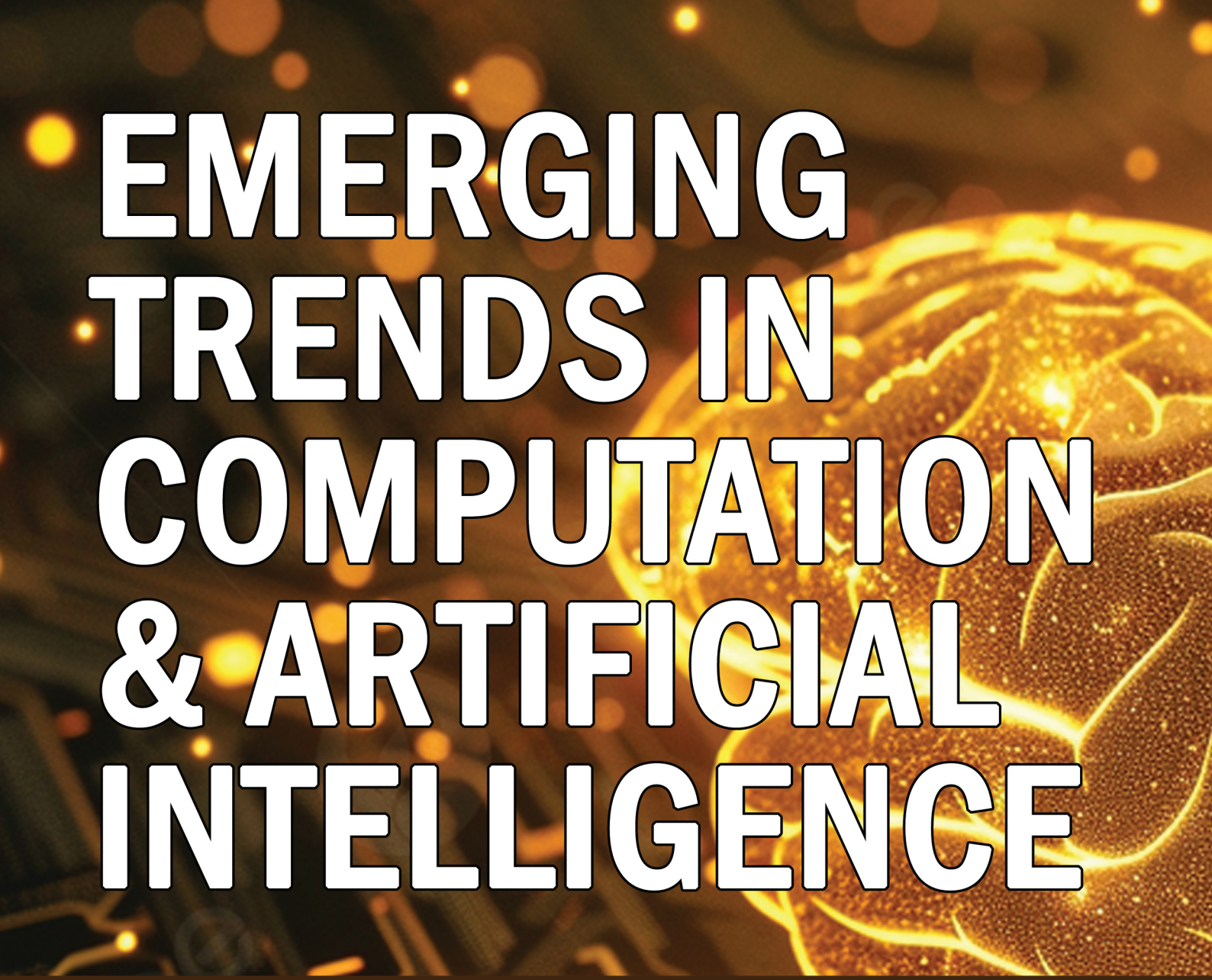

EMERGING TRENDS IN COMPUTATION & ARTIFICIAL INTELLIGENCE

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Dr. H. Sivalingan

Mrs. L. Sankara Maheswari

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Emerging Trends in Computation & Artificial Intelligence

First Edition

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CHAPTER - 9
DETECTION OF LUNG CANCER USING AI TECHNOLOGY: A COMPREHENSIVE APPROACH

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ABSTRACT

Lung cancer remains one of the leading causes of mortality worldwide. Early detection is crucial for improving patient survival rates. Artificial Intelligence (AI) has emerged as a powerful tool in the medical field, enhancing diagnostic accuracy and efficiency. This paper explores AI-based techniques for lung cancer detection, including machine learning (ML), deep learning (DL), and convolutional neural networks (CNNs). We discuss their applications in medical imaging, biopsy analysis, and predictive analytics. Furthermore, the study highlights challenges, including data scarcity, model interpretability, and clinical integration. AI-based lung cancer detection promises improved diagnosis, cost-effectiveness, and enhanced patient outcomes.

KEYWORDS

Lung Cancer Detection, Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Convolutional Neural Networks (CNNs), Medical Imaging, Predictive Analytics.

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I INTRODUCTION

- **Background on Lung Cancer**

Lung cancer is one of the most common and deadly forms of cancer, responsible for millions of deaths worldwide annually. It is primarily caused by smoking, pollution, and genetic factors. The disease often progresses silently, making early detection difficult, which significantly reduces the chances of effective treatment and survival.

- **The Need for Early Detection**

Early detection of lung cancer is crucial as it improves survival rates and treatment effectiveness. When detected in later stages, lung cancer becomes difficult to treat. Timely diagnosis through imaging and biomarkers enables early intervention, which can lead to better prognoses and increased life expectancy for patients.

- **Role of AI in Medical Diagnosis**

Artificial Intelligence (AI) is revolutionizing medical diagnosis by enhancing speed, accuracy, and efficiency. AI-powered algorithms analyze medical images, detect abnormalities, and assist radiologists in diagnosing diseases. In lung cancer detection, AI improves early-stage identification, automates workflows, and reduces human errors, ultimately leading to better patient outcomes and cost-effective healthcare solutions.

II Artificial Intelligence in Lung Cancer Detection

- **Machine Learning Approaches**

Machine learning (ML) techniques utilize vast datasets to recognize complex patterns and predict disease progression. Supervised learning models, such as support vector machines, random forests, and logistic regression, classify lung nodules based on radiological features. Unsupervised learning, including clustering algorithms, helps discover hidden patterns in medical data. Reinforcement learning also enhances diagnostic capabilities by continuously improving predictions based on previous cases, making ML a valuable asset in lung cancer detection.

- **Deep Learning Techniques**

Deep learning (DL), a subset of ML, employs artificial neural networks to process and analyze medical data with high accuracy. Models such as recurrent neural networks (RNNs) and generative adversarial networks (GANs) enable early lung cancer detection by identifying subtle abnormalities