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MONITORING MONKEYPOX DISEASE USING AI AND ML

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ABSTRACT

Monkeypox outbreaks have been detected in 75 countries so far, and they are rapidly expanding over the world. While the skin lesions and rashes of monkeypox frequently resemble those of other poxes, such as chickenpox and cowpox, their clinical characteristics match those of smallpox. Because of these similarities, it might be difficult for medical practitioners to diagnose monkeypox simply looking at the visual characteristics of lesions and rashes. Healthcare workers also lack expertise because monkeypox was uncommon prior to the current outbreak. The scientific community has expressed a growing interest in employing artificial intelligence (AI) to diagnose monkeypox from digital skin photos as a result of AI's success in COVID-19 identification. The bottleneck for employing AI in monkeypox detection, however, has been the scarcity of monkeypox skin picture data. The Monkeypox Skin Image Dataset 2022, the largest of its sort to date, was thus recently released. Also, in this research, we make use of this dataset to examine the viability of detecting monkeypox on skin photos using cutting-edge AI deep models. According to our work, deep AI models can identify monkeypox with an 85% accuracy rate from digital skin pictures. More training samples are needed to train those deep models in order to achieve a more robust detection power.

Keywords: Monkeypox, Artificial Intelligence (AI), CNN (Convolutional Neural Network).

I. INTRODUCTION

A skin condition can alter the skin's tone or texture. Skin conditions tend to be persistent, contagious, and occasionally carcinogenic. To prevent the onset and spread of skin diseases, early diagnosis is therefore necessary. A skin condition requires more time for diagnosis and treatment, and the patient incurs both financial and physical costs. The majority of regular people often are not aware of the type and stage of a skin illness. Some skin conditions don't manifest symptoms for several months, which allows the illness to grow and spread. This is a result of the general public's ignorance about medicine. Sometimes, a dermatologist (a medical professional who specializes in treating skin conditions) may also have trouble diagnosing the condition and may need pricey laboratory testing to do so. The development of medical technology based on photonics and lasers has made it possible to identify skin illnesses considerably more rapidly and precisely. Nonetheless, the price of such a diagnostic is still very high. As a result, we suggest using image processing to diagnose skin problems. This technique uses image analysis to determine the type of disease by taking a digital photograph of the affected skin area. Our suggested strategy is easy, quick, and does not need expensive equipment beyond a camera and a computer.

II. LITERATURE SURVEY

Due of the recent monkeypox outbreak's quick spread to more than 40 nations outside of Africa, public health is now at risk. Due to its resemblance to chickenpox and measles, monkeypox can be difficult to diagnose clinically in its early stages. Computer-assisted monkeypox lesion detection may be useful for surveillance and quick identification of suspected cases when confirmatory Polymerase Chain Reaction (PCR) assays are not easily accessible. Under the condition that there are enough training examples available, deep learning techniques have been demonstrated to be useful in the automated detection of skin lesions. Such databases are not, however, currently accessible for the monkeypox condition. As part of the current work, we first created the "Monkeypox Skin Lesion Dataset (MSLD)," which includes pictures of skin lesions caused by measles, chickenpox, and monkeypox.

Although the world was impacted by COVID-19 in 2020, the arrival of the monkeypox in 2022, as reported by several nations, illustrates another concern on a global scale. The Zoonotic Orthopoxvirus, which also causes cowpox and smallpox and is a member of the Poxviridae family (a subfamily of the genus Orthopoxvirus), is the

infectious illness responsible for monkeypox. Although rodents and monkeys are the primary carriers, human-to-human transmission is also very common. In 1958, the virus was found in a monkey's body in a Copenhagen, Denmark, laboratory. By gathering photographs from various sources (such as news media and internet), the first publicly available collection of monkeypox images was created and is available from the following github repository.

A crucial first step in lowering mortality rates, disease spread, and skin disease progression is the early detection of skin diseases. Skin disease diagnosis requires expensive and time-consuming clinical procedures. In the early stages of developing an automated dermatology screening system, image processing techniques are helpful. The classification of skin diseases relies heavily on the extraction of features. In this study, the pretrained convolutional neural network (AlexNet) and SVM were used to create the detection method. In conclusion, it is important to remember that because Saudi Arabia experiences extremely hot weather despite having deserts, skin disorders are likely to be common. This research can help identify skin problems in the country.

This study backs Saudi Arabia's effective healthcare system. This project advances the study of skin disease detection. We suggested a method for identifying skin conditions based on image processing. This technique uses a digital photograph of the affected skin area to identify the kind of disease through image analysis. A camera and a computer are the only pricey pieces of equipment needed for our straightforward, quick method. The method uses a color image's inputs as its basis. Then use a pretrained convolutional neural network to resize the image and extract features. After that, a multiclass SVM was used to classify the feature. The user is then presented the results, which include the type of disease, its distribution, and its severity.

Because to the lack of datasets, it is essential to design and evaluate machine learning-driven diagnosis models in the context of the recent crisis brought on by monkeypox. There isn't a collection of picture datasets connected to the monkeypox disease that are intended to be used for computer research, despite the fact that there are sizable datasets for other skin conditions like chickenpox, rash, etc. Dr. Joseph Cohenes's initial tiny dataset production during the beginning of COVID-19, which contains 123 image samples at the early stage when the datasets were made available to the public, served as a major inspiration for our data collection methodology. In this research, a public dataset of cases of chickenpox, or monkeypox, which affects the hand, face, leg, and neck of people is introduced (mostly infected due to the virus).

As society advances, lifestyle choices and environmental factors change gradually, increasing people's unnoticed risks of contracting numerous diseases. Serious illnesses like cancer, diabetes, heart disease, vision impairment, and brain disorders have a significant impact on people all over the world. There are 422 million diabetics worldwide, with Type 2 diabetes patients making up more than 90% of this population. Age-related cardiac senescence and function decline raise the chance of developing heart disorders. More than 30% of deaths worldwide are caused by heart disease.

These serious illnesses have a negative impact on one's health and productivity. In addition, it will intensify societal pressure and raise medical and healthcare costs. The fundamental goal of disease prediction is to estimate the likelihood that a person will develop a particular disease in the future. Machine learning has advanced quickly among the various approaches to analyzing complex data, and its deep learning component has recently emerged and taken the lead as the most intriguing subfield. Deep learning outperforms earlier technical solutions in terms of its capacity to handle complicated data, method for extracting the key aspects of multi-dimensional data, effectiveness in handling unstructured data, and classification approach with higher accuracy.

III. PROBLEM STATEMENT

The Monkeypox diseases result in significant financial and physical losses for the healthcare industry. The management of diseases is a difficult task. Diseases or their symptoms, such as colorful patches, are typically visible on the human body. Most illnesses in humans are brought on by viruses, allergies, bacterial infections, and fungal infections. The illnesses brought on by these are defined by various visual symptoms that can be seen on the human body. These signs are typically found by hand. With the aid of image processing, many diseases can be automatically recognized. Since it produces the best results and requires less human work,

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image processing is essential for illness identification. There are several uses for image processing in the healthcare industry. It involves illness detection in order to ascertain the severity of the disease-affected area and the color of the affected area. Experts typically use a method called "naked eye inspection" to identify and find diseases. This method takes a lot of time. Hence, the early stages of monkeypox illnesses are detected and identified using image processing techniques. These technologies notify users and keep track of the monkeypox disease.

IV. PROPOSED SYSTEM

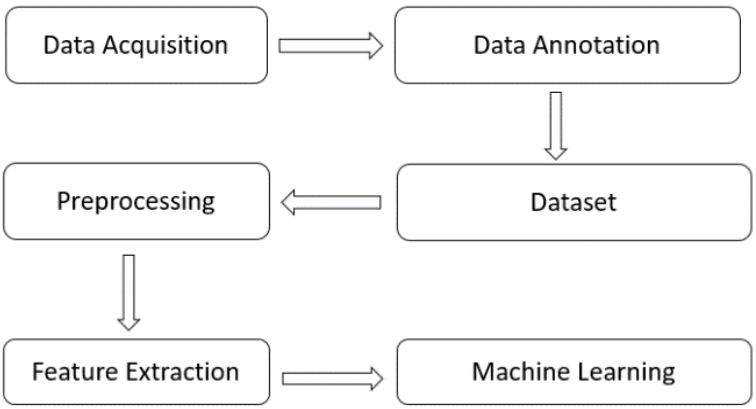

Fig: System Architecture

We used the Monkeypox Skin Lesion Dataset from Kaggle for this research. Images of skin lesions from the "Chickenpox" and "Measles" classes are also included in this collection together with the "Monkeypox" class. It's a binary classification dataset, meaning that photographs of chicken pox and measles are included in the "Others" class, while images of the monkeypox belong to the "Monkeypox" class. The dataset also includes the following three folders: original pictures There are 228 total photographs in it, 102 of which are of monkeypox cases and the remaining 126 are of other diseases, such as chickenpox and measles.

Images that have been enhanced: Both sorts of augmented images can be found in this folder. Many image augmentation techniques are used in this, including rotation, translation, reflection, shear, hue, saturation, contrast and brightness jitter, noise, scaling, etc.

Fold1: This folder contains one of the datasets used in three-fold cross-validation. The following table shows how the photos in the Fold 1 folder's Train, Val, and Test folders are distributed:

1. Train: Monkeypox (980 cases) and Other Cases (1,162
2. Val: Other - 252 and Monkeypox – 168
3. Test: Others -25 and Monkeypox -20

V. CONCLUSION

Our project uses a dataset to address the ongoing monkeypox virus epidemic. The goal of this is to take pictures of patients who are infected with the monkeypox virus so that the disease can be identified from those pictures. Using various techniques, including the VGG16 model and image processing, we can differentiate patients with monkeypox symptoms in this experiment.

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