Deep Learning for Automated Coccidiosis Detection in Poultry Gut Images

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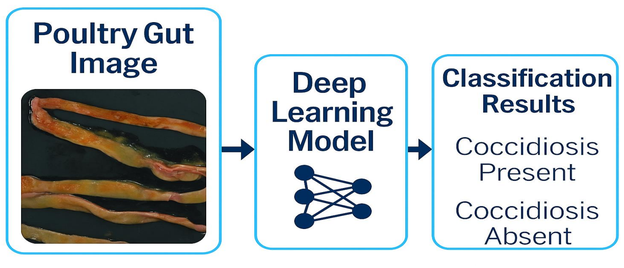
Abstract

- The EU is a leading poultry meat producer and exporter, with ~13.4 million tons produced annually
- Gut health issues impact economy & animal welfare
- Coccidiosis: major threat from Eimeria spp. (E. acervulina, E. maxima, E. tenella)
- Current diagnostics: laborious, subjective, expert-dependent
- No publicly available dataset exists for poultry gut images, so data collection was conducted entirely from scratch.

Objective and Approach

Objective

This study is an initial exploration to evaluate whether deep learning models can accurately perform binary classification on poultry gut images collected during necropsy. Distinguishing between infected and non-infected cases of coccidiosis caused by *E. tenella* and *E. acervuline and E.maxima.*



The aim is to assess the feasibility of this approach and lay the groundwork for future development of species-specific detection and cross-device scalability

Methods and Results

Materials

- Images captured during necropsies at Poulpharm
- Gut images from broilers (Ross 308, 19–21 days old)
- Images collected using smartphone & professional camera

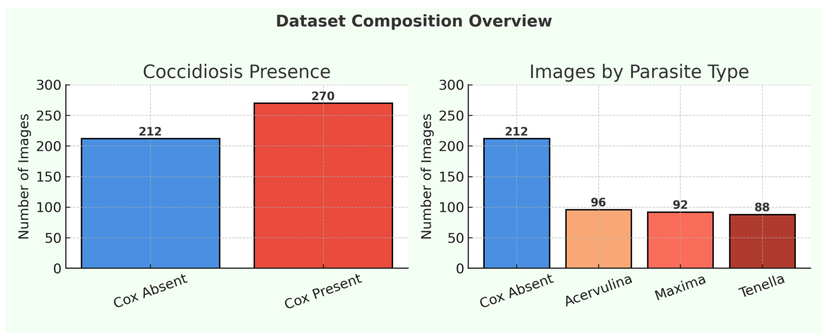
Dataset Overview

Tenella- Score 3

Acervulina- Score 1

Maxima- Score 2

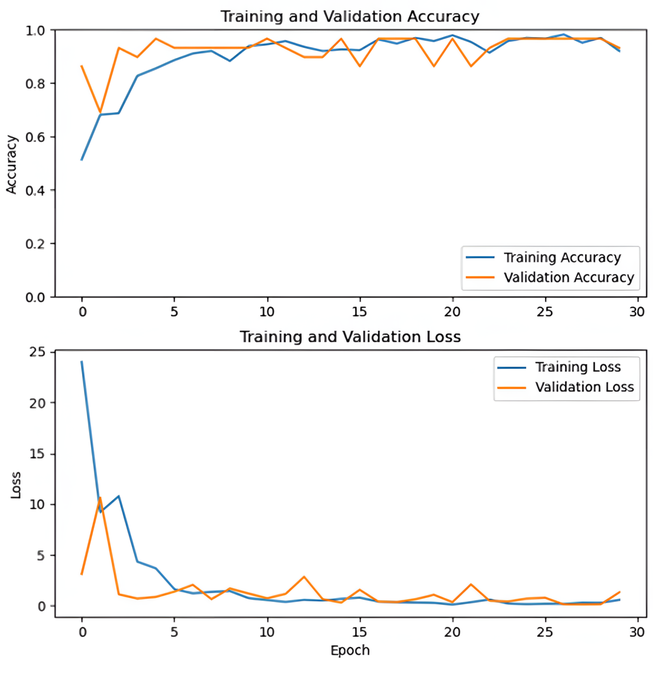
482 Gut Images
Captured using professional camera



Captured using mobile devices, covering the same three types of coccidiosis:

- **Acervulina, Tenella, and Maxima** (ongoing annotation).

Methods and Results



- Evaluated multiple pre-trained convolutional neural networks (CNNs), including InceptionV3, Xception, ResNet50, MobileNet, and VGG16.
- Models were trained with a 70/15/15 split on the 482 images
- InceptionV3 achieved an accuracy of 89%

Conclusions and Future Perspectives

- A new annotated dataset is being created to address the current lack of data for lesion scoring.
- InveptionV3, trained on a small dataset (482 images, ~200 healthy), achieved 89% accuracy in binary classification.
- These early results support the potential for scalable, objective gut health diagnostics.
- Exploration is ongoing into scoring lesions from images captured using smartphones, focusing on E. acervulina, E. maxima, and E. tenella.
- Future versions may gradually extend to other lesion types as understanding feasibility evolve.