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CATTLE MEDICAL DIAGNOSIS AND PREDICTION USING MACHINE LEARNING

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Abstract - *Cattle Livestock Rearing is a major business in India with over 300 million cattle present in India. The total number of cattle throughout the world amounts to around 1 billion. The main products of this industry are milk and milk products, meats, and hides. The cattle unable to supply the former is used for transport and on farms for ploughing. The American Cattle Industry alone is worth about $77 billion. This makes the cattle sector one of the most valued industries in the world. Yet, there is not any significant system to keep health checks on these prized possessions except by workforce. In this age of reducing labour, excess workforce is expensive and does not always guarantee correct examinations. This void of a system causes annual losses of about $4-5 billion in the US alone. This can completely be avoided by using Deep Learning. With our Health Check System, we aim to surmount this challenge by capturing images of key areas in cattle and comparing them with a massive dataset of ill and healthy cattle to decide whether the animal is healthy or needs to be quarantined to prevent further spread of infection. This will provide a major boost to the cattle industry as it will narrow down the chances of a widespread infection causing losses with the help of Deep Learning.*

Key Words: *Cattle Rearing, Deep Learning, Machine Learning, Infection Detection, Disease Prevention*

1. INTRODUCTION

Livestock Rearing is a massive business today with almost a billion cattle existing throughout the world. The $77 Billion Cattle Industry in America has seen a steady decline in cattle population and has suffered losses due to extreme outbursts of diseases. In 1992, there were about 120,000,000 cattle in the US. Now, it has declined to about 92 million. In 2015, about 3.9 million cattle were lost due to either non-predator or predator causes. This amounts to about $3.7 billion in losses. These deaths are dominated by non-predator causes as they account for 98% of the deaths in cattle and 89% in calves. Majorly, Respiratory Diseases make up about 23.9% of the total non-predator deaths in cattle and 26.9% in calves. A major group of respiratory diseases is the Bovine Viral Diseases. The usual symptoms include face lesions, ocular discharge, and nasal discharge. By using a highly trained prediction model, we can ease the process of infection detection and prevent any outbreaks. This will not only reduce the need for a large workforce, but also will provide a fool proof method to keep a check on livestock.

1.1 Traditional Method

Steps Involved in Traditional Infection Detection:
BVD is diagnosed based on samples tested at laboratories.
Necroscopy findings are also considered.
Body Temperature is kept under a strict vigilance and any fluctuations are noted.
Milk Production is monitored.
A sudden drop in production indicates infection.
Nasal discharge and ocular discharge(eyes) are observed.

1.2 Problems Faced:

1. Low Infection Detection Rate.
2. Large Workforce needed.
3. Low Disease Incubation Period.
4. Risk of Outbreak.
5. Probability of Disease spreading to humans.
6. Human Intervention destabilises cattle
7. Symptoms difficult to observe.

2. SOLUTION

The proposed solution is an easy-to-use software named "Cattle Infection Diagnosis," which aims to ease the process of ensuring each cattle remains healthy. A setup of 3 cameras is installed to capture images of the designated area and send them over to the control centre aka the laptop. The three cameras are positioned at parts which are the most susceptible to display symptoms and this ensures that the best output is generated while using less resources. These body parts include the eye, the nose section, and the neck. Currently, cattle diagnosis requires dealing with hostile cattle which makes the process

inefficient. My deep learning model aims to make the process smoother and accurate.

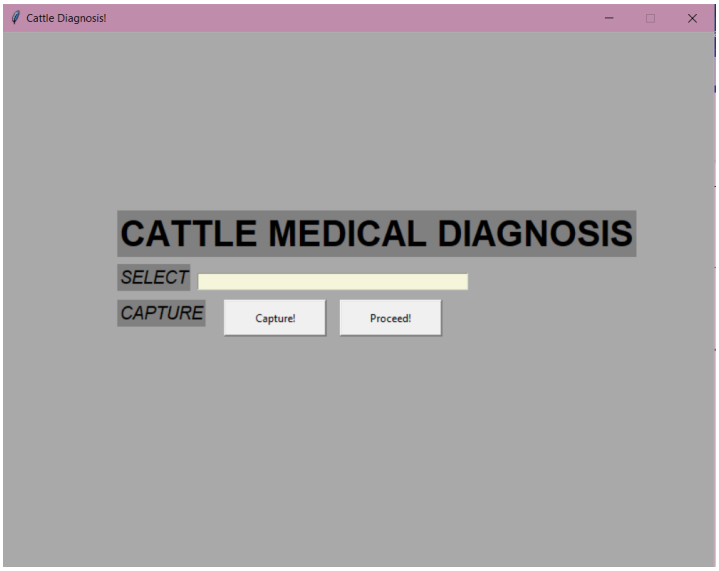

Fig –1: Prototype Software

This model can be implemented in washing sheds which will help do two tasks at one time. To diagnose a cow, the caretaker must make sure that the cow is aligned with the cameras. Once the cow is in place, he/she should trigger the cameras which will capture images and port them to the software. This will pass the image through the classification model and a result will be produced. Or else, the path of the image can be passed through and an output can be received. If the cow has ocular discharge, an output of an "Ill Eye" will be received. If the cow has a healthy nose section, a "Healthy Nose" output is received. Likewise, such outputs are received from all the sections. This helps caretakers determine whether the cattle are healthy or otherwise.

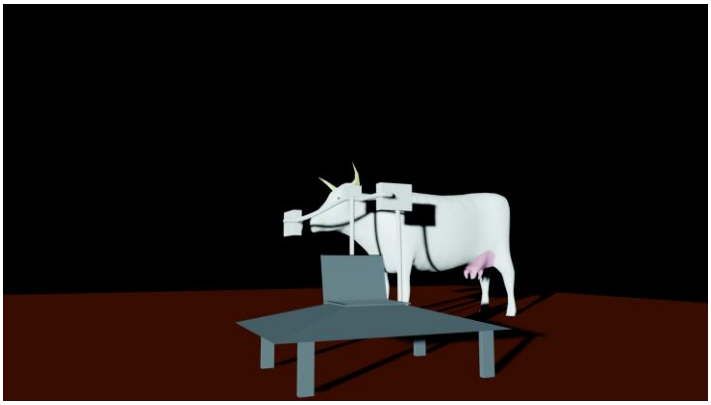

Fig -2: Model (not yet implemented)

3. METHOD

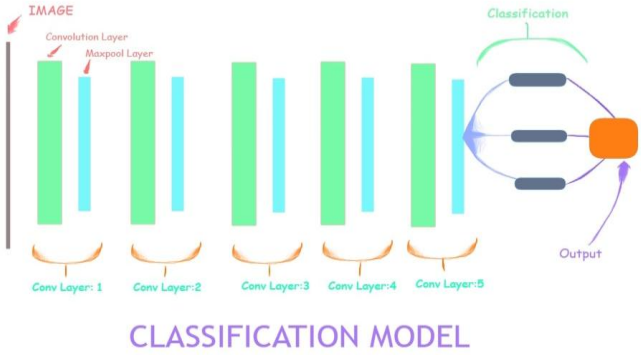

Fig –3: Methodology

The system is built upon the "TensorFlow" machine learning library as well as the "Keras" deep neural network library in Python. The model includes three cameras and a control center (personal computer). All the classification is done through a Python code.

3. IMPLEMENTATION AND RESULTS

The system aims to diagnose symptoms in the nasal, eye and the neck area

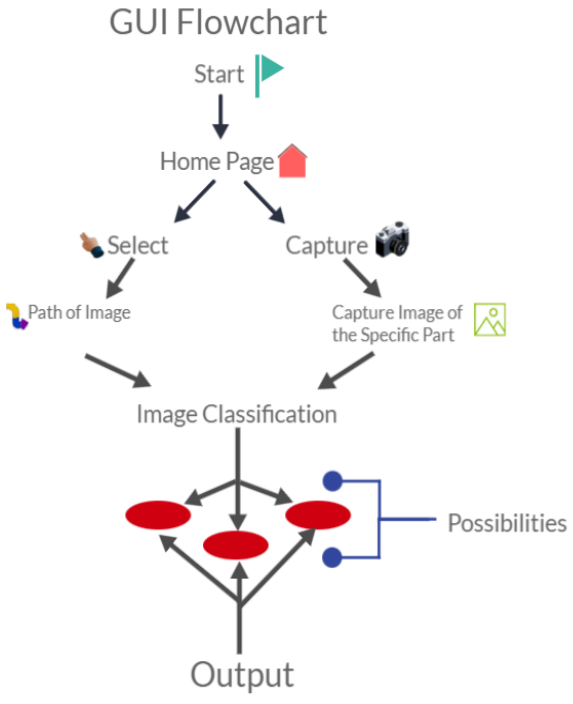

Fig –4: Flowchart of the software

In all, there are 6 possibilities:

1st Possibility:

HEALTHY EYE

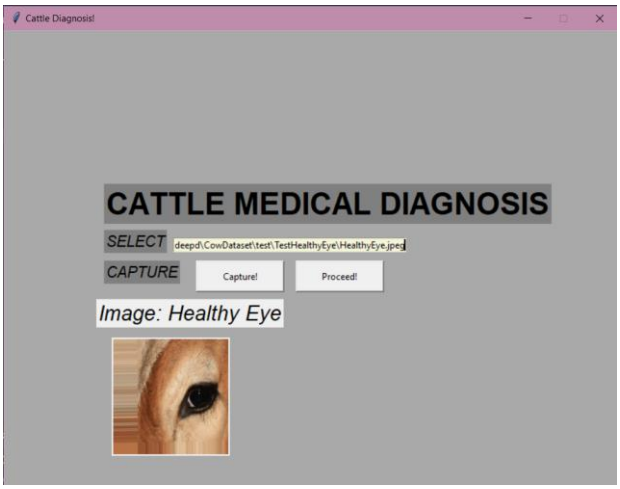

Fig –5: Prediction 1- Healthy Eye

If the cow has a healthy eye, a similar output will be displayed. Here, the path guides to the image of a healthy eye. On pressing "Enter" the image is run through 10 layers of classification and is funneled into its respective category. The image is displayed as well. A Clear Eye suggests that the cow does not have ocular discharge, a major symptom of the Bovine Respiratory Disease.

2nd Possibility:

HEALTHY NASAL SECTION

Fig –6: Prediction 2- Healthy Nose

If the cow does not have any nasal discharge, it again eliminates a major symptom of the Bovine Disease.

HEALTHY SIDE

Fig –7: Prediction 3- Healthy Side

If the cow has an infection-less neck region, an output of Healthy Side will be received.

Any minor anomaly will also be classified as a healthy side.

ILL EYE

Fig –8: Prediction 4- Ill Eye

If the cow has Kerato-conjunctivitis and a cloudy/foggy eye is captured, it is classified as an Ill eye. Also, if the eye is either bloody or has flesh extrusions, it will again be classified as an Ill eye. Also, a similar result will be observed if the cow has ocular discharge.

ILL NOSE

Fig –9: Prediction 5- Ill Nose

If the cow shows signs of mucous discharge through nostrils, an Ill Nose output is received.

ILL SIDE

Fig –10: Prediction 8- Ill Side

If the neck region has ringworms, lesions, or any other dermatological disease, the output received is Ill Side.

CAPTURE FUNCTION:

All the same outputs can be received if the "CAPTURE" and the "PROCEED" buttons are used.

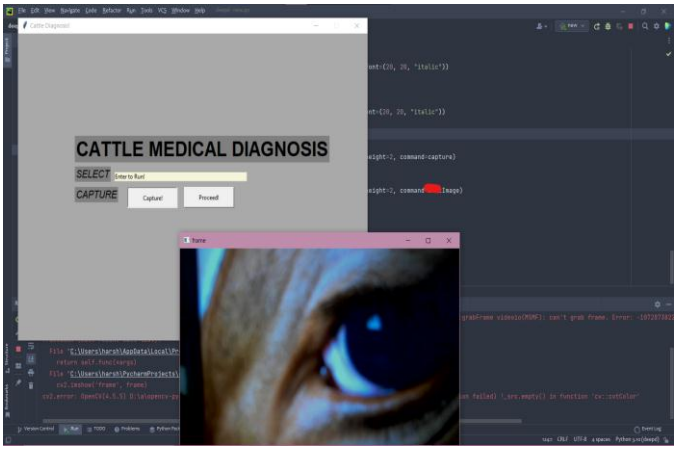

Fig –11: Prediction through a camera

CONCLUSION:

The target of this software is to provide resources to determine whether cattle are healthy or unhealthy through machine learning. It aims to help cattle owners to keep their livestock healthy without human intervention. It would be helpful to increase efficiency in infection diagnosis and prevent any contagious diseases from spreading amongst either cattle or from cattle to humans. This will be revolutionary as the number of cattle lost per year will decrease and in turn reduce losses and make the cattle Industry lucrative again.

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