What Did the Chicken Say?

A Multi-class Classification Method on Chicken Vocalisations

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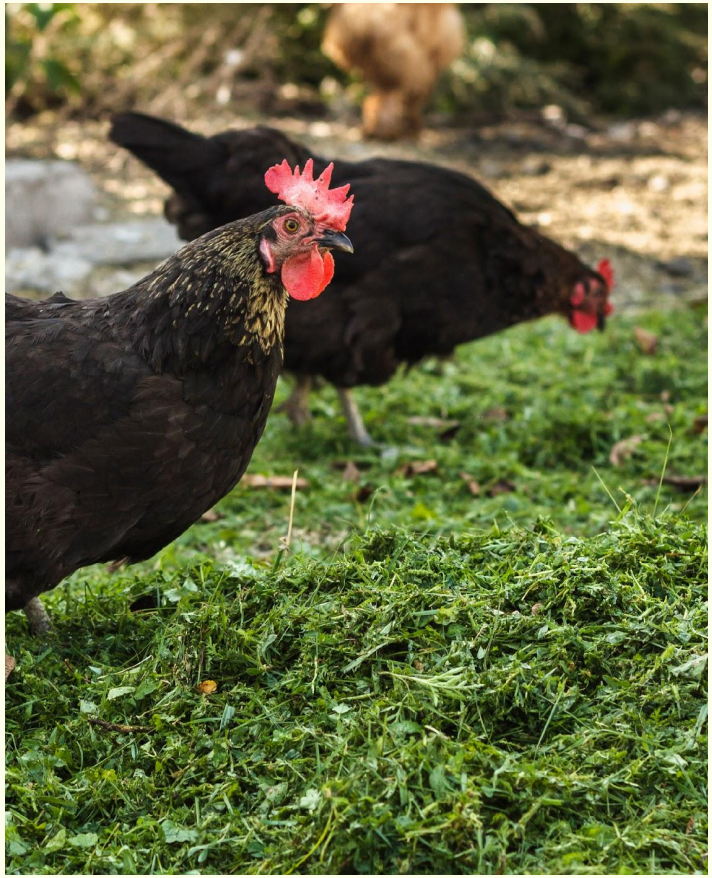


01 Introduction

Introduction

- Poultry is one of the largest industries in India, with a market size of USD 23.07 billion in 2022.
- It is imperative that the health conditions of the poultry chickens are monitored to ensure optimum output.
- However, due to the size of poultry farms it is a difficult task to keep track of individual chickens and ensure healthy conditions.
- Our current proposal aims to target this very problem statement using chicken vocalizations.

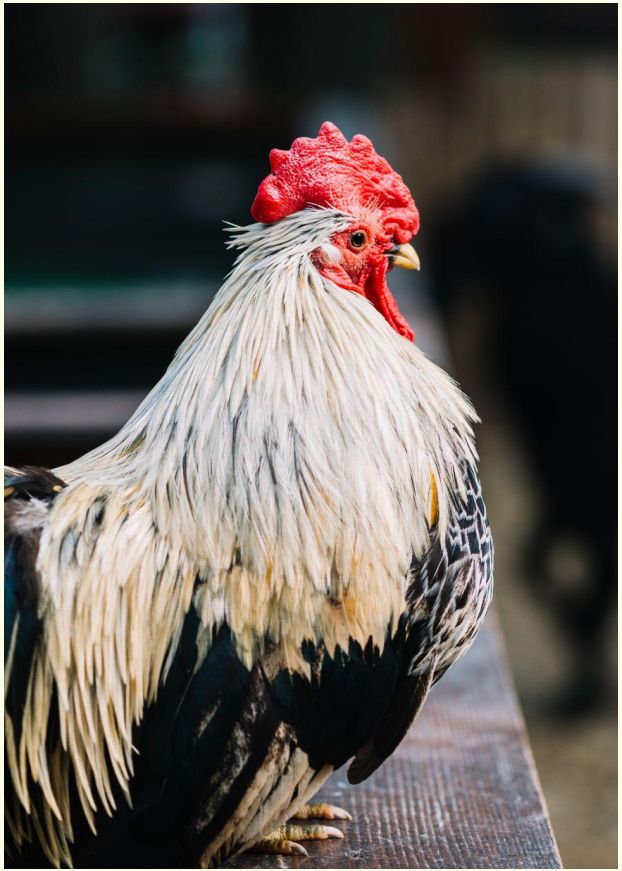
02 Methodology

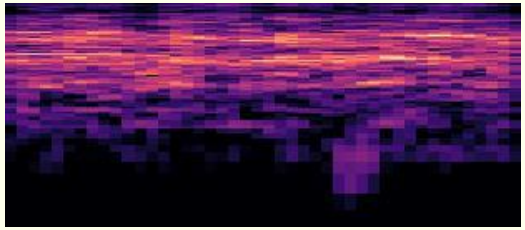
Data Collection

- Poultry Farm at Bainsa, Punjab
- Busra breed
- Data size of 1 hour approximately on phones

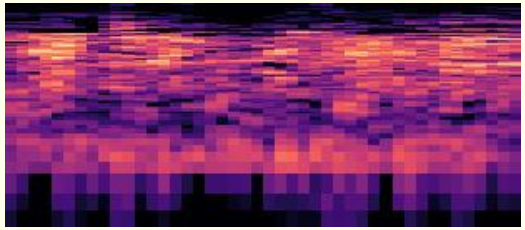
Dataset Annotation

- To annotate the data, we had to manually run through all the video and crop out the parts belonging to different classes.
- The audio was taken from the video footage shot on the farm by first extracting the audio using an online extractor at 128Kbps, and then finding instances of distress in the continuous audio.
- Thereafter we manually split it without overlap in 0.5s and 1s intervals.

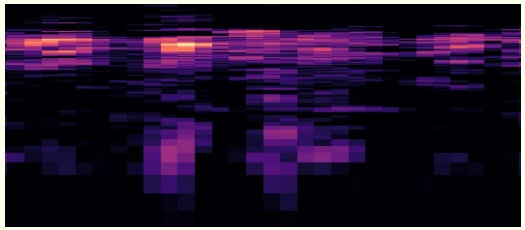




Feeding



Egg-laying



Distress

Audio Preprocessing and Generating Mel Spectrograms

- The recordings are then gated using a minimum decibel limit and then transformed into Mel Spectrograms
- The x-axis refers to the time duration (1s here). The y-axis denotes the frequency value of the signal. The different colors represent the decibel levels (the darker the color, the louder the sound)
- Egg-laying is relatively quite calm, whereas feeding has a lot more activity.
- Loudness sharply increases during distress, as shown by the large dark spots

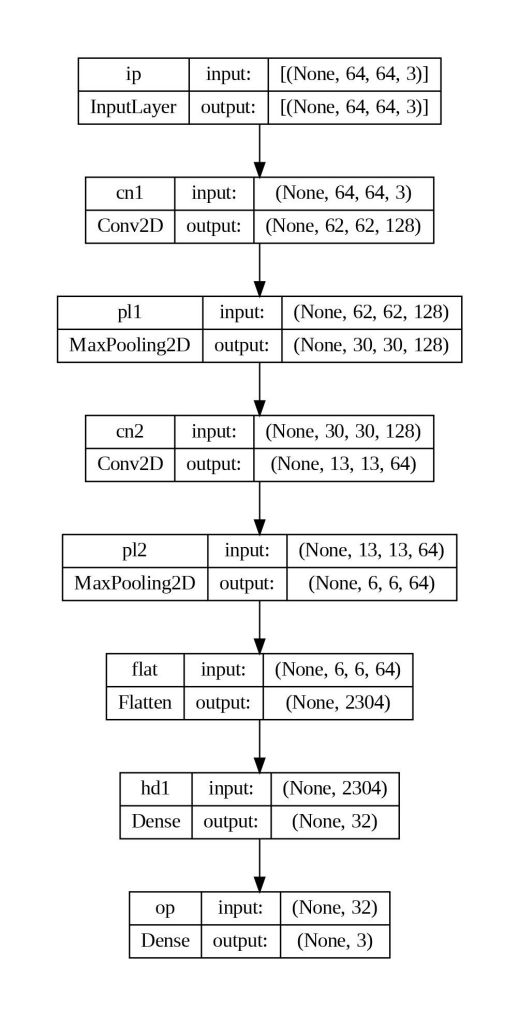
Data Distribution

Table 1: Data Distribution in terms of Mel Spectograms

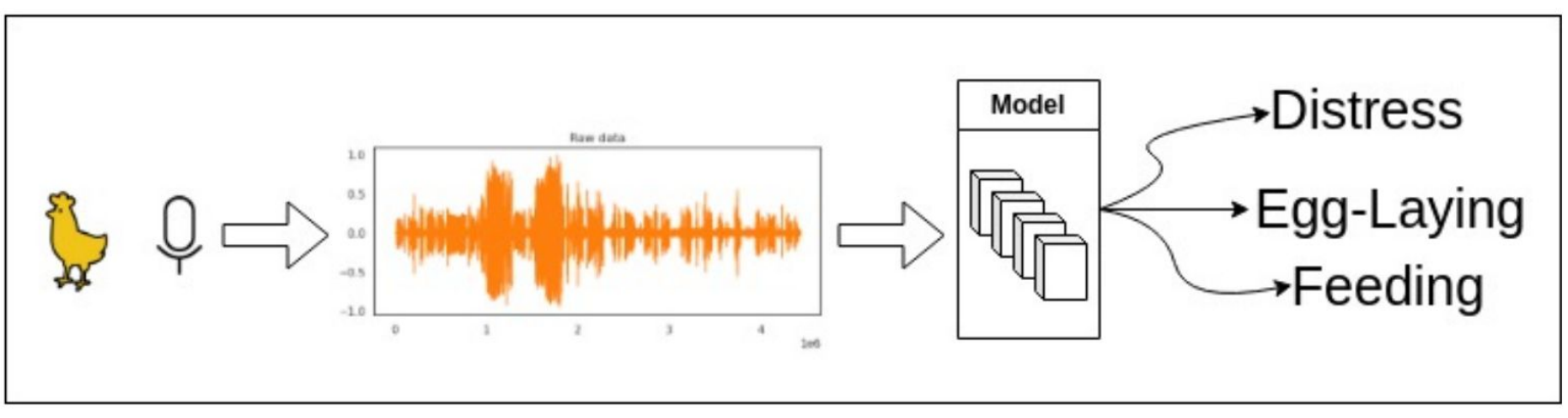
Split	Dataset	Distress	Egg-Laying	Feeding	Total
1	Train	85	390	1003	1478
1	Validate	12	56	143	211
1	Test	24	111	286	421
0.5	Train	169	779	2004	2952
0.5	Validate	24	111	286	421
0.5	Test	49	224	574	847

Classification by Model

- Our first model is a simple custom neural network model.
- For this architecture we end up with less than 300,000 parameters.
- In our case we found that it only had a size of 3.4MB. Thus, this is a light and easily deployable model.
- Our second model is a pre-trained VGG16 model which we fine-tuned with our proprietary dataset.
- VGG16 has been trained on 1,000 different classes, so we felt that it would have been best suited to our problem statement.



Final Architecture



03 Results

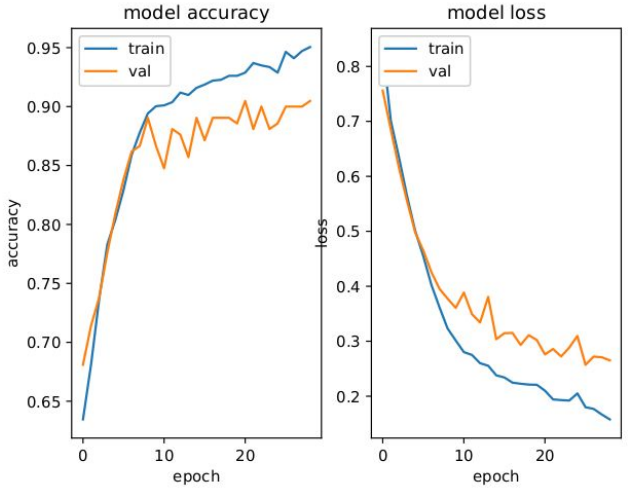


Fig. 5: Training Data Plots for the Base CNN Model for 1s Split

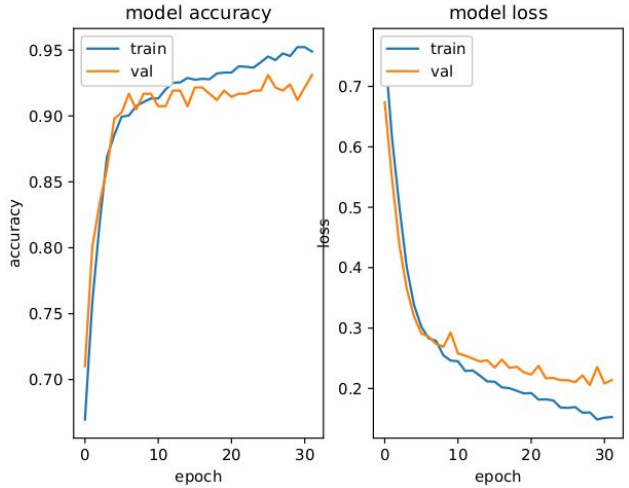


Fig. 6: Training Data Plots for the Base CNN Model for 0.5s Split

CNN Model

92.23%

Best accuracy achieved (using 1s split)

0.5s and 1s

We test for both kinds of split

32 epochs

With early stopping

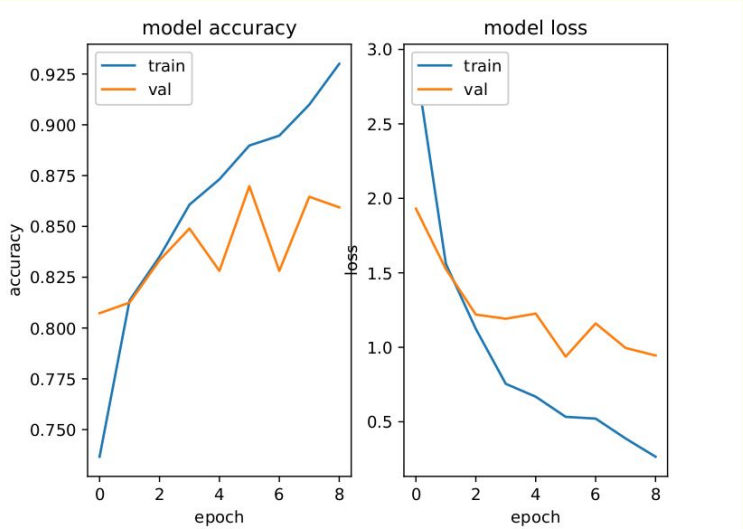


Fig. 7: Training Data Plots for the VGG16-based Model for 1s Split

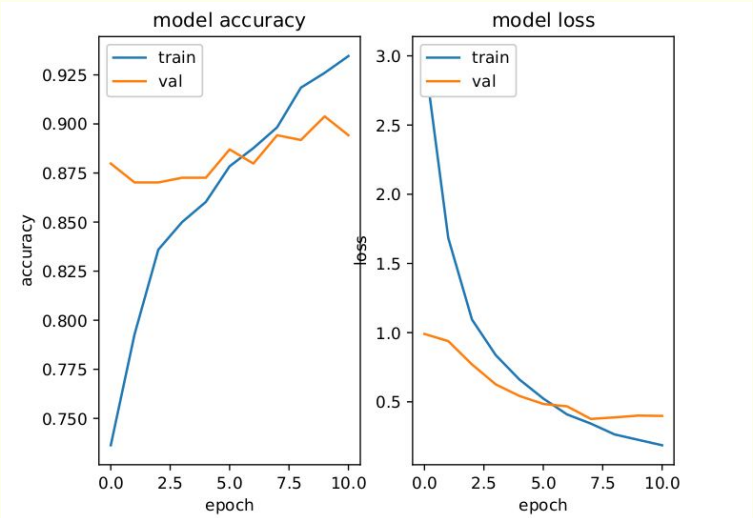


Fig. 8: Training Data Plots for the VGG16-based Model for 0.5s Split

VGG16 Model

90.82%

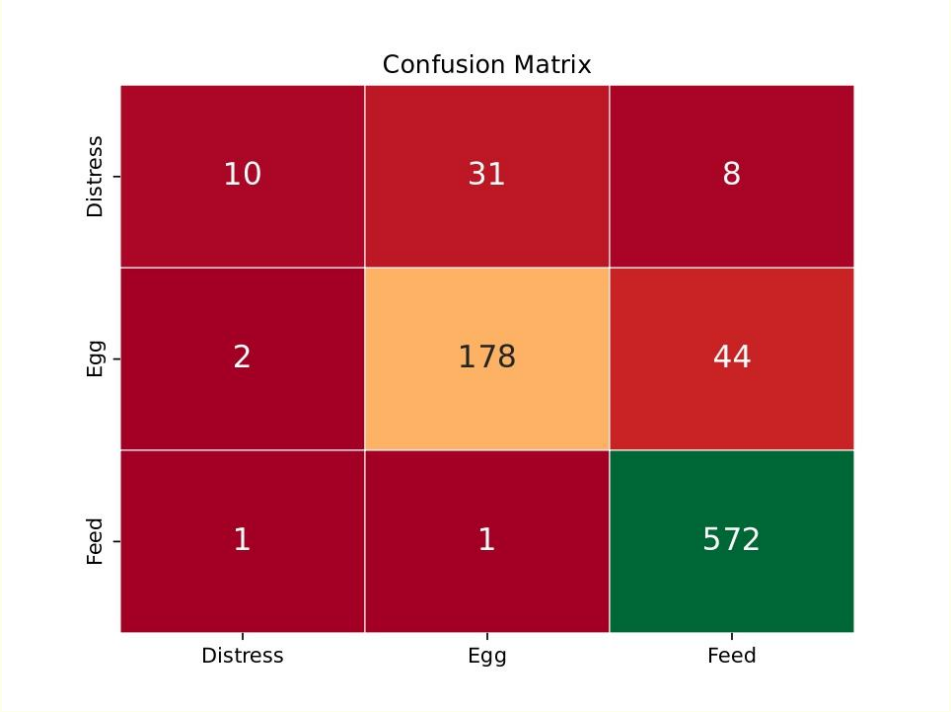
Best accuracy achieved (using 1s split)

0.5s and 1s

We test for both kinds of split

11 epochs

With early stopping



89%

Weighted average precision

90%

Weighted average recall

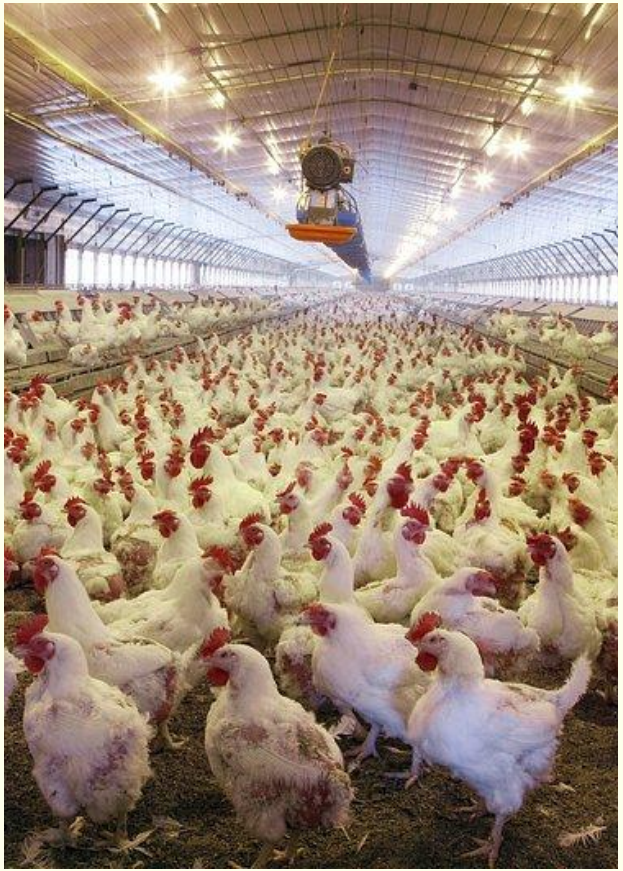
88%

Weighted average F1-score

04 Use Cases and Future Scope

Use Cases

- Can be easily deployed in poultry farms with minimal equipment
- Can help in the complete automation of poultry farms by acting as a means of monitoring
- Can help new farmers to set up without significant knowledge gap.



Thanks!

I would be glad to answer your questions!