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Analysis of Lung Cancer Staging (using TNM)

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ABSTRACT
When cells withinside the lungs alter, lung most cancers occur. This is often because of inhalation of unsafe chemicals. However, lung most cancers can increase in humans who've by no means been uncovered to toxins. Cancer cells, not like ordinary cells, develop out of manipulate and create tumors, which harm wholesome lung tissue. The 2d maximum common malignancy is lung most cancers. Men are much more likely to increase prostate most cancers, whilst girls are much more likely to increase breast most cancers. According to the American Cancer Society, over 236,740 new instances of lung most cancers might be identified withinside the United States in 2022. Lung most cancers debts for about 130, a hundred and eighty deaths .Most Lung cancers impacts the bulk of human's elderly sixty five and beyond; only a small percent of these identified are below 45. People are usually round 70 years antique whilst they may be identified.

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I. INTRODUCTION

Cancer is a disease in which certain cells of the body grow out of control and spread to other parts of the body. Cancer can begin practically anywhere in the trillions of cells that make up the human body. Human cells normally expand and multiply (via a process known as cell division) to generate new cells as needed by the body. Cells die as they become old or injured, and new cells replace them. This ordered process can sometimes break down, resulting in aberrant or damaged cells growing and multiplying when they shouldn't. Tumours are lumps of tissue formed by these cells. Tumours may or may not be malignant (benign). Cancerous tumours can infect adjacent tissues and spread to other parts of the body, resulting in the formation of new tumours (a process called metastasis). Malignant tumours are another name for cancerous tumours. Many malignancies, including leukaemia's, create solid tumours, whereas cancers of the blood do not. Benign tumours do not penetrate or spread into surrounding tissues. When benign tumours are excised, they rarely return, whereas cancerous tumors do. However, benign tumours can grow to be extremely enormous. Some, such as benign brain tumors, can produce serious symptoms or even be fatal.

LUNG CANCER

Lung cancer is a cancer that starts in the lungs and spreads throughout the body. Your lungs are two spongy organs in your chest that take in oxygen and expel carbon dioxide when you breathe in and out. Lung cancer is the most common cancer-related death worldwide. Lung cancer is most common in smokers, although it can also strike persons who have never smoked. The length of time and number of cigarettes you smoke increases your risk of lung cancer. Even if you have been smoking for a long time, quitting smoking can greatly reduce your risk of lung cancer. In the early stages of lung cancer, there are usually no signs or symptoms. Lung cancer signs and symptoms usually appear when the disease is advanced.

STAGING OF LUNG CANCER USING TNM

Doctors most commonly use the TNM staging technique to stage non-small cell lung cancer. It's also used to treat small cell lung cancer. Tumor, Node, Metastasis is the acronym for Tumor, Node, Metastasis. The term tumor refers to the tumor's size (area of cancer). The T stage can be described in this way. The term "node" refers to whether or not the cancer has progressed to the lymph nodes. If cancer has spread to another portion of the body, it is called metastasis (M).

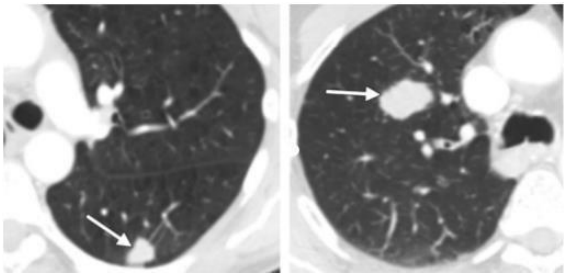


Fig: Stage T1 tumor's (Chest CT scan)

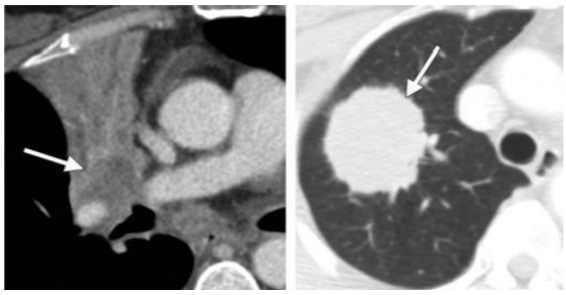


Fig: Stage T2 tumor's (chest CT scan)

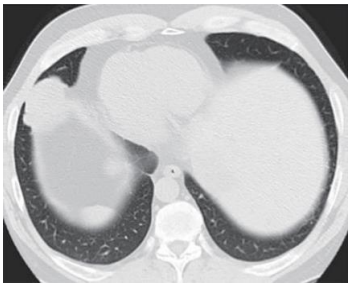
LUNG CANCER STAGING

Lung cancer is the world's second most frequent cancer. It is the most prevalent male cancer and the second most frequent female cancer. In 2020, there were about 2.2 million new cases of lung cancer. The tables below show the ten countries with the highest rates of lung cancer and the largest number of lung cancer fatalities in 2020. Age-standardized rates (ASR) These are a summary measure of the disease rate that would exist in a population with a standard age structure. When comparing populations that differ in age, standardization is required since age has a significant impact on the risk of dying from cancer.

STAGING OF TUMOR (T)

The T-stage is determined by the size of the main plant in the long axis is measured in the multiplanar reconstruction, and its involvement with adjacent building (s) (7). Tstage, prognosis was analyzed in patients tumor is more than 7 cm, prognosis is similar to other T4 adjectives

Tumor Description	7th	8th
Within main bronchus >2 cm of carina	T2	T2
Within main bronchus <2 cm of carina	T3	T2
Invasion of visceral pleura	T2	T2
Obstructive atelectasis (partial)	T2	T2
Obstructive atelectasis (whole lung)	T3	T2
Local invasion of chest wall, parietal pericardium, phrenic nerve	T3	T3
Local invasion of diaphragm	T3	T2
Invasion to mediastinum, trachea, heart/great vessels, oesophagus, vertebra, carina, recurrent laryngeal nerve	T4	T4
Satellite nodule (same lobe)	T3	T3
Satellite nodule (different lobe, same lung)	T4	T4



This is the T4 tumor based on 8th edition but previously.

Rank	Country	Number	ASR/1
	World	*1,796,144*	*18.0*
1	Hungary	8,920	42.4
2	Serbia	7,084	40.0
3	French Polynesia	129	36.0
4	Turkey	37,070	35.9
5	Guam	86	35.1
6	Poland	27,444	32.8
7	Bosnia and Herzegovina	2,240	32.1
8	Montenegro	370	31.6
9	France,New Caledonia	124	31.4
10	Croatia	2,984	30.9

Table: T- descriptors in 8th edition compared with 7th

STAGING OF NODULE (N)

A nodal platform assesses plant load in the region hilar and mediastinal nodes (7). The nodal sections have been able to differentiate patients at different times a prognostic group and remain unchanged from the beginning system (Table 3). Nodal channels are described in IASLC location map has been developed for version 7 of TNM (14). Examination analysis of pathologically isolated cases suggested that prediction could be interpreted more accurately plus the number of channels on the N1 as well this is the location of the N2. In short, nodal channels beyond that involved, the prediction is very bad. Thus, they are more accurate the division of the N1 into N1a (single channel, philateral hilum) and N1b (multiple channels); and N2 to N2a1 (one N2 station without N1 involvement), N2a2 (one N2 station including N1) and N2b (multiple N2 in channels) proposed pathological planning. A detailed analysis of the pathological classified cases indicates that the survival rate of 5 years in the population M0 patients fully operated on :The different categories of N are: N1a, 59%; N1b, 50%; N2a1, 54%; N2a2, 43%; and N2b, 38%. A different mediastinal nodal disease other than N1 disease has a similar condition more involvement of the N1 station (15).

N- stage	Nodal descriptor
Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in ipsilateral peribronchial and/or hilar lymph node and intrapulmonary node, including involvement by direct extension
N2	Metastasis in ipsilateral mediastinal and/or subcarinal lymph nodes
N3	Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral, or contralateral scalene, or supraclavicular lymph node(s)

Table: 8th edition for N Descriptors

STAGING OF METASTASIS (M)

The M-line is defined by the presence of metastasis across regional lymph nodes. In version 8, this data extracted and analyzed in 1,059 patients that were subsequently registered with electronic data capture system (EDC). Analysis verified 7th edition definition of intrathoracic metastatic disease, and this definition is kept as such. However, when extrathoracic metastases were considered, four patients One extra thoracic metastasis has better prognosis than those with more metastases, with lower survival 11.4 months instead of 6.3 months, regardless it is a single or multiple involvement. Therefore, M1b it is also included in the M1b and M1c to help better define it oligometastasis . Moreover, it may also to help define a group of local aggressive patients treatment, in addition to systemic therapy, is very appropriate (Table 4). M1a plants have the same prognosis as M1b, though they are kept separate as they may need a different one therapies and diagnostic method. In harmony from The IASLC Staging and Prognostic Factors Committee, for purposes of clarity and similarity in reporting, pleural the disease is considered M1a. However, if the metastatic wound outside the pleura, which includes the chest wall or contralateral diaphragm, considered extra-thoracic metastasis.

M-stage	Descriptor
M0	No distant metastasis
M1a	Separate tumor nodule in a contralateral lobe; pleural nodules or malignant pleural or pericardial effusion
M1b	Single extrathoracic metastasis or involvement of a singleee node
M1c	Multiple extrathoracic metastasis in one or several organs

8th edition for m descriptors, introducing M1c known as extrathoracic metastasis.

STAGE GROUPING

T / M	Subcategory	N0	N1	N2	N3
T1	T1a	IA1	IIB	IIIA	IIIB
	T1b	IA2	IIB	IIIA	IIIB
	T1c	IA3	IIB	IIIA	IIIB
T2	T2a	IB	IIB	IIIA	IIIB
	T2b	IIA	IIB	IIIA	IIIB
T3	T3	IIB	IIIA	IIIB	IIIC
T4	T4	IIIA	IIIA	IIIB	IIIC
M1	M1a	IVA	IVA	IVA	IVA
	M1b	IVA	IVA	IVA	IVA
	M1c	IVB	IVB	IVB	IVB

There are other modifications to stage groups, accepting new T and M categories, as well divding groups into very different survival result. This will affect the treatment options in certain patients. Stage Ia is now divided into Ia1, Ia2 and Ia3 to reflect the subdivision of sub-T1a, T1b and the new T1c.Similarly, phase IV is now divided into IVa and IVb; IVb to show multiple extrathoracic metastasis. Phase IIIC was added to the most advanced display in the area stages of the disease with T3 or T4 tumor, which are associated with it N3 disease. This section shows the worst predictions the effect can be seen in conditions involving the remaining plants in section IIIB. Reduction of endobronchial ulcer from T3 to T2, it is also seen in the lower transition of categories. The changes are described in Table 5. There is a great difference of life between stages with the exception of phase IIIc and IVa, which are always classified as represent different types of illnesses; in the middle loco regional and metastatic disease.

II. LITERATURE SURVEY

Automated AJCC (7th edition) staging of non-small cell lung cancer (NSCLC) using deep convolutional neural network (CNN) and recurrent neural network (RNN) (Moitra* & mandal, 2019)

The very purpose of the current research is to automate the AJCC (7th edition) process of the NSCLC stage through deep convolutional neural network (CNN) hybrid and RNN. Indepth learning strategy is very successful the construction of a traditional neural network and much more other advanced mechanical learning methods for multiple occasions. Most of the available courses were intended

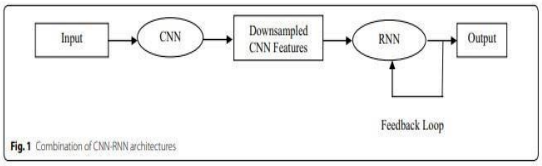


Fig.1 Combination of CNN-RNN architectures

in diagnosing Lung Cancer as anything benign or dangerous through the work of convolutional neural network or traditional neural network [17 - 20]. The research aims to make Deep simple but effective The RNN Integrated Learning Model AJCC (7th edition) default platform for NSCLC with a high degree of accuracy. The study also compares the effect of a proposed model with learning algorithms for a few advanced machines and a few similar investigations done before. Image processing operations performed on the research was conducted using MATLAB R2015 and various data mining activities were conducted using WEKA. 3.7.2. The CNN-RNN Model was relaunched executed on Python 3.5.5 with tensor flow back end with the keras library API. The whole paper is divided in the following sections: methodology, data acquisition, image processing, feature extraction, testing, outcome, conclusion and scope of the future. Such studies are rare testified to the best knowledge of the researchers of current study.

Cloud-Based Lung Tumor Detection and Stage Classification Using Deep Learning Techniques (Kasinathan &
Jayakumar, 2022)

Convolutional neural network (CNN) is popular with the human cortex and is one of the most common depths ways to learn among others. It is considered to be a feedforward network that contains many layers that are mean to them one way from input to outbound. When data is transferred process layer, useful features are excluded from the input data, and the result is displayed in the output layers. In health, used for disease detection in tissue samples. It promotes readable structures that are often difficult to understand folk medicine specialists. In CNN's proposed architecture, leads to the division of lung tumor segments into 9 classes described in Fig.

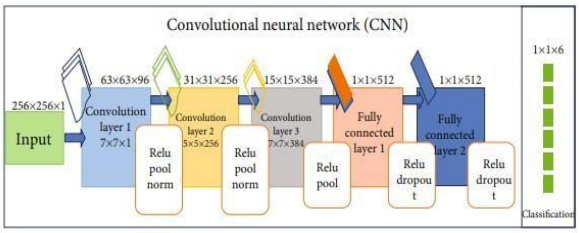


Fig: Architecture of Convolution neural network.

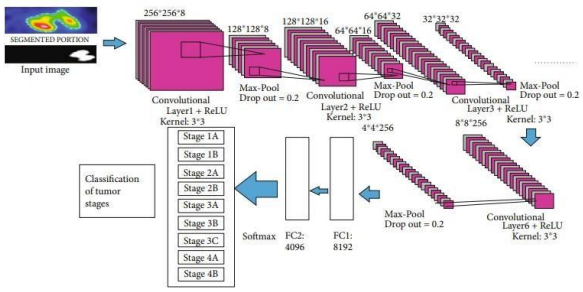


Fig: Proposed multilayer CNN architecture

Using Double Convolution Neural Network for Lung Cancer Stage Detection (Goran Jakimovski 1, 2019)

Image recognition in the Deep Neural Network is based on image classification, where Neural Network is trained to split an image into a list of pre-determined bulk or types. In its simplicity form, used to determine whether an object is visible or not. In our case, we have tried to separate the medical pictures and determine whether there convolution filters is the third image is cancer or not, thus we can simplify the effect of recognition as YES / NO (YES there is cancer or NO there is no). Neural Network needs to be trained to be able to used to separate images. This process takes a list of input data, which is provided on the network and the result is compared with the expected result. The inclusion data in our case was bulk CT images provided by the network, so that the installation layer can have as many input nodes as the size of list.

This way, the installation layer will have more nodes and the training will go slower again the network may override. So, add additional layers (i.e., max-pooling algorithm) that reduce size input data. Network output can be single 0/1 nodes or similar members. The exit layer, ours case, subtracting a single decimal value between 0.0 and 1.0 (0.0 (not cancer) or 1.0 (cancer)).

Since convolution results in images much smaller than the first, by using max-pooling, we reduce the size of these images become pieces of data, where we get a lot (a lot) of the whole picture.

This means that we seek cancer by raising the image to one layer and reducing the effects to the next by increasing bias (similarity) between adjacent letters of convolution. In convolution work, we used a lot of sharpening filters and saw edges. Filter on convolution is simple a matrix that combines an image matrix and the result is another image whose edge is sharpened. The resulting image for

Labelling and clustering-based level set method for automated segmentation of lung tumor stages in CT images (Devi1 & Sasikala1, 2020) .

The proposed program is evaluated using the most commonly available lung cancer database, the Lung Image Database

Consortium (LIDC)

With the exception of large numbers of image available on the website, proposed method is confirmed in 42 patients. Data sets are divided into six phases (Reeves et al 2015) based on tumor phases for

Table: T-Stages of Non-Small cell Lung carcinoma

Stage grouping	Stage description
T1mi	The tumor is minimally invasive adenocarcinoma, total size is < 3 cm and ½ cm invaded into deeper lung tissues
T1a	The tumor is less than 1 cm, seen within lungs and visceral pleura
T1b	The tumor is > 1 cm but < 2 cm, it does not affect the main branches of the bronchi
T1c	The tumor is > 2 cm but < 3 cm does not affect the main branches of the bronchi
T2a	The tumor is > 3 cm but < 4 cm, grown into the main bronchus
T2b	The tumor is > 4 cm but < 5 cm, grown into the main bronchus

Artificial networks are stimulated by the human brain that connects machine learning to solve complex problems. So, machine learning has a small set called deep learning are many deep learning strategies. In this section, we have discussed some common strategies among them.The artificial neural network (ANN) is DL a process that consists of several structural layers that it has perceptron, neurons. The convolution layer is one of the most important parts of CNN.

Non-Small cell Lung carcinoma as shown in Table. The T levels mentioned in this activity are adenocarcinoma (T1mi), adenocarcinoma in situ (T1a), adenocarcinoma (T1b), invasive adenocarcinoma. (T1c), squamous cell carcinoma (T2a, T2b), each of these categories have more than 5 patient data, each patient has more than one phase of CT scan and more than a hundred pieces. All images are in JPEG format extracted DICOM (Digital Imaging and Communications in Medicine) aircraft with a size of 512 × 512. All statistics are made using the MATLAB platform.

(DL). The DL method is used to extract features from bulk data; collecting useful information from big data using DL algorithms is helpful in many aspects. From finding the feature time consuming and expensive, DL methods do not require labeled data for learning purposes. In this case, we may have both types of labeled and nonlabeled data health care such as CT Scan images regardless of health status, large unregistered data, etc. Separation based on the database of images is shown in Figure.

Convolution is a mathematical process of combining two sets of data. Convolution is connected to the input data using convolution filters to create a map element. Convolution is over by sliding this filter over the input.

Using the LIDC-IDRI dataset, we segmented the tumor portion which is shown in Figure.

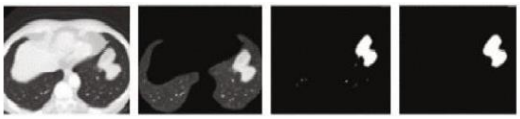


Fig: Segmentation of LIDC-IDRI dataset

III. METHODOLOGY

Deep Neural Network

In the challenges of supervised learning and reinforcement, neural networks are frequently used. These networks are built on a series of interconnected levels

ANN with many layers hidden between the input and output layers is known as the deep neural network (DNN). DNNs can represent non-linear relationships in the same way as shallow ANNs. The basic goal of a neural network is to take a collection of inputs, to make progressive calculations on it, and to produce results to solve real-world problems such as classification. We are limited in the use of deep neural networks.

Increase the width of the layers in the neural network to make it deeper. This improves network complexity and allows us to model complex tasks. The number of network weights, on the other hand, will increase significantly. In fact, normal neural networks may find it impossible to read such complex stories. Convolutional neural networks are the result of this.

CNNs are often used in machine learning, and are also used to monitor human activities for voice recognition. One could argue that all Deep Learning models are Neural Networks, but this is not true. If the algorithm includes at least two hidden layers, it is called "deep" (hence 4 layers in total that include input and output).

Neurobiology was the inspiration for the deep neural network models in the beginning. A biological neuron receives several signals through synapses of dendrites and transmits a single series of action forces outside its axon.

By dividing the input patterns into categories, the complexity of the different inputs can be reduced. Synthetic neural network models are made up of units that combine a few inputs and produce a single output, and are motivated by this understanding. Deep neural networks are now used in three different ways:

- Multi-layer perceptron
- Normal Neural Networks
- Convolutional Neural Networks

Multiple Layer Perceptron (MLPs):

A multilayer perceptron (MLP) is a type of artificial neural network (PN). MLPs of deep neural networks are simple, encompassing a series of fully connected layers. MLP machine learning methods can now be used to acquire the many computer resources required by modern deep learning structures.

Convolutional Neural Network (CNNs):

Another type of deep neural network is the convolutional neural network (CNN, or ConvNet). From a computer perspective, CNN is widely used. With CNN, the AI system learns to automatically extract elements of a set of images or videos from the real world in order to achieve a specific goal, such as image separation, face recognition, and semantic image separation.

Unlike layers that are fully integrated into MLPs, one or more layers of layers deliver simple input features by performing conversion functions on CNN models. Each layer is made up of non-linear functions of the weighted calculation in a variety of sub-sets adjacent to the area of the previous layer results, allowing the weights to be reused.

Recurrent Neural Network (RNNs):

A recurrent neural network (RNN) is a type of artificial neural network that feeds data sequentially. RNNs are designed to solve the problem of consecutive data entry time series. RNN models are commonly used in natural language processing (NLP) because they are advanced in data processing by incorporating dynamic lengths. The goal of AI in this context is to create a system that can understand the natural language spoken by people using techniques such as natural language modeling, word embedding, and machine translation.

Each subsequent layer in the RNN is made up of non-linear functions based on the results of the result statistics and the previous state. The basic RNN unit is called a "cell," and each cell has a layer and sequence of cells that allow repetitive neural network models to be processed sequentially.

T Parameter

The main tumour's size is used to calculate the T stage. In multiplanar reconstruction, the long axis is assessed, as well as its interaction with surrounding structures. T-stage consists with the prognosis of patients with NSCLC, whether they had chemotherapy or not, was examined. Absent metastatic disease or nodal involvement.

The pathologically staged patients were investigated further. Those who had been clinically staged were treated differently. Approximately the data was analysed from 30, 102 clinically staged individuals. In the two groups, the results are consistent. With each centimetre of tumour growth, prognosis worsens. Size, but there was no discernible difference in survival until more than 6cm tumour size.

Tumours that are larger than 5cm and less than 7cm corresponded to a T3 prognosis rather than a T2b. When a tumour grows larger than 7cm, the prognosis is poor which resembles other T4 descriptions.

Other tumour characteristics include participation of irrespective of its distance from the carina, the main bronchus is more associated with the prognosis of the T2 stage. This in contrast to passed iterations, in which proximity to T3 would be assigned to carina within 2cm.

Similarly, if no mediastinal invasion is present, obstructive regardless of whether atelectasis is T1 or T2, the lobe or the entire lung is affected. In the 7th whole lung involvement was classified as a T3 in this version. This change reflects the predictive value of the data.

On the other hand, diaphragm invasion is now classified as T4 rather than T3, because the prognosis is worse when compared to other cancers. Descriptors for T3 pleural mediastinitis invasion is difficult to describe clinically because it is not linked to other diseases. With clinical manifestation it is uncommon in the pathological stage. To locate mediastinal pleural invasion without pleural invasion. The latter is a T4 descriptor for mediastinal tissue. As such, the T subset no longer includes mediastinal pleural invasion. Changes to T descriptors in the 8th edition.

Although there is some consistency between ground-glass opacity on CT and lepidic pattern on pathology, it is not absolute, and clinical staging is subjected to modification after pathologic evaluation of the specimen.

Similarly, the solid component of a subsolid nodule usually correlates to the invasive component of an adenocarcinoma, however benign fibrous scars or areas of atelectasis might add to the solid component's dimension.

IV. PROPOSED ARCHITECTURE

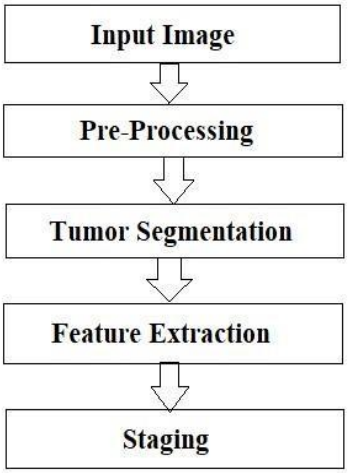


Fig: Process Architecture

Pre-processing Stage:

Pre-processing of data each medical imaging of the chest is scanned and saved. The quality of the medical chest image is harmed during scanning due to non-uniform intensity, changes, shifts, and disturbances. As a result, there is a need for image pre-processing, which aims to improve the quality of medical chest image in order to present them in an appropriate format, as well as cleaning the data by removing unwanted noise present in the scanned medical chest images without affecting the details to improve the image quality. This stage is critical in the diagnostic and analysis process. As a result, image filtering is a key step in the pre-processing process that improves image quality by increasing contrast and lowering noise.

Tumor Segmentation Phase:

The stage of segmentation is the second stage, segmentation, isolates the lung region from medical chest imaging in order to detect objects and boundaries (lines, curves, and so on) in images by partitioning a digital image into several segments (sets of pixels). Image segmentation, in more technical terms, is the process of giving a label to each pixel in an image so that pixels with the same label have certain visual features. The purpose of segmentation is to make the medical chest image more relevant and easier to assess by simplifying or changing its depiction.

Segmentation separates an image into regions, each of which is made up of connected pixels that are comparable in terms of grey levels, colours, and intensity. Image segmentation produces a set of segments that cover the full image collectively. This stage is useful for determining whether or not each individual pixel belongs in a region of interest (nodule detection).

Feature Extraction Stage:

Stage of feature extraction, we must determine whether all of the extracted regions are nodules after extracting the regions of interest. To separate actual nodules from false positive nodules, we must examine the characteristics of each nodule. The image features extraction stage is critical in the image processing because it removes the most interesting features and reduces image processing complexity. These characteristics will aid in the identification of tiny malignant nodules (for eg : regular and circular nodules are more likely to be benign, whereas irregular nodules are more likely to be cancerous). These characteristics were compiled into a data base for use as input in the classification procedure.

Classification Stage:

Stages of classification, the third stage is the classification stage, which seeks to characterise small lung nodules as benign (beginning stage of the cancer tumour) or malignant (an uncontrollable level of cancer tumour). Classification entails anticipating a specific outcome based on a set of inputs. The method uses a training set with a collection of attributes and a corresponding outcome to predict the outcome. The programme tries to find co-relations between the variables that can be used to forecast the outcome.

V. RESULT

The confusion matrix is a table method to see the performance of your guessing model. Each entry in the confusion matrix shows the number of predictions made by the model in which it classified the classes correctly or incorrectly.

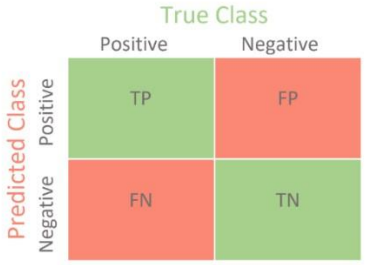


Fig: Confusion Matrix for Binary Classification

The metrics for the Confusion Matrix are:

True Positive (TP): This refers to the number of predictions that the classifier correctly predicts a positive class as positive.

True Negative (TN): It refers to the number of predictions where the classifier correctly predicts the negative class as negative.

False Positive (FP): It refers to the number of predictions where the classifier incorrectly predicts the negative class as positive.

False Negative (FN): It refers to the number of predictions where the classifier incorrectly predicts the positive class as negative.

Accuracy: It gives you the overall accuracy of the model, meaning the fraction of the total samples that were correctly classified by the classifier. To calculate accuracy, use the following formula: (TP+TN)/(TP+TN+FP+FN).

Precision: It tells you what fraction of predictions as a positive class were actually positive. To calculate precision, use the following formula: TP/(TP+FP).

Recall: It tells you what fraction of all positive samples were correctly predicted as positive by the classifier. It is also known as True Positive Rate (TPR), Sensitivity, Probabilit
of Detection. To calculate Recall, use the following formula: TP/(TP+FN).

Specificity: It tells you what fraction of all negative samples are correctly predicted as negative by the classifier. It is also known as True Negative Rate (TNR). To calculate specificity, use the following formula: TN/(TN+FP).

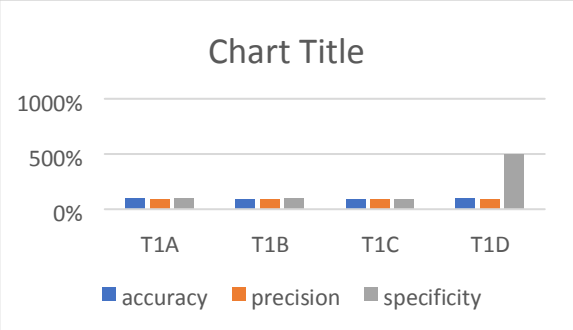
Fig :confusion matrix designed system

	1A	1B	1C	1D
1A	98	1	2	3

1B	1	95	2	2
1C	4	2	99	1
1D	1	2	1	98

Stage	1A	1B	1C	1D
Accuracy	97%	96%	96%	97%
Precision	94%	95%	93%	96%
Specificity	98%	97%	96%	98%
recall	94%	95%	95%	94%

Figure: Stage 1 A,B,C,D Parameters:



Bar graph

VI. CONCLUSION

TNM is a process which best suits for staging lung cancer. Although there were many enhancements made in this system, right from 6th edition to the currently used 8th edition .These changes led to the creation of new groups and modifications to the stage groups with changes to other groups. The 8th edition also introduces new guidelines for the staging of lung cancer with multiple pulmonary sites of involvement and new guidelines for tumor measurement.

By using the UNET model and CNN algorithm we are able obtain 4 stages of lung cancer in the current work. An accuracy of 97%,precision of 94% ,recall of 94%,and specificity of 98% is obtained .
In future further extension on metastatasis(M) staging can be done using new datasets.

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