# A Smart IoT-Based Monitoring System in Poultry Farms Using Chicken Behavioral Analysis

## Introduction

Poultry farming faces challenges like disease outbreaks and poor management, leading to economic losses. Chickens’ behaviors, such as pecking, preening, and dustbathing, are key indicators of their health. However, manual monitoring is inefficient. This study proposes a Smart Poultry Monitoring System (SPMS) using IoT sensors and machine learning to monitor behaviors and predict diseases in chickens.

## Proposed System

The SPMS leverages IoT technology to track chicken behavior and employs machine learning for classification and health monitoring. The key components include:

1. IoT Sensors: Wearable accelerometers record motion data (X, Y, Z axes).

2. Data Preprocessing: The raw data is cleaned and structured.

3. Feature Extraction: Metrics like movement variation and signal magnitude are calculated.

4. Behavior Classification: Machine learning models identify behaviors such as pecking, preening, and dustbathing.

5. Disease Detection: Anomalies in behavior patterns indicate health issues.

## Methodology

Dataset Collection: Data from accelerometers was collected over 20 weeks, recording behaviors of healthy and sick chickens. After cleaning, the dataset contained 99,998 records.

Data Imbalance Handling: An optimized SMOTE (Synthetic Minority Oversampling Technique) combined with the Artificial Hummingbird Algorithm (AHA) was used to balance minority behavior classes like dustbathing.

Classification Models: Models such as Random Forest (RF), Decision Tree (DT), and KNN were evaluated. RF achieved the highest accuracy (98%).

## Results

1. Behavior Classification: RF accurately classified chicken behaviors, with a 98% success rate. The optimized SMOTE technique resolved class imbalance effectively.

2. Disease Detection: Behaviors were analyzed to differentiate between healthy and sick chickens. Early disease detection reduced potential losses.

## Significance

Real-Time Monitoring: Tracks behaviors continuously using IoT sensors.

Early Disease Management: Identifies health issues promptly.

High Accuracy: Machine learning ensures reliable predictions, even with imbalanced datasets.

## Limitations

Sensor Dependency: Wearable devices are costly and require upkeep.

Rare Behavior Classification: Dustbathing remains challenging to classify.

Limited Disease Scope: Focuses on behavior analysis rather than specific pathogens.

## Conclusion

The SPMS demonstrates the potential of IoT and machine learning in poultry farming, improving health monitoring and disease management. Future enhancements will include multi-class classification for more robust predictions and the integration of advanced IoT devices.