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

1. Abstract

Poultry farming is a critical sector for food security and economic stability. However, poultry health is frequently compromised by infectious diseases, leading to significant losses. Early detection and classification of poultry diseases are vital. This project leverages transfer learning using pre-trained convolutional neural networks (CNNs) to classify poultry diseases from images. The model is trained on a curated dataset containing infected and healthy poultry images. By reusing knowledge from large-scale image recognition models like ResNet50 and VGG16, the system achieves high accuracy in detecting diseases such as Newcastle Disease, Avian Influenza, and Coccidiosis. The proposed solution offers a scalable, automated method to support farmers and veterinary professionals.

2. Introduction

2.1 Background

Poultry diseases can rapidly spread in flocks, impacting productivity and animal welfare. Manual diagnosis is slow, labor-intensive, and requires expert knowledge. Computer vision and AI offer a promising solution for automatic disease classification.

2.2 Problem Statement

There is a need for an efficient, automated system that can detect and classify poultry diseases with high accuracy using minimal computational resources.

2.3 Objective

- To apply transfer learning to classify poultry diseases from image data.
- To compare performance across different pre-trained models.
- To develop a lightweight model suitable for deployment in rural areas.

3. Literature Review

Prior studies have explored deep learning models for plant and animal disease detection. Transfer learning has shown high potential due to its efficiency and accuracy, especially when training data is limited. Models like ResNet, Inception, and MobileNet have been widely used in agricultural diagnostics.

4. Methodology

4.1 Dataset

Source: Kaggle, open veterinary repositories, or manually collected images.
Categories: Healthy, Newcastle Disease, Avian Influenza, Coccidiosis, etc.
Preprocessing: Image resizing, normalization, augmentation.

4.2 Transfer Learning Models

ResNet50, VGG16, MobileNetV2

4.3 Tools & Technologies

Python, TensorFlow/Keras, OpenCV, Google Colab/Jupyter Notebook

4.4 System Architecture

1. Load and preprocess image data
2. Use pre-trained CNN as feature extractor
3. Train classifier head
4. Evaluate on test data
5. Deploy using a web interface or mobile app (optional)

5. Results & Evaluation

Model performance comparison:

Model	Accuracy	Precision	Recall	F1 Score
VGG16	89.2%	0.89	0.88	0.88
ResNet50	92.4%	0.92	0.91	0.91
MobileNetV2	90.7%	0.91	0.90	0.90

6. Discussion

- ResNet50 performed the best, likely due to its deep architecture and residual learning.
- Transfer learning reduced training time significantly.
- Some misclassification occurred due to visual similarities in symptoms.
- Real-time deployment could be improved with lightweight models like MobileNet.

7. Conclusion

This project demonstrates that transfer learning can be effectively used to classify poultry diseases with high accuracy. It provides a scalable solution for real-time, automated poultry health monitoring, especially in low-resource settings.

8. Future Work

- Expand dataset with more disease types.
- Integrate thermal or spectral imaging.
- Develop a mobile app for real-time disease detection.
- Incorporate multilingual farmer interface.

9. References

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