Lumpy Diseases Detection using Machine Learning

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Abstract— Machine learning algorithms for improving animal health monitoring have accelerated the creation of ML applications for behavioral and physiological monitoring systems, including ML-based animal health monitoring systems. Currently, farm animals are raised all over the world, and it is necessary to monitor their physiological processes. It is suggested in this article to use machine learning models to continuously monitor each animal's vital signs and look for biological changes. In this model, crucial data is gathered via IoT devices, and data analysis is carried out using machine learning techniques to identify potential dangers from changes in an animal's physiological state. The results of the experiments demonstrate that the suggested model is accurate and efficient enough to identify animal situations. For our purposes, the CNN and YOLO accuracy of more than 90% is a promising outcome.

Keywords- Lumpy disease , Machine learning, Images

INTRODUCTION:

A considerable role in improving a nation's economic condition is played by agriculture. The agriculture industry accounts for over 18% of the gross domestic product in India alone.
Livestock husbandry and agriculture go hand in hand. In the practice of animal husbandry, cattle are raised for both food and non-food purposes. Beef, eggs, and alternatives for milk are all agricultural products. Non-food items can be found in wool, medications, and bone products. This entails giving the animals frequent, meticulous attention. Agriculture's branch on animal husbandry contributes to some of its output. Almost 20.5 million people in our nation depend on cattle for their livelihood, which means that dairy farming provides a living for 2/3 of the local population. We acquire a variety of food and nonfood goods from livestock animals. The health of livestock is a crucial element in the creation and maintenance of the quality of these items. Quality- and quantitywise, cattle illnesses may have a negative impact on productivity. Major cow disorders include parturient paresis, ketonemia, tension, limping, fever, etc. Where thousands of cattle are raised together on large farms, these diseases can spread quickly, which can result in a huge loss of income. Because of the lack of adequate medical facilities in many regions, many dairy farmers in industrialized nations are underpaid to frequently test their cattle, which can anticipate sickness at an early stage. Many farmers from rural communities must transport their livestock a very long way in order to get to a medical facility. Early diagnosis using an electronic device that would record all the crucial tracking data for cattle and feed the information to a disease prediction data mining model would aid in hastening the recovery process and preventing accidents because of a local shortage or unavailability of veterinary specialists. In India, which has a huge number of cattle, thieves target doctors in the rural areas. A plan that would reduce dependency on medical professionals and lower the cost of transporting livestock in big cities or towns during medical conditions is necessary to disseminate information in communities about the prevention of these cattle diseases.

Lumpy Skin Disease:

Lumpy skin disease is a viral infection of cattle. Originally found in Africa, it has also spread to countries in the Middle East, Asia, and eastern Europe. Clinical signs include fever, lacrimation, hypersalivation, and characteristic skin eruptions. Diagnosis is by histopathology, virus isolation, or PCR. Attenuated vaccines First may help control outbreaks. The virus that causes lumpy skin disease in cows can transmit to humans. The main means of transmitting LSD to cattle and water buffalo are insects that consume blood. Look for the presence of firm, round pimples on the cow's skin to detect lumpy skin disease. They lose weight and produce less milk right away.

- discovered in southern and eastern Africa, lumpy skin disease is now seen in a number of Middle Eastern, Asian, and Eastern European nations.
- The most recognized clinical symptom is the appearance of many, painful nodules on the mucous and skin surfaces.
- The spreading of infection may be controlled with the use of vaccinations

Figure 1: Normal cow

Figure 2: Lumpy cow

LITERATURE REVIEW:

We should use the information mining techniques that are available to find different instances from the available huge data set and can be used again for clinical research and run different processes on it since people can't arrange information if it is so big.[1] In mulberry crops, YOLOv4 is employed for the detection and characterization of leaf diseases. It is substantially quicker and more precise, processing leaf pictures at a rate of roughly 45 frames per second than every other approach. Here, detection and classification may be done rather quickly and accurately. The model will suggest the appropriate insecticides after the illness has been detected and identified. Although sericulture makes up between 15% and 20% of the Indian economy, the suggested model will help farmers who grow mulberries since it is user-friendly, economical, and does away with the main shortcomings of the conventional approaches.[2] The inventor applied this method to a common dataset from the Boston real estate market to identify heart diseases. The estimation of heart exercises and expectation of heart infections, which were made with the aid of a help vector machine and something somewhat similar to it, were found to be 83.7% accurate.[3] There are currently no commercial diagnostic test kits for the detection of the LSD virus. Hence, the tentacle. The characteristic clinical indicators, differential diagnosis, and clinical diagnosis—which is confirmed by laboratory testing utilizing conventional polymerase chain reaction (PCR) techniques—are often used to make a diagnosis of LSD. When there are distinctive skin nodules, fever, and enlarged supraclavicular lymph nodes, LSD should be clinically suspected. During two days, skin lumps that can occur anywhere on the body, from the snout to the tail, start to form. identical character[4]

METHODOLOGY:

Several initiatives use CNN to identify cancers. This research accepts input photos with a yes/no label from the raw data.

Image preprocessing on a dataset:

To facilitate training as a result of the many variations in intensity, contrast, and size of the pictures, image preprocessing was developed.

CNN was the algorithm utilized (Convolutional neural network)

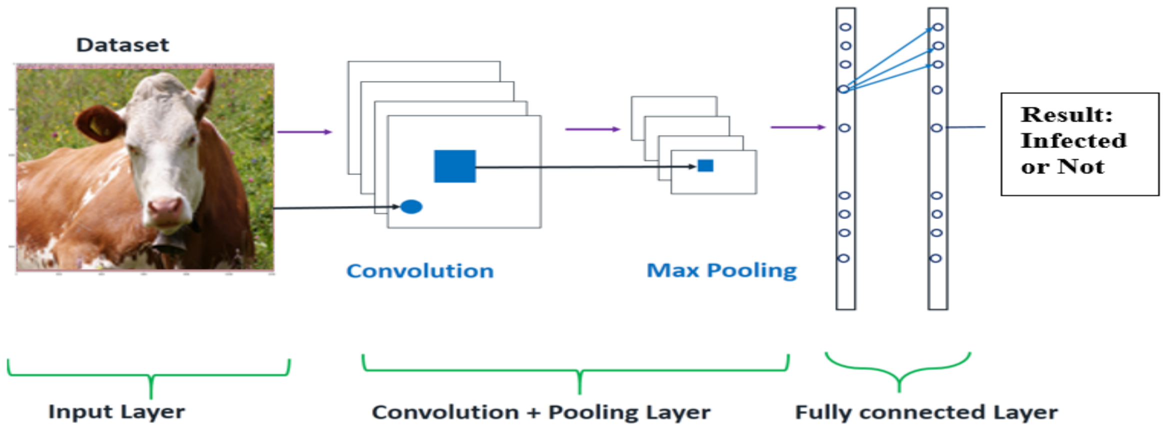

Figure 3: Functionality of CN

Convolution 2D: Extract the featured region of the input image using convolution 2D. It gave the findings in matrix format.

MAX Poolig2D: The largest element from the normalized feature map is used in MAX polling 2D.

Dropout: Dropout is the technique of ignoring randomly chosen neurons when training.
Flatten: Feed output into a layer that is completely linked. Lists of data are provided.
Dense: A linear operation in which each input and each output are coupled by weight. Nonlinear activation function comes next.
Activation: It predicted the likelihood of 0 and 1 using the Non - linear model.

Implementation:

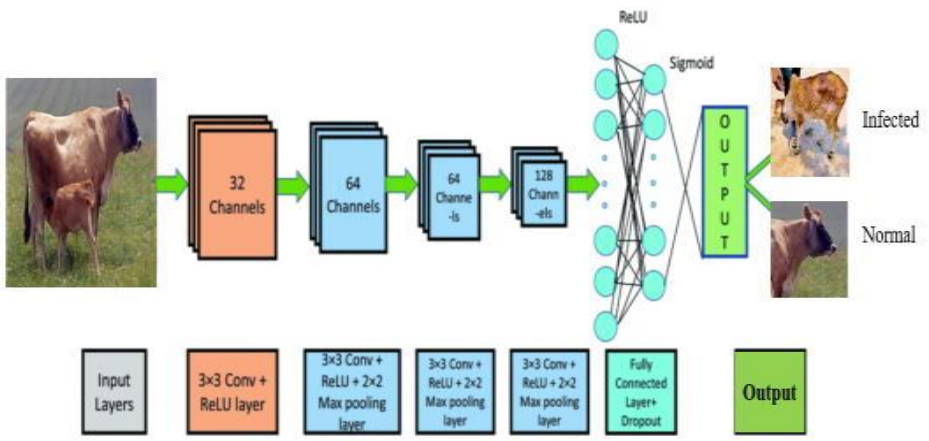

Figure 4: Implementation of CNN Model

FLOW CHART:

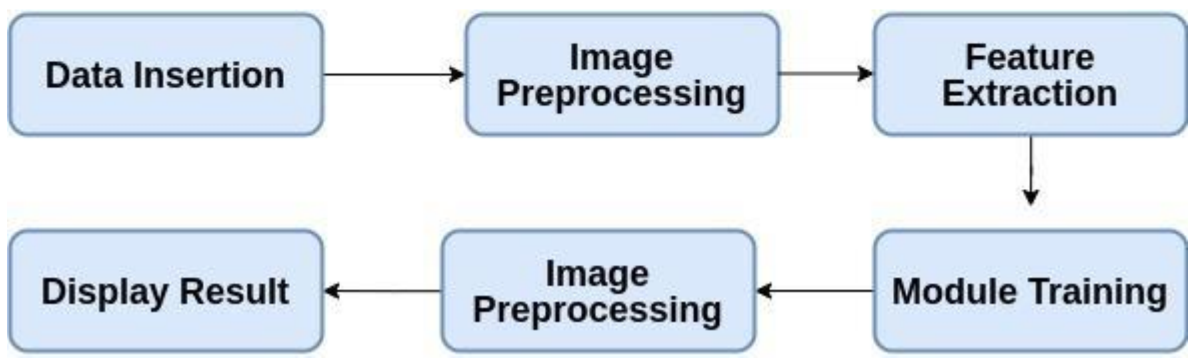

Figure 5: UML Diagram

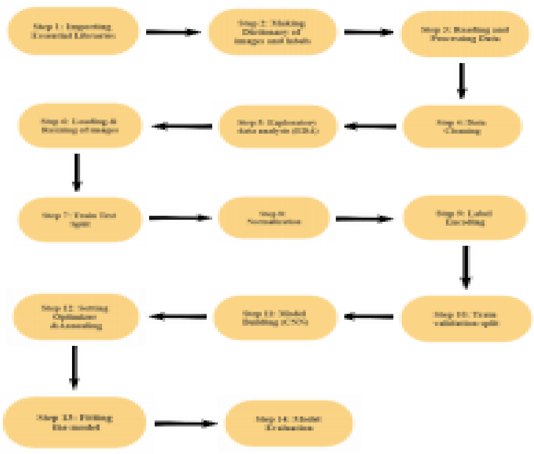

Figure 6 : Sequence Diagram

SYSTEM REQUIREMENT:

Hardware Requirements:
Processor: Intel Core i7- 8th Gen
Installed memory (RAM): 4.00GB
System Type: 64-bit Operating System

Software Requirements:
Python 3.8.4 Language
Anaconda IDE

Module
• Open cv :- used for image vision
• NumPy :- used for undefined array

Advantages:

- By identifying illnesses in their early stages, it will improve the care of cattle animals and save animal lives.
- It will contribute to raising societal and individual awareness of animal health issues.
- It will boost the manufacturing of dairy goods.
- Technologies that are affordable for the general public
- Using a web application or mobile application to display the prediction result will automate this procedure. to efficiently complete the work that has to be done in a machine learning setting

RESULT:

The proposed system's results show 84% accuracy on the specified CNN model with an
F1 score. The images 6.1 and 6.2 display the cattle with and without Disease, respectively. The results provided by CNN are accurate.

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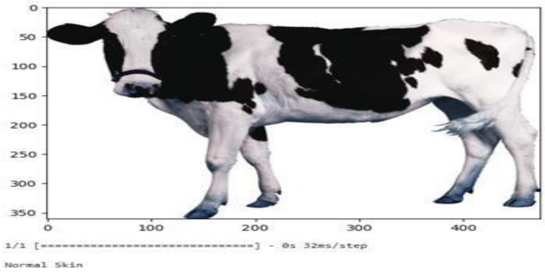

Figure 7: Normal cow detected

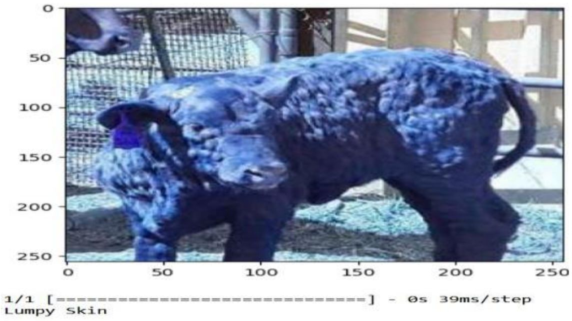

Figure 8: Lumpy cow detected

The CNN model applied the test data with 84% accuracy. CNN appears to be the best supporting approach in diagnosing the existence of a cattle skin disease since it has the highest precision value when precision, recall, and f1 score are all known.

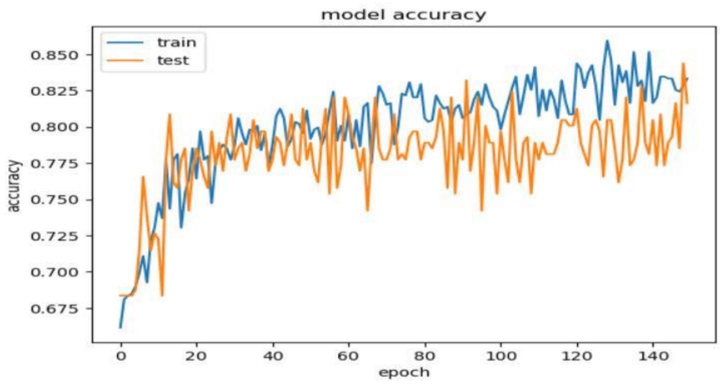

Figure 9: Model Accuracy

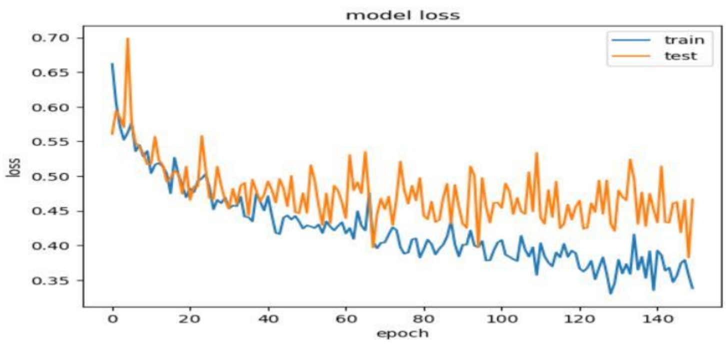

Figure 10: Model loss

Comparative results:

The YOLOv4 model is trained using 1000 photos per class across 10000 epochs. The suggested model illustrates the model prediction for lumpy infection and can detect single or several locations of infections. For more than 1000 photos in each class, the model has been trained for 10000 epochs. The model performance will increase when the number of training epochs and the number of photos in each class are increased. The necessary measure and medications will be recommended in case any infections are found and recognised once the predictions from the model have been received.

CONCLUSION:

In terms of analyzing the picture dataset, CNN is regarded as one of the finest methods. CNN performs the estimate by cropping the image to the desired size while preserving the necessary data. This model was created using the trial and error methodology. The amount of layers and filters that may be employed in a model may be determined in the future using optimization approaches. The CNN currently outperforms other methods in predicting the existence of skin disease for the dataset in question. Using this CNN module we can find difference between diseased cow and the healthy cow.

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