Poultry Disease Identifier

Detecting unhealthy diseases from image files of chicken feces

Poultry Disease Identifier Using CNN By OMIDEYI, Damilare.A

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18/27/PCS007

App Url: https://poultry-diseases-identifier.streamlit.app/

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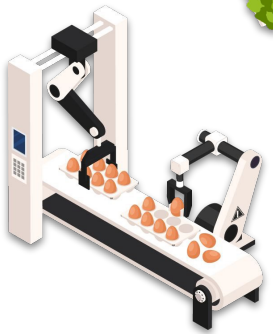
01. Problem Statement

Smart Farm, Chicken Market, and Poultry Disease



Global

- Agricultural Industry
- Higher Competition of quality and yield

Smart Farm

- Big data, AI, and Technologies
- Help to improve farm productivity and increase efficiency

Source:https://www.boi.go.th/upload/content/TIR7_Aw_Smart%20farming_5e5dc88fa8284.pdf

01. Problem Statement (Cont.)

Smart Farm, Chicken Market, and Poultry Disease

+2%

Increasing trend of Global chicken production which is expected to grow up to 2% in 2023

USDA, 2020

The common poultry diseases that affect all farming systems:

- **Coccidiosis**
- **Salmonella**
- **Newcastle disease**

} **Preliminary check by fecal**

Effects of such widespread poultry disease include high mortality rates and failure to compete on the export and consumption market with other high producing countries.

Source : https://www.frontiersin.org/articles/10.3389/frai.2022.733345/full

01. Problem Statement (Cont.)

Smart Farm, Chicken Market, and Poultry Disease

Problem

- Small to Medium scale farms
- Lack of manpower and knowledge for proper surveillance.

Therefore, an early detection is a very important method to control the spread of the diseases by **easy and efficiency**

01. Problem Statement (Cont.)

Smart Farm, Chicken Market, and Poultry Disease

This Project Focused On

"To Classify the Disease of a Chicken form chicken's fecal using deep learning neural network"
to reduce time and easy to use for normal people

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02. Data Gathering

Information of Dataset and Preprocessing Image

Class	No. Picture
Cocci	PCR : 373 Farm : 2,476
Healthy	PCR : 347 Farm : 2,404
NCD	PCR : 186 Farm : 562
Salmo	PCR : 349 Farm : 2,625

Total picture : **8,067 pictures**

Size of all picture : **13.3 GB**

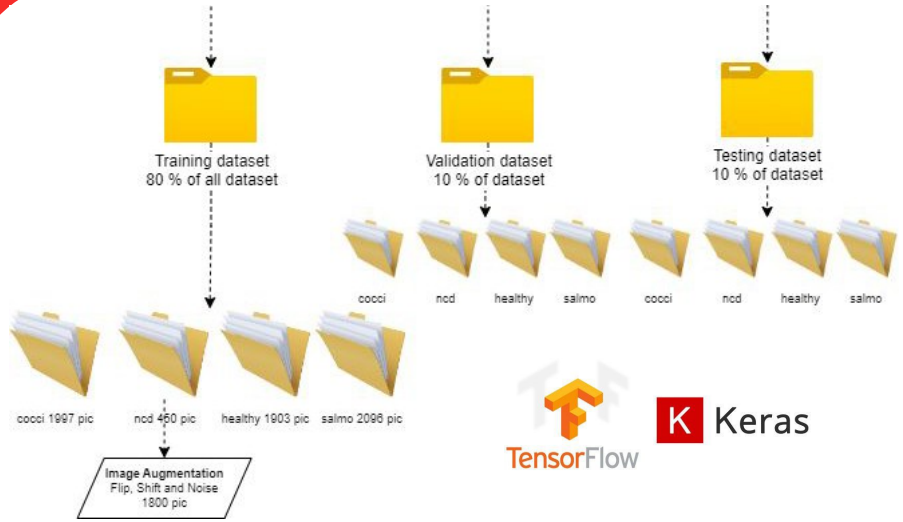
This is a series of information about poultry disease diagnostics that was annotated

- Polymerase Chain Reaction (PCR) - by Lab
- The farm-labeled fecal image
  - by people

Arusha and Kilimanjaro, Tanzania
Sep 2020 - Feb 2022

02. Data Gathering (Cont.)

Information of Dataset and Preprocessing Image



- **Imbalance class** in NCD class
- Use **Image Augmentation** technique to add more images

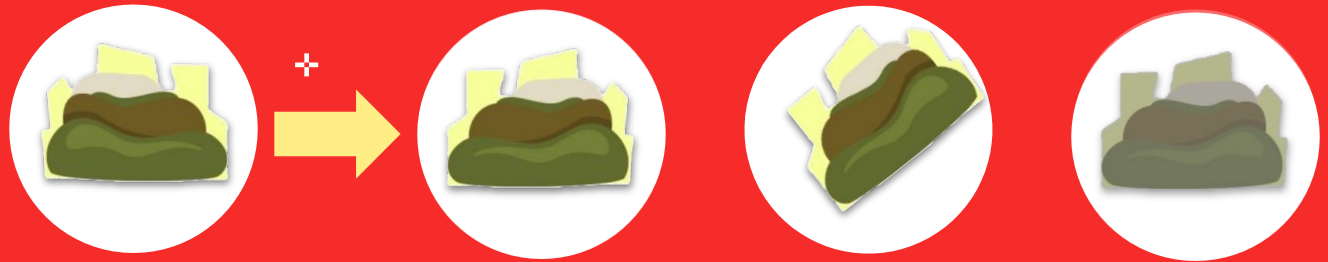
Table of number picture

Class	Train	Valid	Test
Cocci	1,997	247	232
Healthy	1,903	276	225
NCD	450→1,800	54	58
Salmo	2,096	239	290

02. Data Gathering (Cont.)

Information of Dataset and Preprocessing Image

Image Augmentation



Origin image | Flip image | Shift and Rotate image | Noise and Contrast

We are ready to train a Deep Learning model

Source : https://www.thehappychickencoop.com/chicken-poop/

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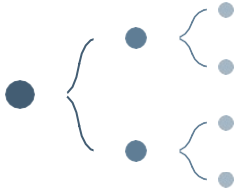
03. Model Training

CNN model Transfer Learning and Fine Tuning

Deep Learning Models used in project



CNN

Deep Learning algorithm which can take in an input image

VGG16

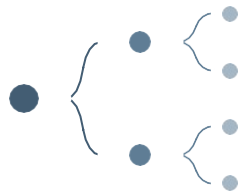
Visual Geometry Group, from the Oxford University have CNN architecture of model

MobileNetV2

MobileNetV2, developed by Google is a CNN architecture that seeks to perform well on mobile devices

03. Model Training (Cont.)

CNN model Transfer Learning and Fine Tuning



CNN

Using the human brain as a reference, the neural network is designed to function the same as one.

Ability

- **Distinct features** will be processed
- **Downsizes** the data for better
- **Produce** an outcome

Pros

- Learning Capabilities
- Massive Data Capacity
- Picture Perfect

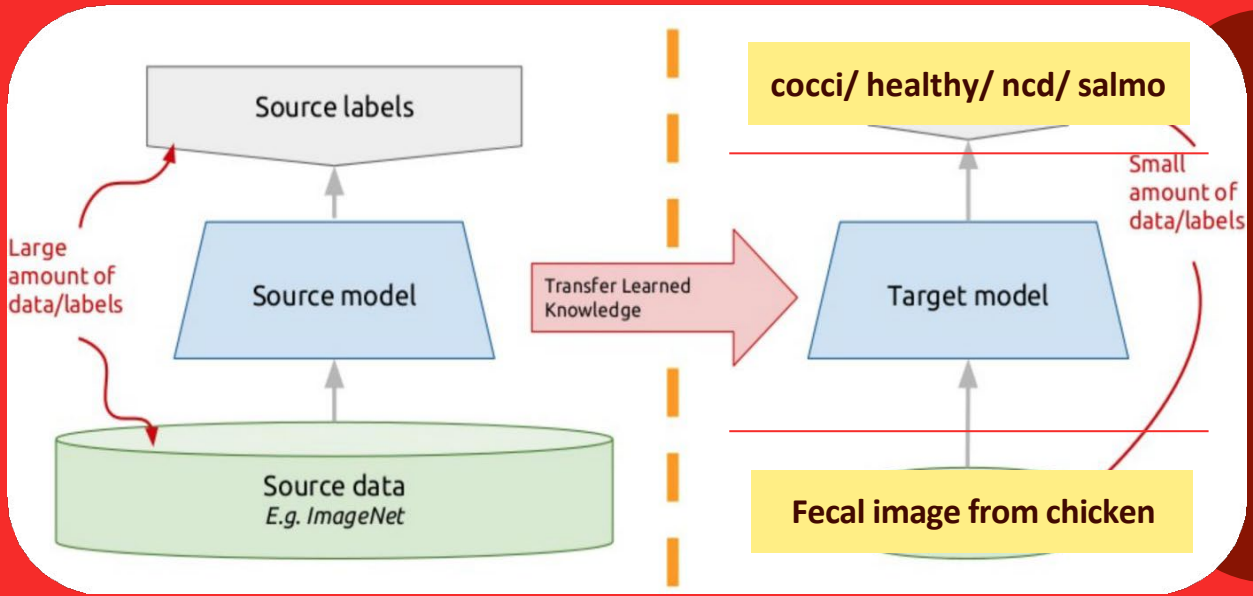
Cons

- Slower Operation
- Improper Translations
- Long Training Period

Source : https://www.itechpost.com/articles/109452/20220307/the-pros-and-cons-of-convolution-neural-networks.html

03. Model Training (Cont.)

CNN model Transfer Learning and Fine Tuning



Transfer learning

the knowledge of an already trained machine learning model is applied to a different but related problem

(Use weight of model Only)

In this project:

- Change input data

→ fecal image from chicken

- Change target labels →

4 Classes (cocci, healthy, ncd, salmo)

Source:https://www.linkedin.com/pulse/face-recognition-using-transfer-learning-pre-trained-model-agrawal/?trk=read_related_article-card_title

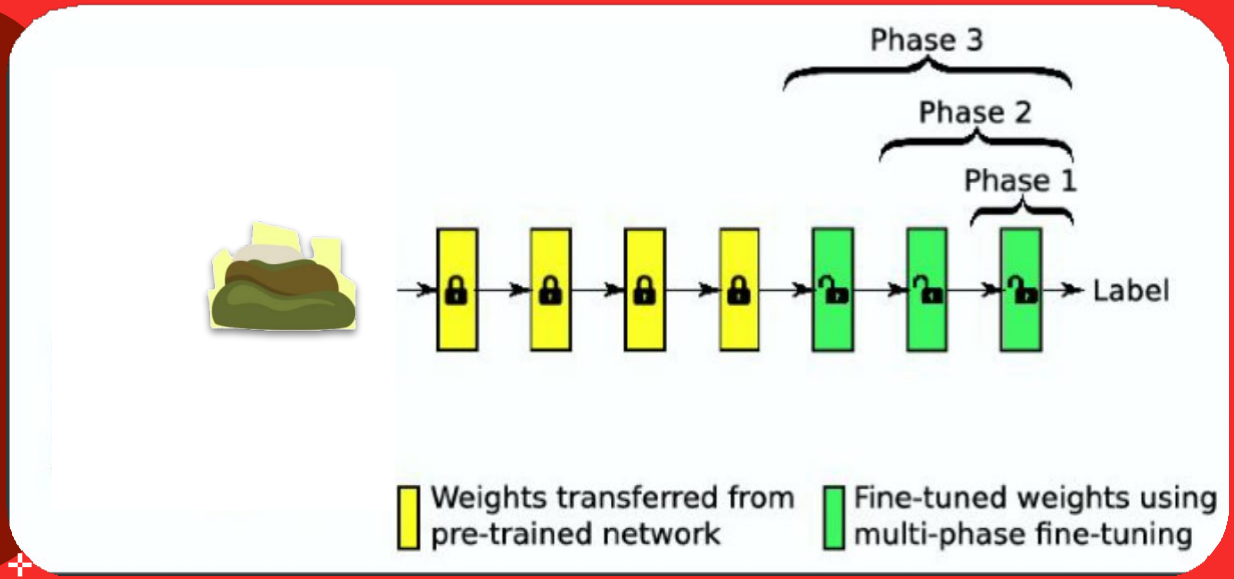
03. Model Training (Cont.)

CNN model Transfer Learning and Fine Tuning

Fine Tuning

Utilizing transfer learning and open some layers of model to **updating the weight and kept some weight** from original model in fix layer

Model learn more general features like edges, shapes, and textures **especially** of my data.



Source : https://link.springer.com/article/10.1007/s13218-021-00746-2

03. Model Training (Cont.)

CNN model Transfer Learning and Fine Tuning

VGG16

Visual Geometry Group, from the Oxford University have CNN architecture of model

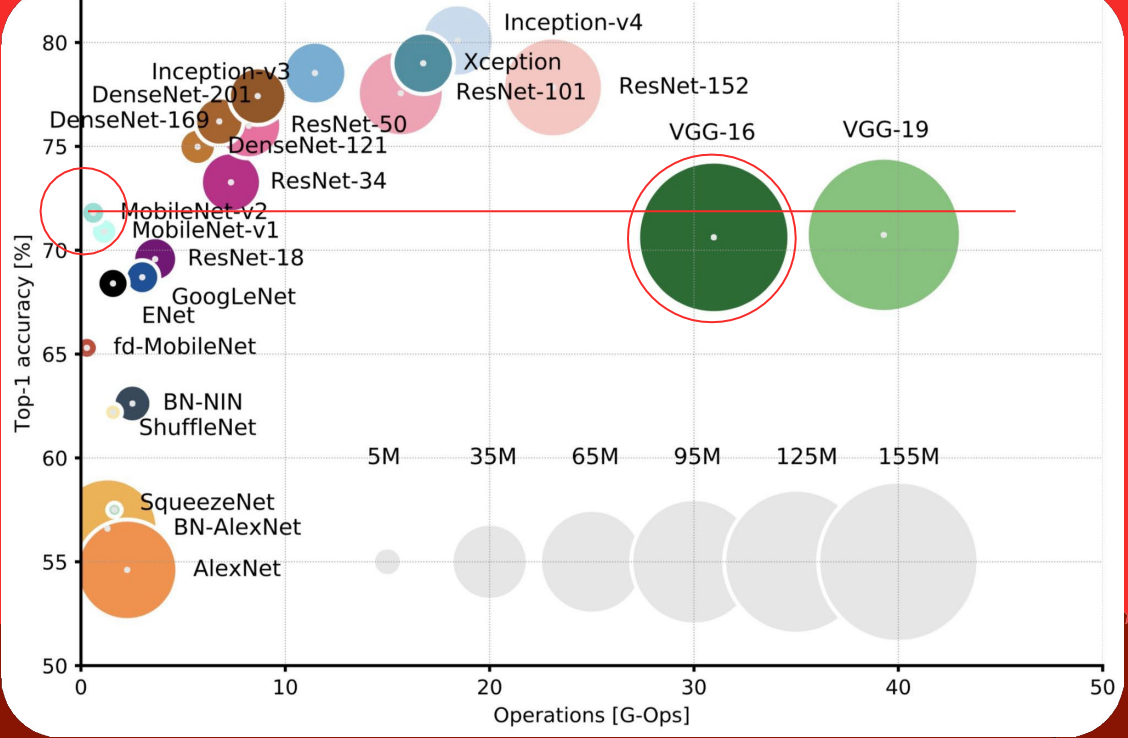
- **Large feature sizes** in many layers
- Inference was **quite costly at run-time**
- **Starter model** in transfer learning image classification
- **Easy to pre-processing** for training

MobileNetV2

MobileNetV2 is a CNN architecture that seeks to perform well on mobile devices.

- **Small feature sizes** in many layers
- **Faster** at run-time
- **High** performance
- **Easy to pre-processing** for training

State-Of-The-Art Image Classification Algorithm



Source : https://culurciello.medium.com/analysis-of-deep-neural-networks-dcf398e71aae

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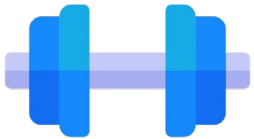
04. Evaluated Model

Selected the most suitable model to deploy on the Streamlit app

Metric for evaluating classification models

Accuracy Score

is the fraction of predictions our model got correct..



F1-score

Combines the precision and recall of a classifier into a single metric by taking their harmonic mean

High

Good performance

Bad performance

Low

04. Evaluated Model (Cont.)

Selected the most suitable model to deploy on the Streamlit app

Table of parameter of model after training 25 epochs and used GPU GTX NVIDIA 1050

Parameter	CNN Baseline	VGG16 Transfer Learning	VGG16 Fine Tuning	MobileNetV2 Transfer Learning	MobileNetV2 Fine Tuning
Accuracy score training	0.95	0.82	0.99	0.98	0.99
Accuracy score validation	0.88	0.80	0.93	0.90	0.92
F1 score average	0.86	0.74	0.92	0.88	0.92
Size model(MB)	24.11	56.23	110.26	9.13	23.46
Number parameters	2 M	14 M	14 M	2 M	2 M
Input image size	(128,128,3)	(224,224,3)	(224,224,3)	(128,128,3)	(128,128,3)

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Size model(MB)	24.11	56.23	110.26	9.13	23.46
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04. Evaluated Model (Cont.)

Selected the most suitable model to deploy on the Streamlit app

Parameter	MobileNetV2 Transfer Learning
Accuracy score training	0.98
Accuracy score testing	0.93
F1 score average testing	0.90
Size model(MB)	9.13
Number parameters	2 M
Input image size	(128,128,3)

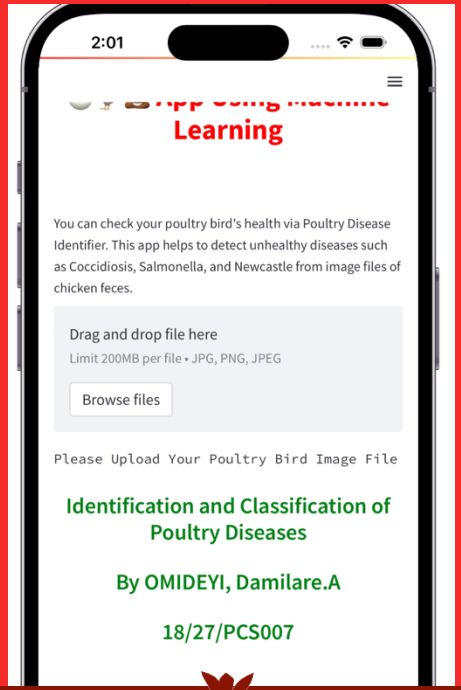
Class	Precision	Recall	F1-score	No.picture
Cocci	0.95	0.96	0.95	232
Healthy	0.92	0.91	0.92	225
NCD	**0.75**	**0.86**	**0.8**	**58**
Salmo	0.95	0.92	0.94	290

Performance

- **Good performance** but slightly overfitting
- **Small size** – Good for upload use in streamlit cloud
- **Short run-time** - small number of parameters
- **Resilient of image**- small pixel input

04. Evaluated Model (Cont.)

Selected the most suitable model to deploy on the Streamlit app



https://bit.ly/3iJoLDe

Poultry Disease Identifier Using CNN

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05. Conclusions & Recommendations

Summary overview of this project and advice for the future

Conclusions

- The performance of all models were practicable with accuracy scores >80%
- The selected model MobileNetV2 Transfer Learning to be deployed on Streamlit app
- It could predict the image of chicken fecal in Nigeria or even in foreign countries

Recommendations

- More NCD data should be collected.
- Error can occur when using an image with two or more fecal or contain text on the images.
- Model was limited to poultry, Data should be collected widely for both poultry and broiler.

THANK YOU FOR YOUR ATTENTION

Acknowledgement

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