

## Evaluating the Efficiency and Diagnostic Accuracy of Machine Learning Algorithms in Early Detection of Lung Cancer: A Systematic Review

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### Abstract

Lung cancer is a leading cause of cancer deaths in the world with an estimated 2.09 million cases affecting both men and women worldwide. Diagnosis in an early stage is needed to improve the survival rate in lung cancer patients. With advanced diagnostic imaging and data-driven methods, Machine Learning algorithms have captured considerable interest to enhance the accuracy as well as efficiency of detecting lung cancer. This review discusses the performance of different ML algorithms, such as SVM, CNN, KNN, logistic regression, and hybrid models, applied in lung cancer diagnostics. This study comprises a systematic literature review which was conducted by reviewing the most important research papers after identifying 100 research papers related to the application of Machine learning in lung cancer detection. From these, 60 relevant papers were selected based on citation count and publication date, from 2019 to 2024. Further analysis narrowed the selection up to 27 papers that were critically reviewed for their contributions on algorithm accuracy, computational efficiency, and dataset usage. A critical literature review was performed, grouping the findings into topics. The key findings shows CNN models, especially those using transfer learning, reach the highest accuracy rates up to 98% for image-based detection. In resource-limited settings, hybrid models such as CNN-SVM provide an effective balance between accuracy and computational efficiency. However, class imbalance, lack of standardized datasets, and interpretability remain as some of the challenges. This review highlights the need for standardized protocols, better computational efficiency, and interpretable algorithm to improve the accuracy and clinical applicability of the lung cancer detection systems.

**Keywords:** *Lung cancer detection, Machine learning, Algorithms, Accuracy, Efficiency*