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Breast Cancer Detection using Histopathology Images and its Implementation through Chatbot and Drawing Comparison between Different Algorithm and Libraries

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Abstract: ***From the past few decades there is a solid increase in the frequency of cancer cases worldwide thus detection and identification at early stage is very crucial and is becoming more difficult with each passing day moreover there is scope of human error which makes it even more critical and tedious task.***
Thus, using Machine learning for cancer detection makes it task faster, accurate and effective.
Through our project we wish to draw an analysis among various algorithm and libraries that have been used to detect cancer moreover we have implemented the same through Densenet201 which is a 201-layer deep neural network and have proved itself most accurate and precise method for cancer detection (breast cancer detection) also its implementation using chatbot would allow it to integrate with other apps, software, websites effortlessly.This could in turn increase user interaction with the chatbot thereby spreading more awareness and knowledge about the disease because not many people know about the disease and its early detection and could help bust myths and facts about disease.
Our research also indicates that 96.4% people knew about the disease and 3.6% people were not aware about the disease moreover only 17.2% people were aware about males developing the disease and 37.9% people were aware about LGBTQ+ community developing disease. Also 62.1%-89.7% people were aware about the early signs. In addition to it 86.2% people knew about only one method of self examination and 72.4% people wanted to know more about the disease and get an accurate cure for it .

I. INTRODUCTION

Cancer is a medical condition where the cells undergo abnormal growth and can even infiltrate and harm healthy body cells. This continued abnormal growth leads to the formation of cell masses usually called tumours. The leading cause for this condition is the loss of a cell property called contact inhibition. According to it, normal cells usually inhibit their growth when in contact with other cells. Cancer cells lose this property and grow in an uncontrollable manner leading to the formation of tumours.
Tumours are broadly classified in two types:-

1) *Benign Tumours* – These tumours remain confined to a place and do not spread to the other parts of body.
2) *Malignant Tumours* – These tumours can spread to different parts of the body through blood. This type of tumour is fatal.

Agents which induce cancer are called as carcinogens.
Cancer is caused by biological (genetics, proto- oncogenes) , physical (X-rays, gamma rays) and chemical agents (carcinogens in tobacco).
Detection of cancer can be done in certain ways using the modern technological advancement in this western world.
Detection in early stages is considered as crucial because it helps in complete and successful treatment of the condition.The major detection is done through biopsy and histopathological study of tissue, blood and blood marrow to check the increased cell count.
But this process could be tedious and time consuming task which may or may not provide accurate results moreover there is scope of human error
Thus in this project "detection of cancer using histopathological images through chatbot" we aim to detect cancer (breast cancer) by using neural network densenet201
In order to achieve higher accuracy and get rapid results, also the usage of chatbot to implement the project will increase the accuracy of the results even more.

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II. WORKING OF PROJECT/RESEARCH

Dataset was collect and sorted out and cleaned for any outlier present, dataset was divided into 2 types where 1 is malignant and 0 is benign. The dataset is then supplied to the algorithm and libraries such as densenet201, tensorflow, keras.

The algorithm is then trained to identify different histopathology images and classify them as benign or malignant this was implemented through chatbot and chatbot is trained and supplied with various questions about self examination and when user uploads the histopathology image the chatbot classifies itself as benign or malignant and also chatbot determines the stage of cancer in case of cancer.

The use of neural network Denset201 has been made here because out of all the different methods used so far in developing the project has proved out to be less effective as neural network can take into consideration many minute details available in the dataset and thus supplies comparatively more accurate results also a 201 layer deep neural network is able to identify hidden patterns, find correlations ,clusters and helps in classifying whether the patient has cancer or not if yes then which type and stage just by uploading an histopathology report in the chatbot. We also implemented the same through different other algorithms and libraries such as Support Vector Machine, Logistic Regression , K-Nearest Neighbour,Naive Bayes,MobilenetV2 and Decision Tree classifier and drawn a comparison among them.

III. CONCLUSION AND FUTURE SCOPE

Here we have compared the several Machine learning algorithms in terms of their accuracies.

When we used Support Vector Machine, the accuracy is 0.57884 and the accuracy on standard scaled data is 0.95491 .

When we used Logistic Regression, the accuracy is 0.97368 and the accuracy on standard scaled data is 0.55361 .

When we used K-Nearest Neighbor Classifier, the accuracy is 0.93859 and the accuracy on standard scaled data is 0.57994 .

When we used Naïve Bayes Classifier, the accuracy is 0.94746 and the accuracy on standard scaled data is 0.938596 .

When we used Decision Tree Classifier, the accuracy is 0.947368 and the accuracy on standard scaled data is 0.75438 .

When we used Random Forest Classifier, the accuracy is 0.97368 and the accuracy on standard scaled data is 0.754385 .

When we used MobileNetV2, the accuracy is 0.94736 and the accuracy on standard scaled data is 0.947368.

When we used DenseNet, the accuracy is 0.9609 and the accuracy on standard scaled data is 0.9660.

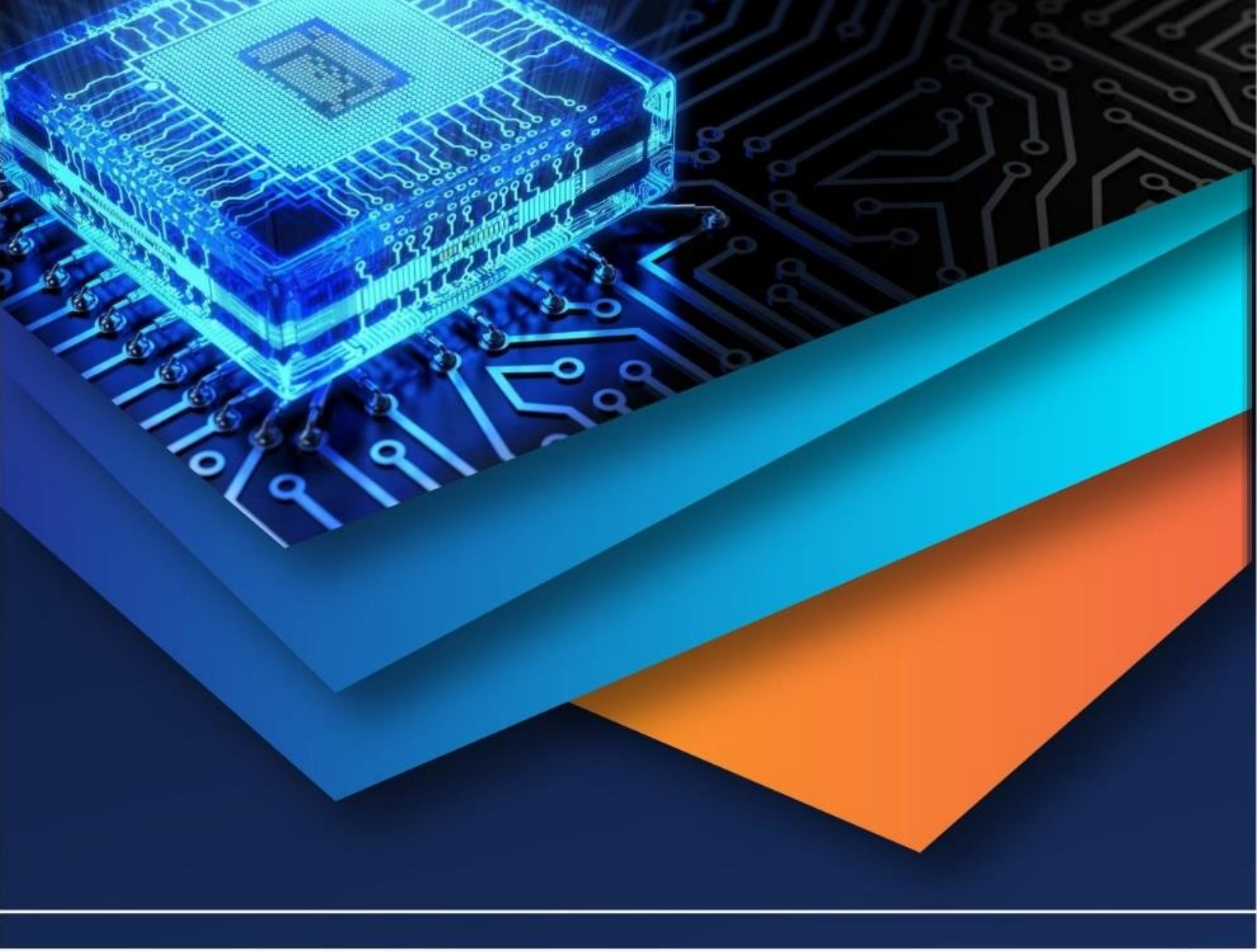
We have used DenseNet201 because it is 201 layer deep neural network which adds connections or shortcuts between different layers. It receives outputs from previous layers and combines and conceives them into next layer and adds depth to the result. The computational level of accuracy increases drastically for complex dataset when more simpler methods are used for the same data set.

The future implications of the project are numerous. We wish to implement the same algorithm and libraries for the detection of different types of cancers (such as lung cancer, prostate cancer, Brain cancer etc.), Tumors, leukemia etc. this could help with early detection and treatment and control of the diseases. It might also prove beneficial in early detection of diseases which can turn into pandemic such as covid 19, this too could help in early detection and control of diseases and thus prevent them from creating an epidemic situation.

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