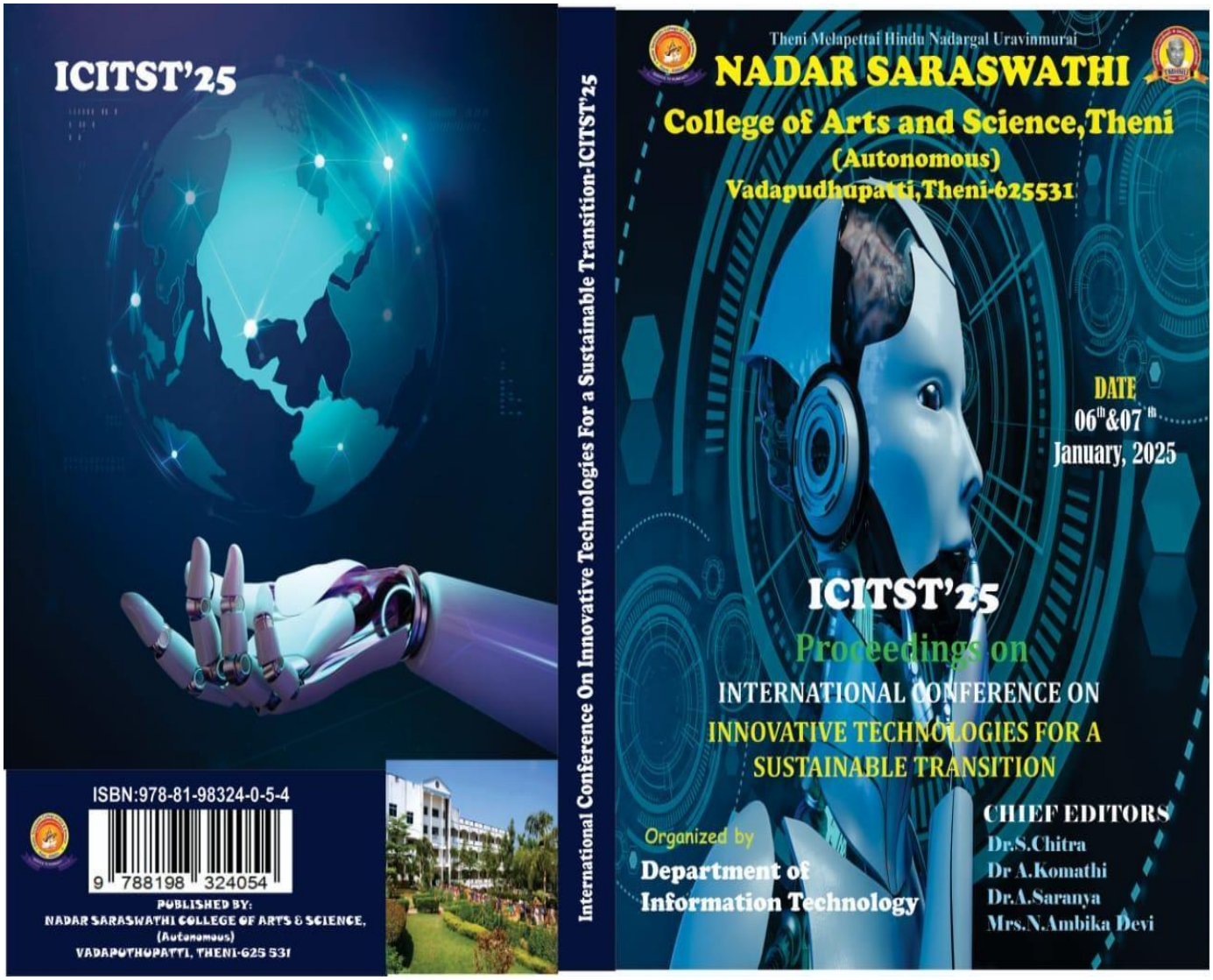
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Radiographic Features and Deep Learning Approaches in the Detection and Classification of Non-Small Cell and Small Cell Lung Cancer

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Abstract :
Lung cancer, including both Non-Small Cell Lung Cancer (NSCLC) and Small Cell Lung Cancer (SCLC), presents with diverse radiographic features that are crucial for accurate detection and classification. NSCLC includes subtypes such as adenocarcinoma, which typically appears as peripheral nodules, squamous cell carcinoma, which is often central and associated with cavitation, and large cell carcinoma, characterized by large, poorly defined masses. SCLC, known for its rapid growth and metastasis, often appears centrally near the bronchi and can lead to complications like superior vena cava syndrome. Radiographically, lung cancer manifests as masses or nodules with varying borders, atelectasis, lymphadenopathy, pleural effusion, and interstitial changes. However, challenges in detection arise due to the overlap of lung cancer with other diseases such as tuberculosis and pneumonia, and early-stage lesions that may be subtle and difficult to identify without advanced imaging techniques. The application of deep learning models has significantly advanced detection, enabling more precise segmentation of tumor regions, feature extraction for differentiating benign from malignant lesions, and classification of cancer subtypes based on imaging patterns. Explainability tools like Grad-CAM further enhance model transparency, helping clinicians better understand automated predictions and improve diagnostic accuracy for lung cancer.
Key words : Non-Small Cell Lung Cancer (NSCLC), Small Cell Lung Cancer (SCLC), Radiographic Signs, Pleural Effusion, Cavitation, Deep Learning Models

I Introduction

Lung cancer, one of the leading causes of cancer-related deaths worldwide, is primarily classified into Non-Small Cell Lung Cancer (NSCLC) and Small Cell Lung Cancer (SCLC). NSCLC, the most common form, consists of subtypes such as adenocarcinoma, squamous cell carcinoma, and large cell carcinoma, each with distinct radiographic features. Adenocarcinoma often presents as peripheral nodules, while squamous cell carcinoma is typically central, associated with cavitation or necrosis. Large cell carcinoma is known for its aggressive nature and poorly defined margins. SCLC, on the other hand, grows rapidly and is commonly found centrally, near the bronchi, with a tendency for early metastasis and obstructive complications. Early detection of lung cancer through radiographic signs like masses, atelectasis, and pleural effusion is crucial but challenging due to overlap with other conditions. Advanced imaging techniques and deep learning models are emerging tools that assist in detecting, classifying, and improving diagnostic accuracy for lung cancer.

II Classifications of Lung Cancer

Lung cancer is primarily classified into two main types: **Non-Small Cell Lung Cancer (NSCLC)** and **Small Cell Lung Cancer (SCLC)**. NSCLC is the more common form, making up approximately 85% of cases, and includes three major subtypes: adenocarcinoma, squamous cell carcinoma, and large cell carcinoma. Each subtype has distinct characteristics in terms of its location, growth patterns, and potential for spreading. Adenocarcinoma is the most prevalent, often found peripherally in the lungs, while squamous cell carcinoma typically affects the central region, and large cell carcinoma is known for its aggressive nature.