

Title: Transforming Leukemia Classification: A Comprehensive Study on Deep Learning Models for Enhanced Diagnostic Accuracy

Author Names: Jawad Hasan; Kamrul Hasan; Abdullah Al Noman; Sayed Hasan; Shayma Sultana; Masum Alam Arafat

Abstract: Leukemia is a severe form of blood cancer that presents significant challenges in both diagnosis and treatment. Early and accurate detection is crucial for successful patient outcomes, but traditional diagnostic methods relying on pathologist expertise can be subjective and time-consuming. This can lead to delays in identifying the appropriate treatment plan, especially given the complexity of accurately categorizing leukemia subtypes. To address these challenges, a study has been conducted to comprehensively evaluate Deep Learning (DL) techniques for leukemia classification. The study compares the performance of conventional Machine Learning (ML) methods with cutting-edge Transfer Learning (TL) models across multiclass scenarios. The study employed Laplacian of Gaussian-based Modified High-boosting (LoGMH) for image enhancement, along with image augmentation techniques such as brightness and rotation adjustments to expand the dataset. Additionally, feature extraction using the gray-level run length matrix (GLRLM) was applied to improve feature representation. Among the models tested, Inception-ResNet emerged as the top performer, achieving an accuracy of 95.52% and an F1 score of 95.49% in distinguishing five leukemia subtypes. This research underscores the potential of TL models in advancing medical diagnostics, particularly in the early detection and precise classification of leukemia, thereby enhancing patient care in hematology and oncology. The future research will focus on integrating additional clinical data, validating models in diverse clinical environments, and emphasizing model transparency and interpretability.

Keywords: Leukemia Classification Deep Learning (DL) Transfer Learning (TL) Inception-ResNet Laplacian of Gaussian Modified High-Boosting (LoGMH)

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