Chapter 13
Lung Cancer Classification Using Deep Learning Hybrid Model

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ABSTRACT

Abnormal growths in the lungs caused by disease. The classification of CT scans is accomplished by applying machine learning strategies. Classification methods based on deep learning, such as support vector machines, can categorize a wide variety of image datasets and produce segmentation results of the highest caliber. In this work, we suggested a method for deep feature extraction from images by altering SVM and CNN and then applying the hybrid model resulting from those modifications (NNSVLC). For this investigation, the Kaggle dataset will be utilized. The proposed method was found to be accurate 91.7% of the time, as determined by the results of the experiments.

1. INTRODUCTION

Lung cancer poses a substantial risk to people's health worldwide for several reasons, including its high death rate, widespread prevalence, and unknown origin (khoddam et al., 2024). It is one of the cancers diagnosed the most frequently, and it is the primary reason people die from cancer worldwide. There is a significant geographical difference in incidence; higher rates are observed in regions with high cigarette consumption and environmental pollution. The presence of numerous histological subtypes, most notably small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC), further complicates the pathophysiology of lung cancer(Gayap & Akhloufi, 2024): small cell lung cancer (SCLC) and non-small

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cell lung cancer (NSCLC). When detecting lung cancer, imaging studies such as computed tomography (CT) and positron emission tomography (PET) scans are only one piece of the puzzle; the histological evaluation of biopsy specimens provides the last piece. Deep learning is a sort of machine learning that has shown promising results when used to detect lung cancer in medical imaging (Asuntha & Srinivasan, 2020; Bhatia et al., 2019; Das & Majumder, 2020). Deep learning models, particularly convolutional neural networks (CNNs), have demonstrated their ability to automatically learn and extract complex patterns from medical pictures(Dodia et al., 2022; Wani et al., 2024). This paves the way for diagnoses that are both more accurate and more reliable.

We aim to develop a model that can differentiate between malignant and benign lung nodules with high accuracy. This would allow radiologists and oncologists to diagnose and treat patients with incredible speed and certainty. We have high hopes that our research will contribute to the development of medical AI and improve the diagnosis and treatment of lung cancer in patients.

Following the main text of the report are additional resources, which include the dataset, method, and models utilized in diagnosing lung cell cancer. In the latter part of this chapter, we compare the hybrid model to three alternative models for 5, 10, and 20 folds.

2. LITERATURE SURVEY

The two most common forms of lung cancer are small-cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). The non-small cell lung cancer (NSCLC) subtype accounts for 75% of all lung cancer diagnoses. Adenocarcinoma (LUAD) and squamous cell carcinoma (LUSC) are the two most common subtypes within this cancer subtype. kilanje(Ayalew et al., 2024; Bushara A. R. et al., 2023; Kim et al., 2024; Lanjewar et al., 2024) In medicine, techniques such as computer-aided diagnostics (CAD) are utilized to diagnose diseases at an earlier stage. Several cancers, such as those of the lung, the skin, and the prostate, can be challenging to diagnose in the early stages (Abunasser et al., 2023). When getting solid results from a CT scan, the only option available is manual identification (Ahmed & MOHAMMED, 2023). However, a method based on artificial intelligence (AI) is necessary to identify lung cancer in its early, benign stages. Two different approaches can be taken in order to identify lung nodules. Before the CT picture can be analysed for the presence of minute nodules in the chest caused by the pulmonary vasculature, the lung endothelium must be eliminated. Deep learning algorithms perform exceptionally well in picture identification tasks such as categorization and detection; hence, these algorithms are frequently employed in medical images and as computer-aided diagnosis tools for various reasons, including those listed above. Convolutional neural networks, often CNNs, are the current industry standard for computer vision (Gudur et al., n.d.; Liu et al., 2024; Poonkodi & Kanchana, 2024; Qian et al., 2024; Rao et al., 2024). A convolutional neural network, also known as a CNN, is a specific kind of deep learning model (Nafisah & Muhammad, 2024)that imitates a network of neurons by employing a processing layer. (Shah & Parveen, 2023) separated the lungs using an upgraded version of the profuse clustering technique after first performing denoising on the photos to improve the overall image quality. Following this step, a neural network is next taught to recognize lung cancer. The authors of (Abdullah et al., 2023) proposed a DL model to evaluate the accuracy of lung cancer prediction using CT scans. U-Net and 3D CNN were successfully utilized to screen for FP nodules, and suggested a DL model. The segmentation issue is resolved thanks to this model's marker-controlled watershed