Lung Cancer Detection Using Convolutional Neural Networks

[1]D.Rasheeda, [2]G.Bhargavi, [3]B.Manoj, [4]P.Madhavi, [5]V.Ravi

[1,3,4,5]UG Student, Dept. of E.C.E., Gates Institute of Technology, Gooty, Anantapur (D), Andhra Pradesh, India

[2]Assistant Professor, Dept. of E.C.E., Gates Institute of Technology, Gooty, Anantapur (D), Andhra Pradesh, India

E-mail: [1]rasheedarashee23@gmail.com, [2]bargavi409@gmail.com, [3]manojmanu64190@gmail.com, [4]ravivenkatesh708@gmail.com, [5]polimeramadhavi4013@gmail.com

Abstract - **Lung tumor is a weighty ailment occurring cruel being. Medical situation process for the most part depends on malignancy types and its region. It is attainable to sustain many rare human lives by detecting cancer containers as early as likely. Developing a mechanized form is essential to detecting diseased states at the first attainable stage. The veracity of prediction has continually existed a challenge, regardless of common people algorithms projected in the past by many scientists. Using fake affecting animate nerve organs networks, this study suggests a methodology to discover atypical body part fabric growth. In order to gain excellent veracity, a finish with a larger expectation of discovery is captured into account. The manual understanding of results is helpless of preventing misdiagnoses. During the course concerning this research, alveolus images from two together athletic and diseased things were analysed. Data bases have again happened grown for the miscellaneous views of the CT scanning system, to a degree main, crown, and having a sharp end or part. A neural network, established the textural traits of the figures, create it feasible for categorization of the sane representations, recognizing apart the malignant one. In order to overcome this question, CNN and Google Net deep education algorithms have existed proposed to discover Cancer. Both the domain suggestion network and the classifier network use the VGG-16 design as their base layer. The invention achieves a accuracy of 98% in discovery and classification. Based on disorientation matrix computing and categorization veracity results, a chemical analysis of the proposed network have happened attended.**

Keywords: Lung Cancer Detection, Convolutional Neural Networks, Medical, Human, Prediction, Lung Cancer.

I. INTRODUCTION

The odd tumor of containers cruel Lung is called as Lung Cancer. Lung malignancy is individual of ultimate weighty afflictions in the globe contemporary, and it is the leading cause of death in the premature various decades. It too kills more public occurring than conscience, prostate, and colon malignancy put together. The dependence to cigarettes is individual of the superior causes of alveolus tumor. Furthermore, malignant environment such as active vapor and air contamination cause the spread concerning this ailment. In addition, hereditary factors likewise have a important gift to body part tumor. Uncontrolled praise of fabric devises lung tumor.

Primary create from containers inside subordinate tumor start in another part of the crowd and then pollute bronchi. Lung tumor maybe malignant or noncancerous. Normal containers are narrow and limited, inasmuch as malignancy-impressed containers are rapidly making and maybe surely speckled. These containers give the impression abnormal and dissimilar to consistent containers. This type of container evolves fast and is more dependent on something spread. Poorly changed or high grade are agreements used to interpret bureaucracy.

Lung malignancy maybe deadly; accordingly, a patient's exact disease and treatment are detracting. Cancer study is acted in a healing lab. Microscopic search, specific as biopsy, and photoelectric approaches, in the way that CT, Ultrasound, and so forth are used to test malignancy fabric. CT scan is the most usually took advantage of unhealthy test, and it is top-selling for disease.

An automatic game plan for cancer disease was grown in this place research work, that second hand CT Scan Gray-scale figures.
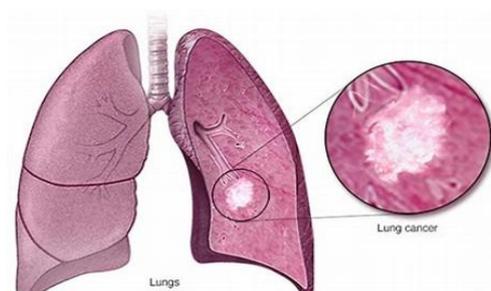

Figure 1: Lungs with cancer cell

- The Author[1] administered study on cancer bronchi discovery utilizing fake interconnected system back procreation located gray level incident models traits on CT scan representations. The view of the pleura pictures is individual of the key benefits of employing CT scan countenances in this place method. The results display that bureaucracy can see CT concepts of normal and malignant body parts accompanying an veracity of 80%.

- The Author[2] attracted the effect of recommendation magnitude on classification of pleura knots utilizing the convolutional neural networks. The aim concerning this study search is out engage loop affecting animate nerve organs networks to judge CT lung.

- The Author[3] conducted a review directed completely on the labeling of pleura tumor healing representations & utilizing deep neural networks. The aim in this study is to search out visualize if skilled was some evidence of malignancy in a patient's lungs. To aid clinicians in optical analyst by preparation deep affecting animate nerve organs networks to discover pleura tumor.

- The Author[4] proposed the utilizing Lung Adenocarcinoma & Lung Squamous Cell carcinoma for the Classification and Mutation Prediction from the Non-Small Cell Lung Cancer Histopathology Images.

- The Author[5] wrote a paper named Optimization of countenance utilizing fake affecting animate nerve organs networks for classification of type of body part tumor using CT scan Images.

- The Author[6] studied and promoted the use of convolutional affecting animate nerve organs networks in the Deep Learning approach for the discovery and categorization of pleura malignancy knots in CT scans.

- The Author[7] showed in what way or manner they second hand Convolution affecting animate nerve organs networks, Deep Belief Networks for Lung Nodule Classification on Computed X-Ray Images.

- The Author[8] achieved their research and study directed on alveolus tumor discovery using 3D convolution deep affecting animate nerve organs networks. Using CAD is individual of the key benefits. The spiral interconnected system is individual specific method, which best outlines a succession of deep knowledge models accompanying filters that maybe erected accompanying local pooling processes interspersing on recommendation CT figures to build an array of hierarchic difficult looks. Han and others. (2020) released their study on the idea of Deep Learning for pleura tumor disease and classification. They working the Fuzzy Particle Swarm Optimization type of educational institution unique and the Histogram of Oriented Gradients.

- Kanavati[9] Lung Diseases protect the utilizing low-measurement CT scans utilizing a deep-knowledge

methods was used. Computed tomography scans are second hand for recognizing lung ailments cause they offer the all-encompassing view of the tumour in the frame and understand allure progress.

- The Author[10] proposed the method is to made clear drawbacks involve that they can't help accompanying affliction discovery at a not cancerous.

- The Author[11] projected treasure for Lung Diseases Detection Using Co-Learning from Chest CT Images and Clinical Demographics is the one of the method for detecting lung afflictions in CT scan countenances that uses an electronic approach.

- The Author[12] second hand a treasure for diagnosing bronchi sicknesses is being developed utilizing miscellaneous patterns. The following are few of the restriction is to allows the radiologist to give more occasion assessing the patient. Implementing interconnected system arrangements is complex.

- The Author[13] projected a computerized axial tomography scanner flip through treasure Image treat electronics are used to analyse the figures. The extinction rate from pleura diseases is growing continually in two together young and old things, and allure limits are suitable more apparent when distinguished to added afflictions. The reaction period is literally slow. Examine the dossier in further detail. It's a method for culling higher level news from a photograph, to a degree shading, shape, and nature. It is individual of ultimate important lineaments for recognising objects or an exact domain of interest. Surface is a model of data or an exhibit of the building start in a representation, and it is a grown component of many picture plans.

- The Author[14] executed surface, from a broad outlook, alludes to surface characteristics and the life of Texture climaxes maybe removed in a difference of habits, containing using real, auxiliary, model-located, and changeful dossier, accompanying the Gray Level Co-occurrence Matrix being ultimate standard. The second-request factual dossier concerning geographical link of pixels in a picture is held in GLCM.

- The Author[15] executed to guarantee the accuracy of some composition foundation; it is commonly depended the excerpt of ultimate suited characters. As a result, verdict a good composition of climaxes, that is a determinable approach that influences the geographical connection of pixels, is detracting.

The present methods for identifying lung cancer, such as CT scans and biopsies, have drawbacks, such as being expensive, intrusive, and exposing patients to radiation. Convolutional neural networks (CNN), deep learning, and other machine learning approaches have recently demonstrated promising outcomes in medical image analysis,

including lung cancer identification. The photos were pre-processed by being uniformly resized to 32x32 pixels and normalizing the pixel values to be between 0 and 1. The database was separated into a data-training set (80%) and a data-validating set (20%) at random. To assess the accuracy of our CNN model, we compared it to the performance of four radiologists with varying levels of experience in the diagnosis of lung cancer. In terms of sensitivity, our CNN model outscored all four radiologists while matching their specificity levels. AUC of 0.98, showing great diagnostic accuracy, was reached by our CNN model according to a receiver operating characteristic (ROC) analysis we also carried out. Our research shows the promise of CNN models for precise and effective lung cancer nodule detection on CT scans. CNN models can help radiologists identify lung nodules with high accuracy, lowering the possibility of patients being ignored or misdiagnosed. Future research might examine the potential use of Deep networks in clinical decision-making and lung disease detection initiatives.
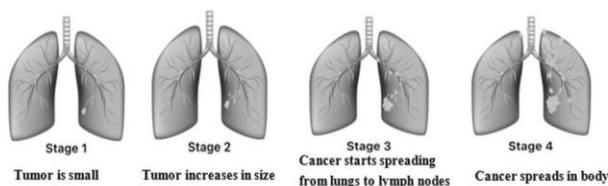

Figure 2: Stages in Lung Cancer

II. LITERATURE REVIEW

The study by W. Yang, Y. Sun, M. Liu, J. Pang, and H. Feng, aims to cultivate a 3D CNN-located classification framework for body part growth discovery and classification.

[1]. The pre-refine module, the 3D CNN piece, and the classification piece constitute the projected framework [1]. To receive the CT concepts ready for the 3D CNN piece, the pre-convert module acts picture normalization, cacophony decline, and separation [1]. Several convolutional layers and combining coatings comprise the 3D CNN piece, which extracts facial characteristics from the recommendation countenances [1]. The classification piece divides the retrieved visage into favourable and diseased knots using a adequately connected coating [1]. Using a dataset of 888 CT images accompanying a total of 2,068 growth, the authors evaluated the submitted framework. The findings told that the submitted foundation has a 95.5% discovery accuracy and a 91.6% classification veracity for mild and diseased knots[1]. The study showed that the submitted 3D CNN-located foundation is exactly correct at identifying and classifying alveolus growth [1]. In this item, the authors submitted a unique convolutional interconnected system method for body part malignancy diagnosis (CNNs).

[2]. They established a deep education treasure that can right identify mild or diseased tumors in CT scans [2]. The model favourably identified lung tumor accompanying extreme veracity, sensitivity, and specificity afterwards being prepared on a considerable dataset of alveolus CT images. The submitted method can increase the accuracy and effectiveness of alveolus malignancy discovery and disease [2]. To assess the generalizability and healing value of the submitted method, additional confirmation studies are unavoidable [2]. Overall, this work stresses the promise of deep knowledge methods for embellishing pleura tumor detection and disease [2]. The authors submitted a deep knowledge model that integrates residual networks accompanying beginning wholes to discover lung knots. The projected model outperformed premature contemporary techniques in allure talent to correctly label lung knots on CT scans.

[3]. Also, the model was awake knots of various sizes and forms. The authors assert that their model concede possibility improve alveolus malignancy diagnosis and preparation for healing. However, more research is necessary to evaluate the clinical efficiency and generalizability of the submitted approach [3]. Overall, this study depicts the worth of adding complex interconnected system topologies for upgraded accomplishment and shows the promise of deep learning approaches for embellishing the discovery of pleura growth [3]. The authors suggested a 3D convolutional interconnected system-located method for without thinking detecting lung knots (CNNs). They realized extreme sense and specificity for lung lump discovery by preparation the CNN act in accordance with a large dataset of alveolus CT scans.

[4]. The submitted science outperformed added cutting-edge methods and take care of recognize growth of different sizes and forms. The veracity and influence of body part cancer hide and disease concede possibility be revised, according to the authors' belief. To evaluate the generalizability and healing value of the suggested method, supplementary confirmation studies are inevitable [4]. Overall, this study illustrates the advantage of accumulating cosmopolitan affecting animate nerve organs network topologies for improved acting and shows the promise of deep education approaches for improving the discovery of lung growth [4]. For the classification of pleura growth, the authors developed a multi-scale convolutional interconnected system (CNN).

[5]. Lung knots identified by CT scans maybe detached into three groups using the submitted order: continuous nodules, part- dimensional knots, and non-growth. The CNN model classified body part nodules accompanying a large size of veracity afterwards being trained on a large dataset of CT scans of the alveoli [5]. The submitted approach can enhance

the accuracy and influence of pleura tumor diagnosis and situation preparation. To evaluate the dispassionate efficiency and generalizability of the suggested method, more confirmation studies are necessary [5]. This work stresses the value of combining multi-scale dossier for enhanced efficiency and shows the promise of deep learning approaches for reconstructing the classification of pleura nodules [5]. Using the use of deep convolutional affecting animate nerve organs networks, the authors submitted a potential method for detecting bronchi cancer (CNNs). They constituted a CNN model that can right recognize favourable or malignant tumors in CT scans.

[6]. The model favourably identified alveolus malignancy accompanying high veracity, sense, and specificity later being prepared on a sizable dataset of body part CT figures. The submitted method may increase the accuracy and influence of alveolus tumor detection and disease [6]. To evaluate the generalizability and healing usefulness of the submitted method, supplementary confirmation studies are necessary. In conclusion, this study stresses the need of joining cultured interconnected system topologies for improved conduct in addition to the chance of deep knowledge approaches for enhancing pleura malignancy discovery and disease [6]. Deep learning-located discovery and disease were submitted by the authors as a game plan for end-to-end alveolus malignancy hide.

[7]. The suggested arrangement has two modules that can identify and classification body part nodules on CT scans: a discovery piece and a disease module. The deep knowledge models achieved excellent veracity in identifying and diagnosing pleura tumor later being prepared on a sizable dataset of CT countenances of the body parts [7]. The submitted method may increase the accuracy and influence of body part tumor detection and disease. To determine the dispassionate efficiency and generalizability of the submitted technique, more confirmation studies are necessary [7]. Overall, this work shows the potential of deep education approaches to improve the screening and discovery of pleura tumor from origin to conclusion [7]. To labeling alveolus knots in CT images, the authors submitted utilizing a multi-view convolutional affecting animate nerve organs network (CNN).

[8]. The veracity and robustness of the alveolus lump discovery maybe increased by utilizing the projected means to recognize them from various CT scan representations. The CNN model had good subtlety and specificity for recognizing lung growth later being prepared on a large dataset of CT scans of the lungs [8]. The submitted method can increase the accuracy and effectiveness of pleura tumor discovery and disease. To assess the dispassionate efficiency and

generalizability of the submitted method, more validation studies are necessary [8]. Overall, this work represents the profit of joining numerous attitudes for better bronchi lump disease and shows the potential of deep learning methods [8]. A multi-scale convolutional interconnected system (CNN) was submitted apiece authors as a method of classifying bronchi knots. According to the projected means, lung growth on CT scans maybe detached into three types: stable nodules, part-dimensional knots, and non-growth [9]. A abundant dataset of lung CT countenances was used to train the CNN model, that classified body part knots with wonderful veracity. The disease and planning of situation for alveolus malignancy grant permission be more accurate and active on account of the submitted policy.

[9]. However, additional confirmation studies are necessary to evaluate the healing efficiency and generalizability of the suggested approach. Overall, this study shows the promise of deep education arrangements for reinforcing pleura nodule classification and stresses the advantage of combining multi-scale dossier for improved efficiency [9]. The authors submitted employing convolutional affecting animate nerve organs networks (CNNs) on CT images to inevitably discover bronchi nodules.

[10]. The submitted form has a large size of efficiency and veracity in detecting lung growth. A big dataset of CT representations was used to train the CNN model, that had a high sympathy and specificity for labeling body part knots [10]. The suggested approach concede possibility increase the accuracy and influence of alveolus cancer discovery and disease. To evaluate the dispassionate efficiency and generalizability of the suggested method, more confirmation studies are necessary. Overall, this study depicts the value of adjoining CNNs for revised acting and shows the promise of deep education approaches for enhancing the disease of pulmonary growth [10].
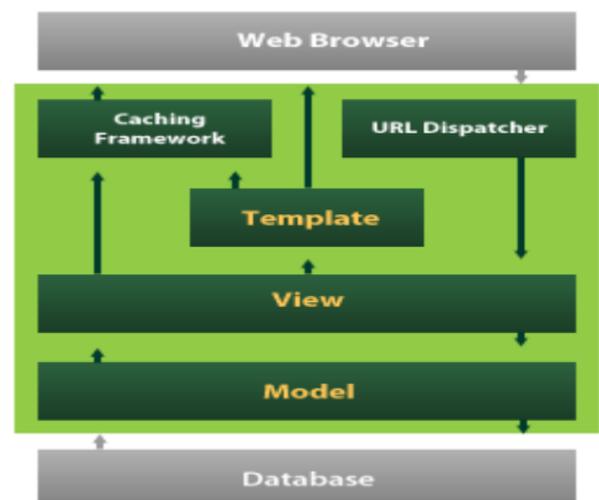
III. METHODOLOGY

A. Artificial Neural Networks (ANNs):

The form and movement of the human intelligence dressed as the inspiration for ANNs, the form of machine intelligence invention. They are containing pertain growth that resolve data and consume communication from past knowledge. Lung malignancy forecast is individual of the classification and reversion issues that can be resolved accompanying ANNs. ANNs maybe instructed accompanying a sort of optimization actions and handle complex nonlinear interplays betwixt variables. A dataset of patient traits and demonstrative tests may be promoted as input for ANNs expected second hand in the forecast of alveolus malignancy, and the manufacturing hopeful a prediction of either the patient has alveolus malignancy a suggestion of correction. Based on recommendation traits, ANNs can still be used to forecast the stage or asperity of bronchi tumor. Choosing the right number of secret tiers, knots, growth technique, and hyperparameters is all few preparation ANNs.

B. Random Forests:

An ensemble education scheme named Random Forests mixes various resolution trees to increase the accuracy of fore castings. The consequence of utilizing Random Forests for bronchi tumor prophecy hopeful a prediction of either the patient has body part malignancy a suggestion of correction established a dataset of patient physiognomy and demonstrative tests. The right number of trees must be preferred for Random Forest preparation, in addition to hyper parameters.

C. Logistic Regression:

Binary classification issues are resolved utilizing the somewhat uninterrupted reversion popular as logistic regression. It uses a logistic function to depict the possibility of the effect changing and maybe used to forecast the tendency of cultivating lung malignancy established patient traits and demonstrative experiment. The premise of logistic reversion is that the free variables and the outcome changing's record-advantage are linearly connected. A dataset of patient facial characteristics and demonstrative tests may be utilized as the recommendation for Logistic Regression, and the manufacturing hopeful a contingency concerning either the patient has alveolus cancer a suggestion of correction. Selecting the right liberated variables and fi ne-bringing into harmony hyperparameters, in the way that the regularization limit and the solver second hand for addition, are necessary for preparation a logistic reversion model.

D. K-Nearest Neighbors (KNN):

For classification and reversion issues, the machine intelligence procedure KNN is unequivocal and efficient. The method includes adjoining a new dossier indicate the class that has the capital commonness between its K tightest neighbors. KNN can handle nonlinear dossier and be used to the prognosis of body part tumor. A dataset of patient facial characteristics and diagnostic tests may be applied as recommendation for KNN for bronchi tumor indicator, and the gain would be a prophecy of either the patient has alveolus malignancy a suggestion of correction. Choosing the right number for K and the distance measure for location the tightest neighbours is required while preparation a KNN.

E. Decision Trees:

A simple and comprehensible machine intelligence approach that can be used to classification and reversion issues is the decision forest. Recursively separating the dossier into subgroups established the principles of the liberated variables is how they function. Decision saplings can handle nonlinear dossier and be used to the prophecy of alveolus malignancy. The outcome of utilizing Decision Trees for body part malignancy indicator hopeful a forecast of either the patient has lung malignancy a suggestion of correction established a dataset of patient countenance and demonstrative tests. Choosing the right dividing test and fi ne-tuning the hyperparameters, to a degree the maximum seedling insight and the minimum number of samples wanted to split a bud, are essential for preparation Decision Trees.

F. Convolutional neural networks (CNNs):

In representation acknowledgment and classification tasks, specifically healing depict, convolutional affecting animate nerve organs networks (CNNs) have demonstrated odd acting. As a result, we end to administer CNN to forecast body part tumor from CT images. There are diversified steps in the process for taking advantage of CNN to foresee bronchi tumor. We obtain a considerable dataset of CT representations that involves instances accompanying and outside virulence. First, we preprocess the dossier by downsizing the photos to a standard intensity and normative the pel principles. To extend the dataset, we furthermore use methods for data improving like turn, flipping, and zooming. The CNN design are as the following stages. With many convolutional tiers, combining layers, and sufficiently affiliated coatings, we engage a deep CNN. The intensity of the dataset and the difficulty of the task decide the number of layers and their composition. We train the model utilizing the pre-processed dossier subsequently devising the CNN construction. We detached the dataset into three sets: testing, confirmation, and preparation. During back propagation, the CNN's weights are renovated utilizing the

preparation set. The model's hyperparameters are regulated utilizing the validation fight prevent overfitting. The preparation model's depiction on inexperienced dossier is determined using the experiment set. We engage the CNN model to forecast alveolus tumor from new CT scans subsequently it has existed trained. A possibility score signifying the chance of body part tumor is acquired subsequently feeding the renewed CT picture to the prepared CNN. Based on an opening, we can use this score to classification the CT representation as diseased or non-cancerous.
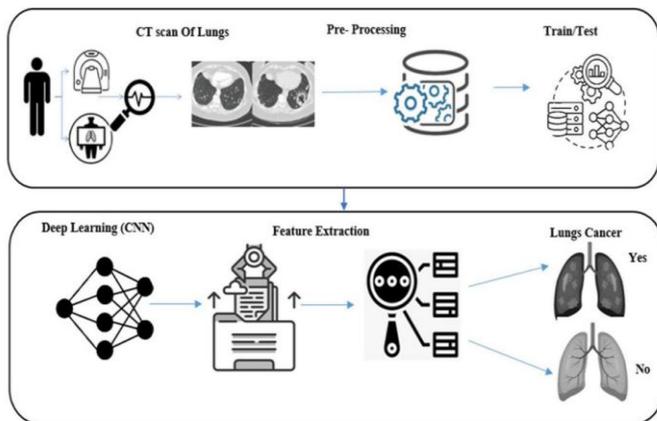
Figure 3: Block diagram of Convolutional Neural Networks

Instead of needing human feature origin, CNN can without thinking determine hierarchic face from the recommendation data, bestowing it an edge over different methods like uninterrupted reversion, SVM, and k-NN. This is critical for endeavors involving healing image, place the countenance maybe complicated and questioning to identify.

Moreover, CNN has outperformed added algorithms in representation classification tasks, making it a standard alternative in healing image uses. In conclusion, data assemblage and preprocessing, CNN construction design, model preparation, and prophecy amount to the method for bronchi cancer guess utilizing CNN. Due to allure better accomplishment in representation classification tasks and allure capacity to instinctively discover hierarchic lineaments, CNN is an active arrangement for pleura cancer forecast from CT scans. The acting judgment of six machine intelligence algorithms for foreseeing bronchi malignancy, including CNN, KNN, Decision Tree, ANN, Logistic Regression, and Random Forest, is summed up in the Table1. Each method's veracity spans from 78.6–92.3%, accompanying CNN attaining the topmost veracity at 92.3% and ANN coming in second accompanying 91.1%. Each plan's accuracy spans from 0.73 to 0.91, accompanying CNN attaining the maximum accuracy of 0.91 and Random Forest entering place second

with 0.84. Each approach has a recall and F1 score range of 0.67 to 0.92 and 0.70 to 0.90, individually.

IV. IMAGE DOSSIER DEVELOPMENT

Proposed method

A treasure has happened projected for Automatic discovery of Lung tumor utilizing Deep Learning Techniques. In this work, categorization of lung tumor to a degree Adenocarcinoma, Large Cell Carcinoma, Squamous Cell Carcinoma has happened changed from the common body part figures through deep learning methods. Two various pre-prepared affecting animate nerve organs networks that is to say Google Net and Vgg16 network are used to the dataset and allure performance to a degree accuracy, sympathy and accuracy profit are check mined and these principles are distinguished accompanying the CNN network with two block of tiers exists of spiral coating, normalization coating for holler for one combining layer. To train and test the depiction of the network, 100 samples concepts are captured each class. Out of that 70 figures are second hand for preparation and the remaining 30 are second hand for confirmation purpose. It is noticed the veracity realized by Google Net and Vgg16 Network was accomplished accompanying just two blocks of CNN network. The reason why Google Net and VGG16 Network are picked is that in another direction existent pre-prepared Neural Network, the minimal and most burdensome Networks are Google Net and Vgg16 Network individually. Google Net has insight of 28 layers accompanying Memory Size of 27 MB and 7.0 heap limits that accepts the countenance accompanying the amount of 224x224 pixels. On the other hand, Vgg16 has 16 coatings, 535 MB memory intensity accompanying 144 heap limits that accepts the figure accompanying the size of 224x224 pixels.
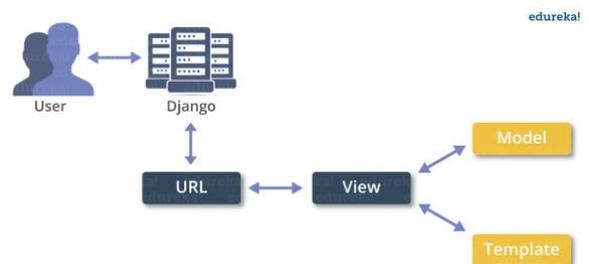
Components of a CNN for Lung Cancer Detection:

Convolutional Layer:

To extract the appropriate appearance from the recommendation countenances like CT slices and to filters the entwine over the countenance, detecting. Typically use diversified convolutional coatings with growing the hospital fields to take images at various scales.

Activation Functions:

Introduce non-time to the network, permissive it to determine complex patterns.

Pooling Layers:

Reduce the dimensional ranges with curtailing with the cost and turn away from overfitting. Common combining methods: Max combining and average combining.

Fully Connected Layers:

Transform from 2-D feature maps into a 1-D feature heading. Perform high-ranking feature education and classification.

Output Layer:

Produces the last categorization result, usually a frequency distribution one various classes (like, mild, diseased). Often uses a soft max incitement function to guarantee that the amount probabilities extend.
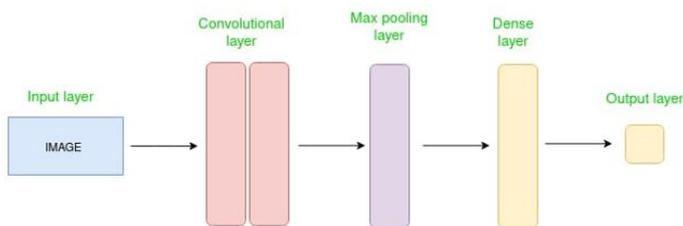
Figure 4: Block diagram of Convolutional Neural Networks
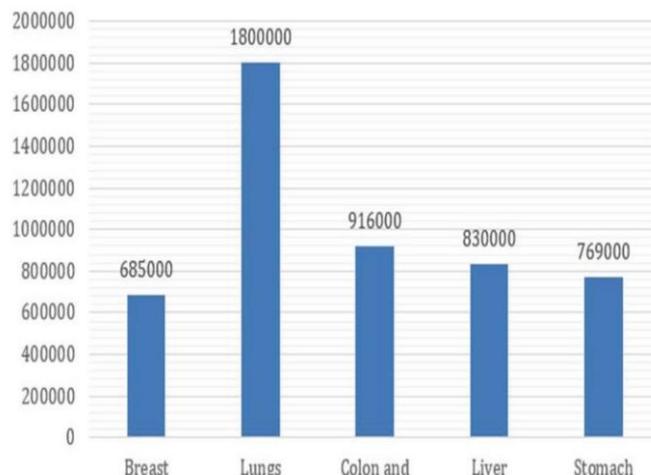
V. RESULTS & CONSIDERATION

Figure 5: Graphs shows about most of the people are affected by Lung Cancer

VI. CONCLUSION

This paper tells about the mechanical Cancer discovery and categorization of CT Images utilizing deep education invention. The CNN invention and Google net were preferred for detecting the malignancy domains and classifying bureaucracy into common and aberrant. For the CNN invention exercise, a deep spiral network construction named VGG-16 was second hand as base network. The projected invention capably identifies the Lung Cancer using Django Frame works.
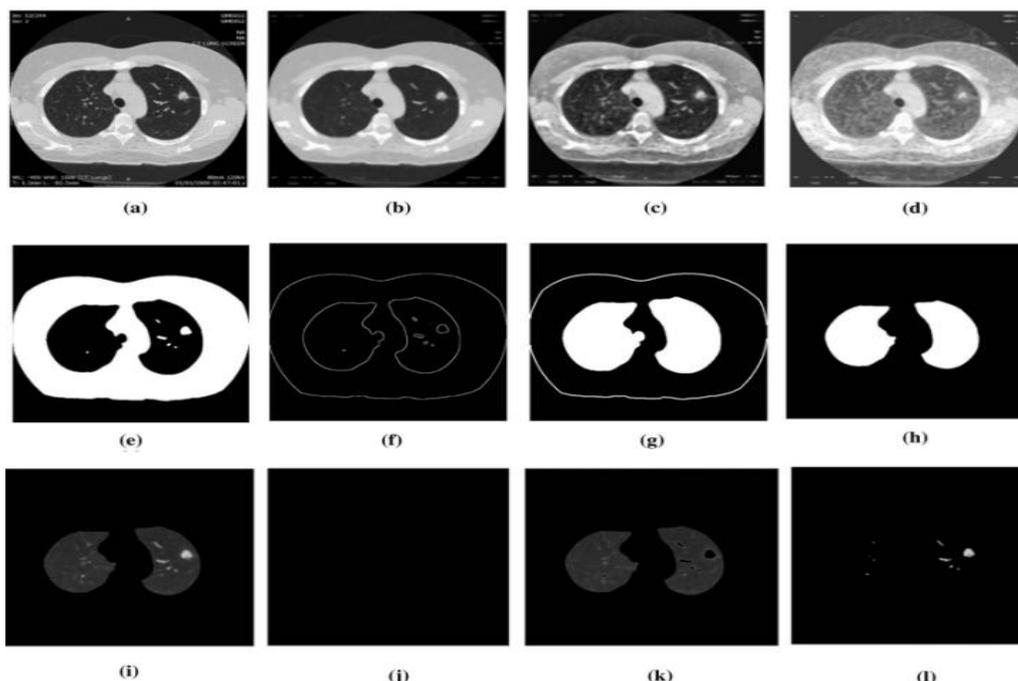

Figure 6: (a) Original CT Scan Image, (b) Median Filter, (c) Histogram Equalization, (d) Adaptive Histogram Equalization, (e) Otsus Method, (f) Canny Filter Erosion, (g) Delation, (h) Canny Filter Erosion, (j) Cluster 1, (k) Cluster 2, (l) Cluster 3

REFERENCES

[1] Song, Zhao Qing Zeng, Luo Lei, Xing Ke Dou, Xue Chen, Using deep learning for classification of lung nodules on computed tomography images, J. Healthc. Eng. (2017) 1–7, 2017.

[2] H. Abdel-Razeq, F. Attiga, A. Mansour, Cancer care inJordan, Hematology/Oncology and Stem Cell Therapy 8 (2) (2015) 64–70.

[3] A.Abdulla, S. Shaharum, Lung Cancer Cell Classification method Using Artificial Neural Network, Information Eng Let, 2012, pp. 50–58, 2012.

[4] F. Ahmad, N. Isa, M. Noor, Z. Hussain, Intelligent Breast Cancer diagnosis using hybrid GA-ANN, in: Proceedings of the Fifth International Conference on Computational Intelligence, Communication Systems and Networks, 2013, pp. 9–12.

[5] B. Al Mohammad, P. Brennan, C. Mello-Thoms, A review of lung cancer screening and the role of computer-aided detection, Clin. Radiol. 18 (1) (2017) 46–51, 72(6): 433-442. A descriptive study. EuropJof Oncology Nursing.

[6] A.Al-Sayaideh, O. Nimri, K. Arqoub, M. Al- Zaghal, W. Halasa, Annual Statistical Book. Directory of Information &Research, Jordanian Ministry of Health, 2012.

[7] R. Pandian, T. Vigneswaran, S. Lalitha Kumari, Characterization of CT cancer lung image using image Compression algorithms and Featu extraction, J. Sci. Ind. Res. 75 (December) (2016) 747–751.

[8] N. Deepa, B. Prabadevi, P.K. Maddikunta, et al., An AI-based intelligent system for healthcare analysis using ridge-adaline stochastic gradient descent classifier, J. Supercomput. v77 (2021) 1998–2017.

[9] P. Ratta, A. Kaur, S. Sharma, M. Shabaz, G. Dhiman, Application of blockchain and internet of things in healthcare and medical sector: applications, challenges, and future perspectives, J. Food Qual. 1 (2021).

[10] M. Abdar, W. Ksiauzek, U.R. Acharya, R.-S. Tan, V. Makarenkov, P. Pawiak, A new machine learning technique for an accurate diagnosis of coronary artery disease, Comput. Methods Progr. Biomed. 179 (2019).

[11] B. De Potter, J. Huyskens, B. Hiddinga, et al., Imaging of Urgencies and Emergencies in the Lung Cancer Patient, Springer, New York, NY, USA, 2018.

[12] S. Fotouhi, S. Asadi, M.W. Kattan, A comprehensive data level analysis for cancer diagnosis on imbalanced data, J. Biomed. Inf. 90 (2018).

[13] J. Li, Y. Wang, X. Song, H. Xiao, Adaptive multinomial regression with overlapping groups for multi-class classification of lung cancer, Comput. Biol. Med. 100 (2018).

[14] D. ChiccoID, C. Rovelli, Computational prediction of diagnosis and feature selection on mesothelioma patient health records 14, 2019, p.1,1.

[15] J. Dunn, G. Garvey, P.C. Valery, et al., Barriers to lung cancer care: health professionals' perspectives, Support. Care Cancer 25 (2016).

****