

An On-site Feces Image Classifier System for Poultry Health Assessment

Introduction

Rapid and accurate assessment of poultry health can inform producers to make timely decisions to reduce disease transmission, improve animal welfare, and decrease economic loss. There is currently a lack of automated on-site health assessment to support timely decision-making.

The objectives of this research was to develop a mobile application for feces classification to assist caretakers in assessing poultry health during their daily flock inspections.

Materials & Methods

Dataset

- ❑ Collected from small- and medium-scale poultry farms
- ❑ Four classes
 - Healthy: 2,057 images, solid feces without liquid
 - *Coccidiosis*: 2,103 images, fresh yellow liquidous feces
 - *Newcastle Disease*: 376 images, mixed liquidous feces
 - *Salmonella*: 2,276 images, white liquidous feces
- ❑ A total of 6,812 images

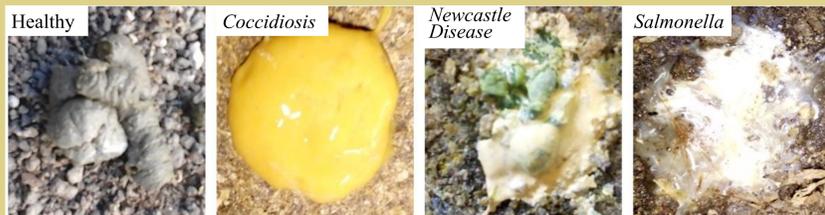


Fig 1. Sample images of the dataset

Classification models

- ❑ Six models: “VGG19-ANN”, “ResNet101V2-ANN”, “InceptionV3-ANN”, “MobileNetV2-ANN”, “DenseNet169-ANN”, and “EfficientNetB2-ANN”
- ❑ Development strategies: cross-validation, data augmentation

Key components of the system

- ❑ App: collecting, uploading, and displaying images
- ❑ Internet of Things: receiving/transferring images and connecting devices
- ❑ Server: processing images and assigning usage credentials

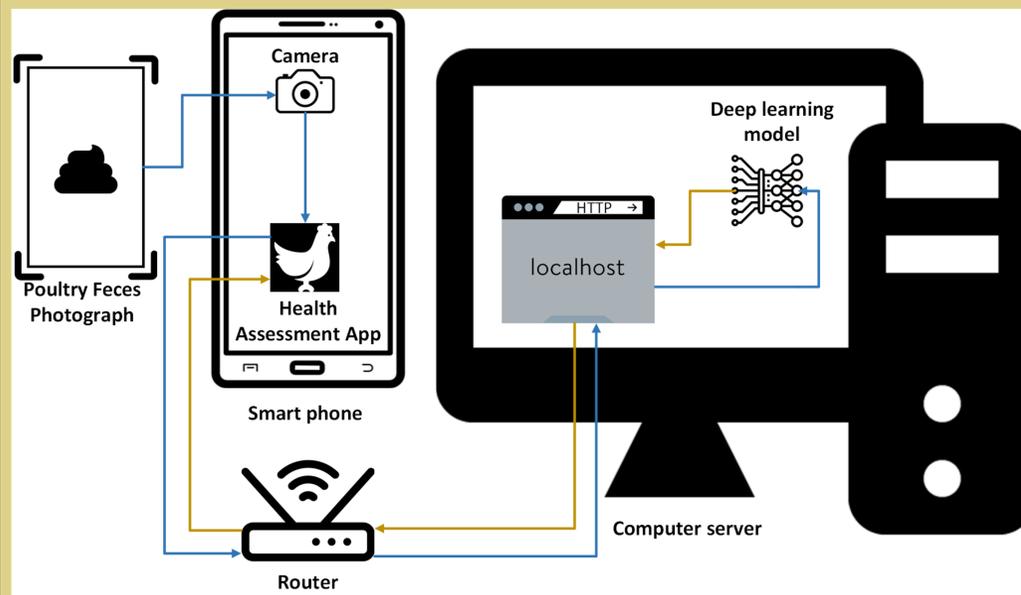


Fig 2. Overall framework of the poultry health assessment system. Blue lines indicate the pathways of transferring a raw image, and yellow lines indicate the pathways of transferring a processed image.

Results

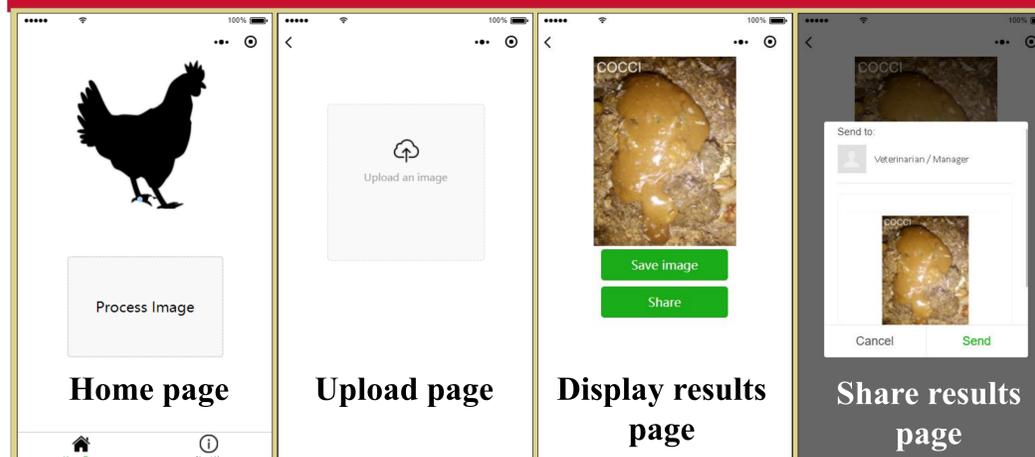


Fig 3. Illustration of the poultry health assessment App.

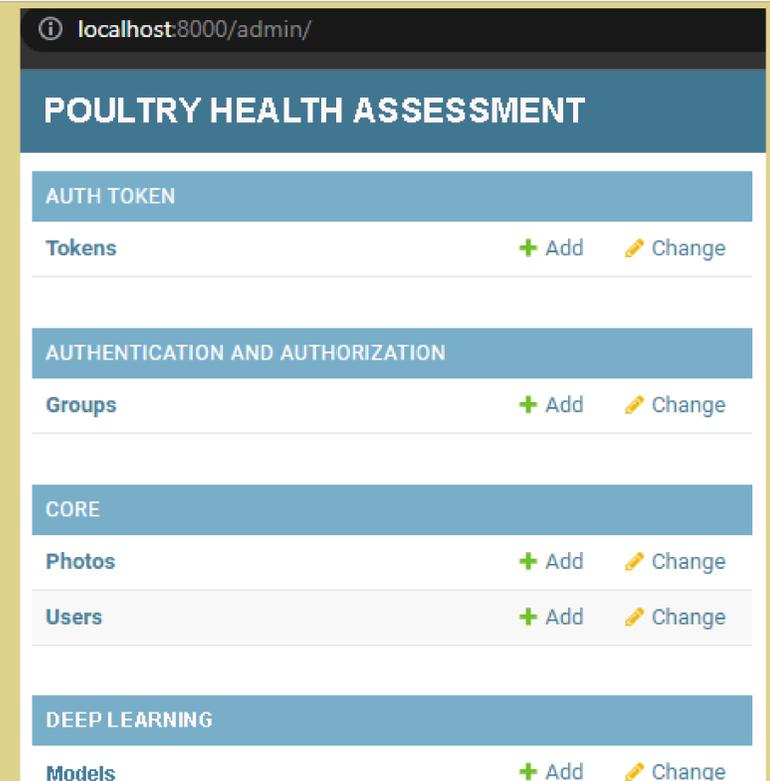


Fig 4. Example poultry health assessment website page.

Table 1. Final performance of the poultry health assessment system

Class name	Accuracy (%)	Processing speed (ms trial ⁻¹)
Healthy	90.0	876 ± 114
<i>Coccidiosis</i>	96.0	866 ± 87
<i>Newcastle Disease</i>	82.0	792 ± 71
<i>Salmonella</i>	92.0	770 ± 71
Overall	90.0 ± 0.1	826 ± 93

Findings & Summary

- ❑ The MobileNetV2 was selected for the classification.
- ❑ A system was developed to achieve automated on-site poultry health assessment.
- ❑ The poultry health assessment system had 90% accuracy and processed an image in less than 1 s.