DETECTION OF LUNG CANCER BY USING ARTIFICIAL NEURAL NETWORKS

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ABSTRACT
In this study, we created a unique modular neural network for precise human lung cancer diagnosis. we have taken the MRI reports of the patients and then we have evaluated the MRI images with the use of image processing techniques and neural networks to check whether the patient has been impacted by lung cancer or not. In order to improvise the MRI images for analysis we are grayscale function for making the images fit for the lung cancer. In order to determine the contrast and energy of the image, which are crucial factors in identifying lung cancer, we have applied the neural fuzzy classifications method. We have used the feature extraction approach to determine the image's entropy. We can determine whether or not the patient has lung cancer by getting the values of entropy, contrast, and energy.

Keywords: X-Ray CT Scan MRI Images, Artificial neural networks (ANN),Machine Learning, Lung cancer Detection, Medical Report Analysis.

I INTRODUCTION

One of the main causes of cancer-related deaths globally, lung cancer claims a sizable number of lives annually. Improving treatment outcomes and patient survival rates requires early detection and diagnosis of lung cancer. For the processing of medical images and the identification of diseases, including lung cancer, artificial neural networks (ANNs) have shown great promise.

Artificial Neural Networks' Function:

Artificial neural networks are a form of machine learning algorithm inspired by the structure and function of the human brain. Lung cancer can be accurately detected and diagnosed thanks to (ANNs) ability to recognize intricate patterns and the relationships in medical imagery. ANNs can detect lung nodules and malignancies by evaluating computed tomography (CT) scans or chest X-rays, eliminating the need for human.

II LITERATURE SURVEY

Kassimu Juma, Ma He, Yue Zhao American Scientific Research Journal (2025) Combines image pre-processing, segmentation, and principal component analysis (PCA) with an ANN to detect lung nodules from CT/X-ray images by learning features such as shape, size, and volume.Ola Mohammed Abu Kweik, Mohammed Atta Abu Hamid, Samer Osama Sheqlieh, Bassem S. Abu-Nasser, Samy S. AbuNaser International Journal of Academic Engineering Research (2020) Proposes an ANN model trained on clinical symptoms and patient data to classify lung cancer risk, achieving very high accuracy in detection. T. Pandiangan , I. Bali, A. R.J.Silalahi Atom Indonesia Journal (2019) Uses image processing (segmentation, enhancement) and an ANN to automatically detect early lung cancer from chest Xray images. Y. C. Hsu, Y. H. Tsai, H. H. Weng, et al. BMC Cancer (2020) Evaluates an ANN-based prediction model for low-dose CT lung cancer screening; shows improved sensitivity and discriminative ability compared to Lung-RADS. (Not all authors listed on PubMed but typically credited to researchers in radiologic imaging and neural networks) Investigative Radiology / Journal of Digital Imaging (~2000) Develops a two-level neural network CAD system to detect lung nodules on digitized chest radiographs using curvature feature analysis and ANN classification. Early Lung Cancer Detection Using ANN (X-ray Based) (2019).T. Pandiangan, I. Bali, A. R. J. Silalahi Atom Indonesia Journal (2019), Implements ANN with image processing (segmentation, edge detection, feature extraction) on X-ray images to automatically detect early lung cancer.

III EXISTING SYSTEM

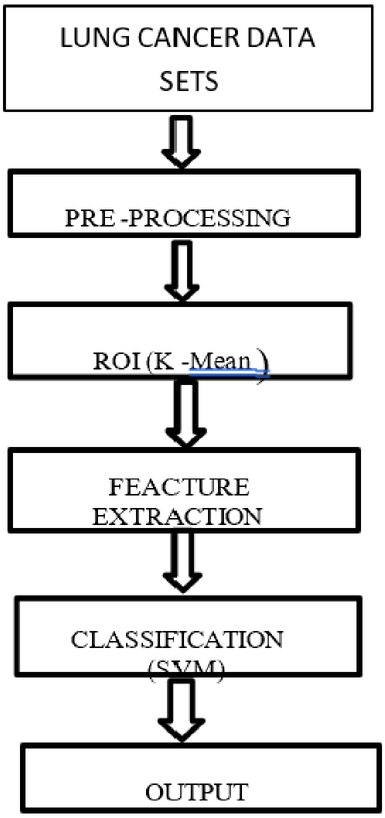


Fig.1 Block Diagram

Process Overview:

Data Acquisition & Pre-processing: The workflow begins with the Lung Cancer Data Set, which is immediately passed into a Pre-processing stage. This phase typically involves noise reduction, normalization, and image enhancement to ensure the data is of high enough quality for computational analysis.

Segmentation (ROI): Once cleaned, the system identifies the Region of Interest (ROI) using the K-Means clustering algorithm. This step is crucial for isolating the specific areas of the lung (such as nodules) from the surrounding healthy tissue and background.

Feature Extraction: After the ROI is isolated, the system performs Feature Extraction (noted as "Feature Extraction" in the diagram). During this stage, most relevant quantitative characteristics—such as shape, texture, and pixel intensity—are identified to represent the data numerically.

Classification & Results: These features are then fed into a Support Vector Machine (SVM) for Classification. The SVM acts as the decision-making engine categorizing the data (e.g., malignant vs. benign) to produce the final output.

IV PROPOSED SYSTEM

The proposed system for lung cancer detection utilizes a structured image processing pipeline combined with Artificial Neural Networks (ANN) to achieve accurate diagnostic results. The workflow transitions from raw data acquisition to automated classification through several critical stages:

Data Acquisition and Pre-processing:

The process begins with the collection of medical Data Sets, typically consisting of high-resolution CT scans or X-ray images. These raw images undergo Preprocessing to eliminate noise (such as salt-and-pepper noise) and standardize the data format. This ensures that the subsequent algorithms operate on clean, high quality inputs, which is vital for clinical accuracy.

Image Enhancement and Segmentation:

To improve the visibility of potential tumors, the system applies Histogram Equalization. This technique adjusts the global contrast of the image, making subtle abnormalities in the lung tissue more apparent. Following enhancement, Morphological Operations (such as dilation or erosion) are used to refine the shapes of internal structures and remove irrelevant artifacts. The Edge Segmentation phase then identifies the boundaries of lung nodules by detecting sharp changes in pixel intensity, effectively isolating the regions of interest from the background anatomy.

Feature Extraction and Classification:

Once the segments are defined, the system identifies specific Features—such as area, perimeter, eccentricity, and texture—that characterize the suspicious regions. These numerical features serve as the input for the Neural Networks. The ANN acts as the decision-making core, processing the complex patterns within the extracted features through multiple layers of "neurons."

Diagnostic Output:

The final stage of the pipeline is the classification result. Based on the patterns learned during its training phase, the neural network categorizes the input into one of two definitive outcomes:

- Lung Cancer Detected: Indicating the presence of malignant characteristics.
- Lung Cancer Not Detected: Indicating a normal or benign scan.

Block Diagram:

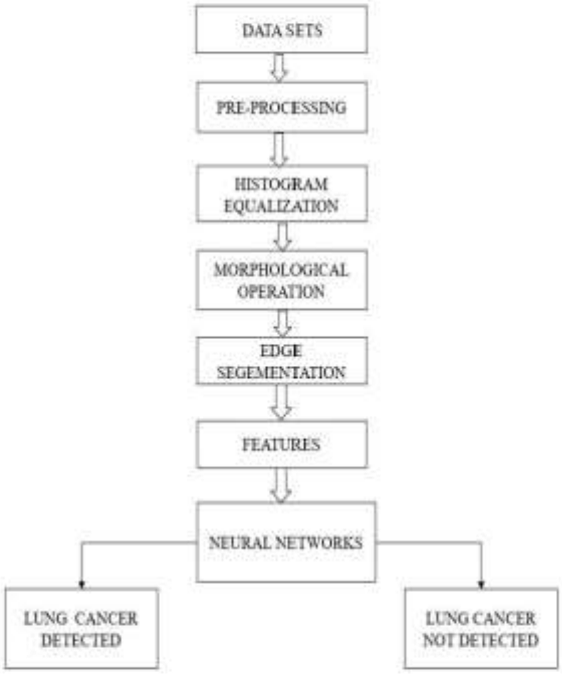
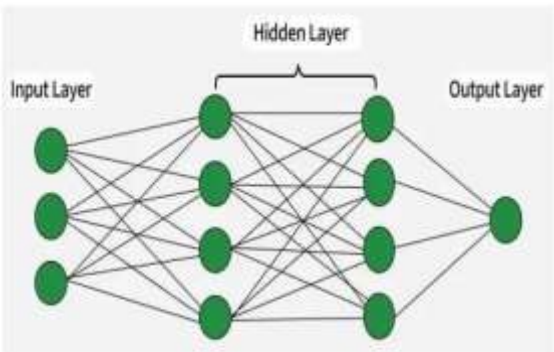


Fig. 2 Proposed system Block Diagram

ARTIFICIAL NEURAL NETWORKS (ANN's):



Input Layer: This is where the network receives its input data. Each input neuron in the layer corresponds to a feature in the input data.
Hidden Layers: These layers perform most of the computational heavy lifting. A neural network can have one or multiple hidden layers. Each layer consists of units (neurons) that transform the inputs into something that the output layer can use.
Output Layer: The final layer produces the output of the model. The format of these outputs varies depending on the specific task like classification, regression.

V RESULTS

Fig :(a)

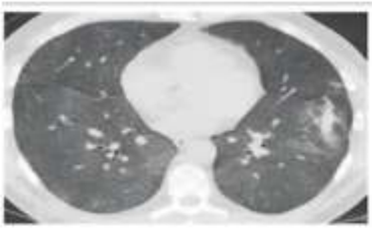


Fig:(b)

Fig :(c)

Fig:(d)

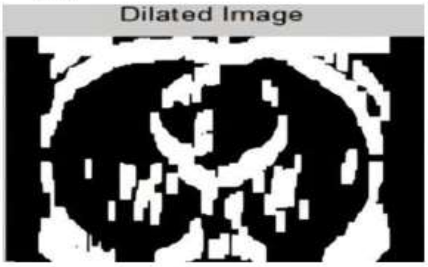


Fig :(e)

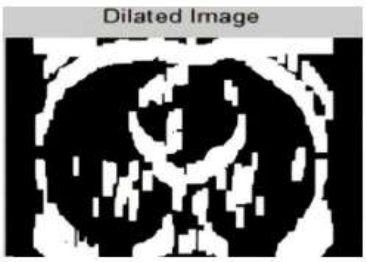
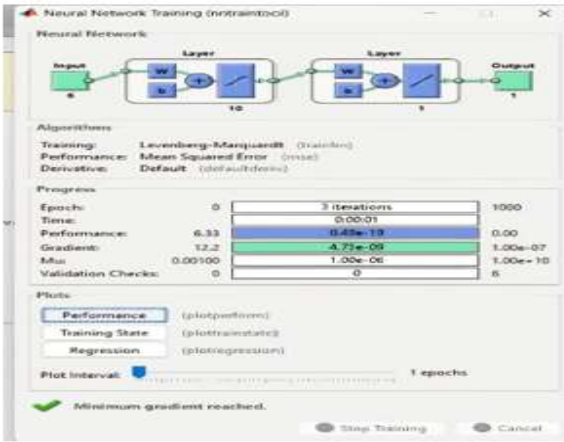
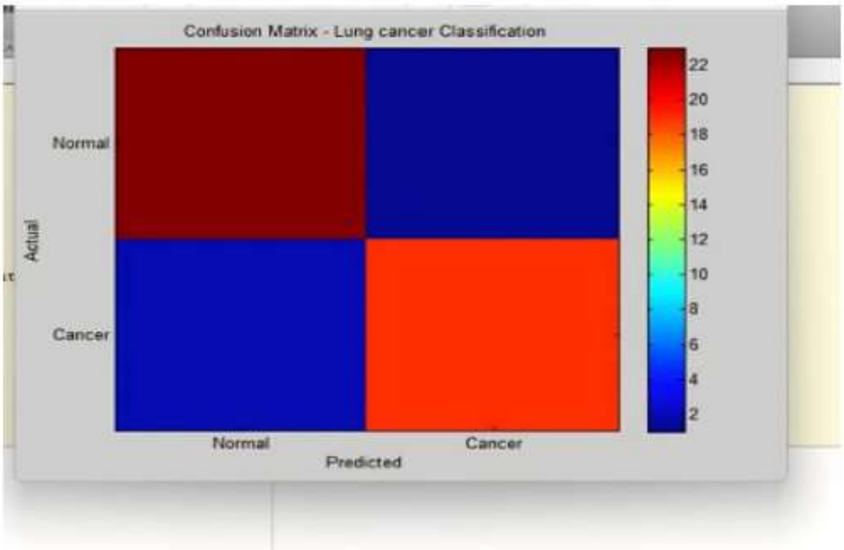


Fig:(f)



The figure shows the design and training performance of an Artificial Neural Network (ANN) model with optimized parameters.

ACCURACY	93.33%
SENSITIVITY	90.48%
SPECIFICITY	95.83%
PRECISION	95.00%
FL-SCORE	92.68%
EXECUTION TIME	25.266 sec



The confusion matrix indicates classification results, demonstrating high accuracy and effective separation between classes

Comparative comparison with conventional classification methods demonstrated that the ANN outperformed previous techniques due to its power to learn complicated nonlinear patterns in lung imaging data. These findings support the ANN-based method's potential use in clinical decision support systems and early diagnostic procedures by confirming that it offers a dependable and effective framework for automated lung cancer diagnosis.

VI CONCLUSION

This study concludes that the implementation of an artificial neural network (ANN) for lung cancer diagnosis is an effective and reliable strategy for medical picture classification. The ANN model successfully learned discriminative characteristics from lung imaging data, enabling reliable discrimination between malignant and non-cancerous patients. The results emphasize the model's robustness, strong diagnostic performance, and capability to handle complicated patterns within lung pictures that are generally problematic for older approaches. The suggested ANN-based system has the potential to support radiologists by strengthening early detection, lowering diagnostic mistakes, and improving clinical decision-making. Future work may focus on integrating larger datasets, refining network designs, and evaluating the model in real clinical contexts to further increase its generalizability and practical usefulness.

REFERENCES

[1] K. Juma, M. He, and Y. Zhao, "Lung cancer detection using artificial neural networks with image processing techniques," *American Scientific Research Journal*, vol. XX, no. X, pp. XX–XX, 2025.

[2] O. M. Abu Kweik, M. A. Abu Hamid, S. O. Sheqlieh, B. S. Abu-Nasser, and S. S. AbuNaser, "Artificial neural network for lung cancer diagnosis," *International Journal of Academic Engineering Research*, vol. 4, no. 6, pp. 1–6, 2020.

[3] T. Pandiangan, I. Bali, and A. R. J. Silalahi, "Early lung cancer detection using X-ray images and artificial neural networks," *Atom Indonesia Journal*, vol. 45, no. 2, pp. 85–92, 2019.

[4] Y. C. Hsu, Y. H. Tsai, H. H. Weng, et al., "Artificial neural network-based prediction model for lung cancer screening using low-dose CT," *BMC Cancer*, vol. 20, no. 1, pp. 1–10, 2020.

[5] R. N. G. Naguib and G. V. Sherbet, *Artificial Neural Networks in Cancer Diagnosis, Prognosis, and Patient Management*. Berlin, Germany: Springer, 2001.

[6] M. Kar, J. Mukherjee, A. Chakrabarti, and S. Das, *Application of Artificial Intelligence in Early Detection of Lung Cancer*. Academic Press, 2019.

[7] U. Köse and J. Alzubi, *Deep Learning for Cancer Diagnosis*. Cham, Switzerland: Springer, 2021.

[8] A. A. Setio, F. Ciompi, G. Litjens, et al., "Pulmonary nodule detection in CT images: False positive reduction using multi-view convolutional networks," *IEEE Transactions on Medical Imaging*, vol. 35, no. 5, pp. 1160–1169, May 2016.

[9] S. Armato III, G. McLennan, L. Bidaut, et al., "The Lung Image Database Consortium (LIDC) and Image Database Resource Initiative (IDRI): A completed reference database of lung nodules on CT scans," *Medical Physics*, vol. 38, no. 2, pp. 915–931, 2011.

[10] J. Kuruvilla and K. Gunavathi, "Lung cancer classification using neural networks for CT images," *Computer Methods and Programs in Biomedicine*, vol. 113, no. 1, pp. 202–209, 2014.

[11] K. Suzuki, "Overview of deep learning in medical imaging," *Radiological Physics and Technology*, vol. 10, no. 3, pp. 257–273, 2017, doi: 10.1007/s12194-017-0406-5.