

Comparative Analysis of Machine Learning Algorithms for Accurate Leukemia Detection from Blood Smear Images

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Leukemia, a cancer originating in red blood cells, disrupts blood cell formation by causing an overproduction of immature lymphocytes. Detecting leukemia is critical, especially considering its significant impact on children (80%) and the heightened fatality rates in adults. Globally, the challenging and time-consuming nature of leukemia diagnosis has led to a growing interest in leveraging machine learning (ML) techniques for enhanced detection. The review, encompassing 28 articles sourced from thorough searches on IEEE Xplore, Google Scholar, and Springer, robustly supports the application of ML in leukemia diagnosis. Predominantly conducted post-2012, these studies focused primarily on Acute Lymphoblastic Leukemia (ALL), utilizing ML algorithms for analyzing microscopic images. The overarching objective was to boost diagnostic accuracy, revealing a notable research gap in Acute Myeloid Leukemia (AML), Chronic Lymphocytic Leukemia (CLL), and Chronic Myeloid Leukemia (CML). Technical findings underscore the prevalent use of advanced ML techniques, particularly convolutional neural networks (CNNs), and feature extraction methods like texture analysis and shape-based features, contributing to nuanced and precise diagnoses. The temporal surge aligns with the integration of deep learning, indicating a correlation between technological advancements and research output. Despite the focus on ALL, literature analysis highlights potential research gaps in other leukemia types, signaling an evolving landscape in ML applications for leukemia diagnosis. This refined abstract, enriched with technical insights, reinforces the claim that ML has the potential to revolutionize leukemia diagnosis, emphasizing the reciprocal relationship between ML evolution and medical research output, and pointing towards areas for future exploration.

Keywords: *Leukemia; Blood cancer; Machine learning; Decision tree; Naive Bayes; Random Forest*