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LUNG CANCER DETECTION USING CONVOLUTIONAL NEURAL NETWORK

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Abstract : Cancer has become a nightmare in the past few years with an increased mortality rate amongst those diagnosed with it. Early cancer detection was not possible in the past years due to a lack of knowledge, research, and slow medical development. With the changing world and growing economy, now it is possible and has become a boon to the living. Here we use artificial intelligence. An area where the system replicates human actions understands and performs computations based on its training. Deep learning is another branch of AI. Neurons in humans transmit information to the brain using electrical impulses and the brain computes the information. Similarly, in AI, we have artificial neurons that analyze the trained data and store this information. It studies this trained data and remains quiet till a new attribute is given as the input and has to be classified. Based on the previous knowledge, it classifies the new attribute and performs the operation. This is called by the name instance-based learning. AI is a field that has emerged and is growing rapidly across the world.

1. INTRODUCTION

Neural networks mimic human actions. The difference is it utilizes using an artificial neuron and computes the result. Multi-layered perceptron is used to analyze images. They have 3 layers including the hidden layer. The multi-layered neural network uses a sigmoid activation function. It takes the input as attributes associated along with its weights. It looks as shown below.

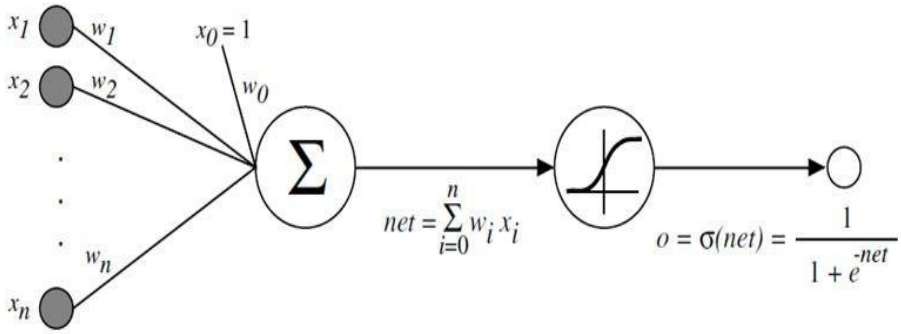

Figure: A Sigmoid Threshold Unit

The sigmoid function is:

$$o = \sigma(\vec{w} \cdot \vec{x})$$

Where,

$$\sigma(y) = \frac{1}{1 + e^{-y}}$$

Where w is said to be the weight associated with the attribute. The importance of the attribute here in AI is calculated by its weight. And 's' stands for the attribute in the dataset that needs to be classified. The values x1,x2…xn are the attributes given as input, and the w1,w2…wn are the weights associated respectively.

Coming to understanding the working of a perceptron, it uses various machine learning algorithms to classify and compute the output. CNN is one such deep learning image computing algorithm that computes the required analysis. 3 phases of

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image processing occur here. Image pre-processing, segmentation, and feature extraction. After that, the cancer detection is computed.

II. LITERATURE SURVEY

Tiwari A K [1]: Prediction of lung carcinoma using image processing techniques: A review. In the published paper, the author talks about how lung cancer complicates the task of detecting cancerous cells because they overlap each other and grow rapidly. Also, the author classifies image data collected by various authors. In conclusion, he says that there are various techniques and algorithms which can be applied to scanned images for the early detection of cancer cells present within the lungs. Also, pattern recognition plays a vital role.

Kulkarni A et al. [2]: Lung Carcinoma Detection Using Deep Convolutional Neural Network. This article shows the methodology within which lung carcinoma detection is forwarded by feeding these pictures to research and detect the presence of cancer cells. The Lung Image Database Consortium was used to obtain the dataset (LIDC). In order to comprehend and become familiar with lung cancer, the neural network based on convolutional and watershed segmentation has been constructed in MATLAB. Feeding the input image, pre-processing, feature extraction, locating the cancer spot, and showing the user the results are all steps in the process.

Hatuwal B K et al. [3]: Lung cancer detection using convolutional neural networks on histopathological images. This research work presents lung cancer detection using histopathological images. A convolutional neural network (CNN) was implemented to classify an image into three different categories benign, Adenocarcinoma, and squamous cell carcinoma. The model was able to achieve 96.11% and 97.20% of training and validation accuracy. The precision, f1-score, recall were calculated, and a confusion matrix plot was drawn to measure the model performance.

S. Sasikala et al. [4]: Lung Cancer Detection and Classification Using Deep CNN: To identify the malignant tissues visible in the input lung CT image, a convolutional neural network-based system was put into place. For system training, a lung image with various malignant tissue sizes and shapes has been fed. The suggested approach has a 96 percent accuracy rate for determining if malignant cells are present or absent.

Samhitha .B .K et al. [5] : Prediction of Lung Cancer Using Convolutional Neural Network: The goal of the method for the classification of emerging lung knobs from distinct depth layers is to distinguish highlights of varied depths using CNNs. Convolution neural network (CNN) technology is employed in the framework that is being suggested. The CNN technique is genuinely categorised as yield since it uses basic visual information as information and is increasingly computerised. The preparation and use of a single CNN model is more advantageous than using an AI computation.

Khan. A et al. [6]: Convolutional Neural Networks-Based Classification for Lung Cancer Identification: For classifying lung nodule CT scans into carcinogenic (malignant) and non-cancerous lung nodules in our research, we used deep convolutional neural networks (benign). Pre-processing was done in order to make the input CT images' sizes and formats equivalent before applying them to the network model. The dataset we used for our study is a part of the LIDC dataset.

Alakwaa .W et al. [7] 3D Convolutional Neural Network (3D-CNN) for Lung Cancer Detection and Classification: Using U-Net architecture, we created a deep convolutional neural network (CNN) architecture in this paper to identify lung cancer patient nodules and identify the interest locations. For 3D CNN, this stage serves as preprocessing. On the test set, the deep 3D CNN models fared the best.

Gawade P [8] : Prediction of lung cancer using image processing techniques : A review :The method is applied in two steps in this research. 1) filter and segmentation processing for noisy input images 2) CT image morphological procedures. The final image from the CT input image shows the area of the lungs impacted by cancer. Other cancer forms, such as skin cancer and breast cancer, can also be treated using the suggested approach. Additionally, it has use in medical research.

Matsuyama E [9] : Prediction of lung cancer using image processing techniques : A review : In this study, we suggested an over transfer learning technique that connected the newly created full-connected layers to the Alex Net-based pre-trained network. Classification of four forms of lung cancer from lung CT scans included normal instances using wave let coefficients as inputs. We also assessed a traditional transfer learning method and an SVM-based method in order to confirm the suggested method's applicability and efficacy. With the help of the LL, HL, and LH components, our suggested strategy achieves an overall accuracy of 91.9 percent. The accuracy as a whole is greater than what was attained using the other two methods. This proves that the suggested approach is superior. Another benefit of the suggested approach is that it does not require removing the suspicious lesion as in

Hindawai A K [10] : Using Deep Learning for Classification of Lung Nodules on Computed Tomograph Images : Three significant deep neural networks were used and thoroughly assessed in this article. The prediction in the benign and malignant pulmonary nodules classification Table 5: Comparative analysis of different publications LIDC-IDRI compared Journal of Healthcare Engineering. According to the trial findings, the CNN archive performed better than the DNN and SAE. Due to the limits of the data sets, the layers of the neural network in this article are quite thin. We can anticipate that the suggested strategy will increase the other database's accuracy. The technique can be used in the future to design high-performance CAD systems for various medical imaging jobs.

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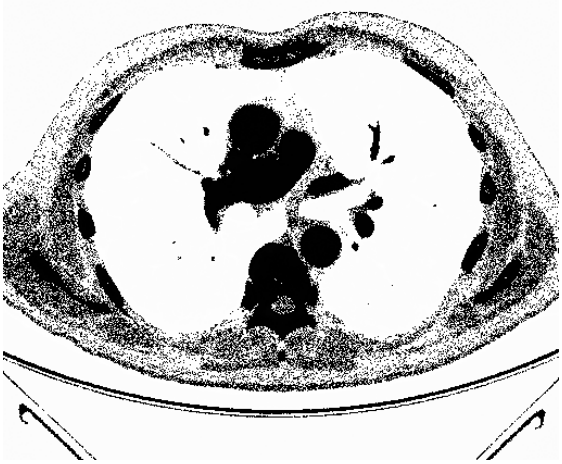
III. DATASET

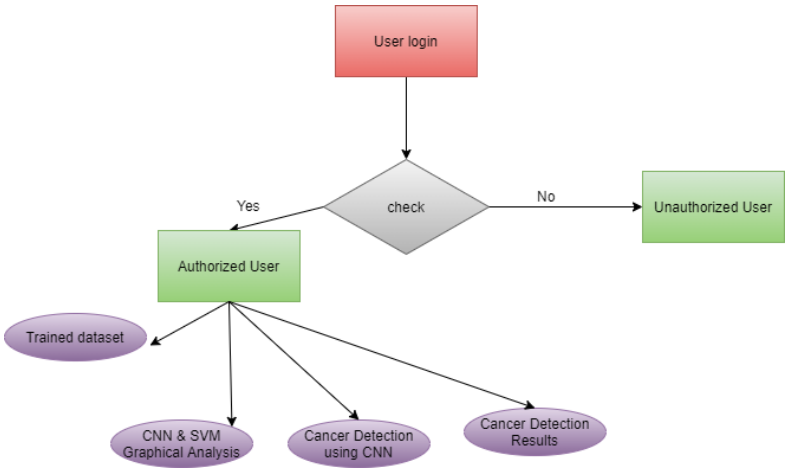
The dataset we have used consists of CT scan images of the lung. These images will be scanned and analyzed using the algorithm and the presence of cancer cells will be computed.
The image will go through several phases of scanning and only the part of the CT image that is needed to predict the cancer will be taken for input.



CT(Computerized tomography) image gives us a cross-section of a particular body part. It shows the cut out slice of the section we need. CT scan images are widely used for detecting any diseases or abnormal presence or abnormal growth of cells. Here, the image will be classified and scanned to detect the presence of cancer cells.

IV. MODULE DESCRIPTION

4.1 Data Collection:
The dataset we have used here is the Lung Cancer Dataset that consists of the compiled set of CT scanned lung images. Originally released under the name of UCI lung data repository but later changed to the above name. This dataset was used to demonstrate the best discriminant plane's potential in poorly-posed scenarios. The information on the pathological subtypes of cancer is contained in this dataset..
4.2 Segmentation
In the pre-processing phase we use lung parenchyma segmentation particularly for lung diseases. The resultant image is directly impacted by this pre-processing. Quicker and exact segmentation results have more clinical importance than any. Segmentation plays a vital role here.
4.3 Feature Selection
In our project, the attribute is evaluated by computing the correlation between the attribute and the class before the feature extraction process begins. Finding a highly relevant subset of traits that are uncorrelated with one another is the primary goal of CA. The dimensionality of datasets can be significantly decreased in this method, and learning algorithm performance can be enhanced.sER diagram:



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Since we are using convolutional neural networks, our system supports only images. These images, that is, raw images, will be classified using SVM (Support Vector Machine) algorithm. This algorithm provides a decision border to classify images into various classes. Later these images will be scanned and the lung cancer detected.

As shown in the above diagram, the ER diagram shows the relationships between the entities. Here it starts from the user login. If the user is registered and has an authorisation, then it will proceed to get the trained dataset. After collecting the data, the images will be scanned and classified using the Support Vector Machine algorithm. Then the classified images will go through CNN to detect the presence of cancer cells in the lungs. Then it shows the output. If not an authorized user, then the process ends.

Design methodology can be expressed using various diagrams like the data flow diagram etc. We use here the entity relationship diagram.

V. CONCLUSION

Lung cancer, as already known to the world, stands as one of the most deadliest diseases. Early detection plays a very vital and supportive role in identifying and in treatment. Our project, hence, thrives to fulfil this task. This paper focuses on effectively using algorithms that is used here.

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