO v7 and Hampel Filters was successfully developed and validated. The system demonstrated reliable detection of early abnormalities in combs and eyes, enabling faster disease prevention measures. This approach enhances productivity by reducing disease-related risks and demonstrates the potential of integrating AI with precision livestock farming. Future research should explore real-time integration with farm management systems and the scalability of this method in large-scale poultry farms.

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