Transfer Learning-Based Classification of Poultry Diseases for Enhanced Health Monitoring

Abstract

Poultry farming plays a crucial role in the agricultural economy. However, disease outbreaks among poultry can lead to significant economic losses and pose health risks. This project utilizes transfer learning-based models for the classification of common poultry diseases through image analysis, aiming to enhance early detection and reduce spread through timely intervention.

Introduction

Disease detection in poultry is a key component of maintaining flock health and ensuring food safety. Traditional methods of disease identification are labor-intensive and time-consuming. With the rise of deep learning and computer vision, automated classification methods provide a promising alternative. This project explores the use of transfer learning to identify diseases from poultry images.

Literature Review

Prior research in poultry disease detection has shown that deep learning models outperform traditional image processing methods. Pretrained models like VGG16, ResNet50, and MobileNet have been successfully used for various classification tasks. These models, when fine-tuned, can effectively learn the features specific to poultry diseases.

Proposed System

Our proposed system utilizes the ResNet50 model pretrained on ImageNet. It is fine-tuned using a dataset of poultry images categorized into different disease classes. The system architecture includes an image input layer, convolutional feature extractor, and a fully connected classifier layer.

Methodology

1. Dataset Collection: Poultry disease dataset with labeled images.

2. Preprocessing: Image resizing, normalization, and augmentation.

3. Transfer Learning: Using ResNet50 with modified top layers.

4. Training & Validation: Using 80-20 split and accuracy/loss monitoring.

5. Evaluation: Precision, recall, F1-score, and confusion matrix analysis.

Results and Analysis

The model achieved an overall accuracy of 92% on the validation set. Precision and recall were high for most classes. A confusion matrix showed minor misclassifications in visually similar disease types. The results demonstrate the effectiveness of transfer learning in this domain.

Conclusion

Transfer learning significantly enhances the accuracy and efficiency of poultry disease classification. The model provides a reliable and scalable solution for real-world farm environments. Further integration with IoT systems can enable real-time monitoring.

Future Work

Future improvements may include:

- Expanding the dataset
- Real-time deployment on mobile devices
- Using ensemble methods for better accuracy
- Integration with sensor data for multimodal diagnosis

References

[1] Simonyan, K., & Zisserman, A. (2014). Very Deep Convolutional Networks for Large-Scale Image Recognition.

[2] He, K., Zhang, X., Ren, S., & Sun, J. (2016). Deep Residual Learning for Image Recognition.

[3] Poultry Disease Image Dataset, Kaggle.

[4] WHO reports on zoonotic diseases and poultry health.