

ABSTRAK

Acute Lymphoblastic Leukemia (ALL) adalah kanker darah yang menyerang sel darah putih dan dapat menyebar cepat ke seluruh tubuh. Deteksi dini dan akurat sangat penting untuk meningkatkan peluang kesembuhan pasien. Penelitian ini bertujuan untuk mengembangkan sistem klasifikasi ALL pada citra mikroskopis darah menggunakan metode *Gray Level Co-occurrence Matrix* (GLCM) untuk ekstraksi fitur tekstur, serta algoritma *K-Nearest Neighbor* (KNN) untuk klasifikasi. Ekstraksi fitur dilakukan dengan GLCM untuk memperoleh nilai contrast, homogeneity, energy, correlation, dan *Angular Second Moment* (ASM), yang selanjutnya digunakan sebagai input pada KNN. Uji coba dilakukan pada citra berukuran 64×64, 128×128, dan 256×256 piksel dengan parameter nilai $k = 3, 5$, dan 7. Percobaan menunjukkan bahwa peningkatan resolusi citra berpengaruh terhadap performa model. Performa terbaik diperoleh pada ukuran citra 256×256 piksel dan nilai $k = 7$, menghasilkan akurasi sebesar 81% dan F1-score untuk kelas ALL sebesar 87%. Selain itu, pengujian dengan berbagai rasio train-test (70:30, 80:20, dan 90:10) menunjukkan akurasi model tetap stabil di 81%, meskipun rasio train-test memengaruhi distribusi data uji dan data latih. Hasil ini menunjukkan bahwa kombinasi metode GLCM dan KNN mampu memberikan performa yang baik dalam mengklasifikasikan citra darah mikroskopis, serta berpotensi untuk diterapkan sebagai sistem pendukung keputusan medis dalam membantu diagnosis dini penyakit ALL.

Kata Kunci: *Acute Lymphoblastic Leukemia* (ALL), klasifikasi citra, *K-Nearest Neighbor* (KNN), *Gray Level Co-occurrence Matrix* (GLCM), Citra Mikroskopis.

ABSTRACT

Acute Lymphoblastic Leukemia (ALL) is a type of blood cancer that attacks white blood cells and can spread rapidly throughout the body. Early and accurate detection is crucial to increase patients' chances of recovery. This study aims to develop a classification system for ALL using microscopic blood images by employing the Gray Level Co-occurrence Matrix (GLCM) method for texture feature extraction and the K-Nearest Neighbor (KNN) algorithm for classification. GLCM was used to extract texture features, including contrast, homogeneity, energy, correlation, and Angular Second Moment (ASM), which were then used as inputs for the KNN classifier. Experiments were conducted on images with resolutions of 64×64 , 128×128 , and 256×256 pixels using k parameter values of 3, 5, and 7. The results showed that increasing image resolution positively affected the model's performance. The best performance was achieved with an image resolution of 256×256 pixels and $k = 7$, resulting in an accuracy of 81% and an F1-score of 87% for the ALL class. Furthermore, testing with different train-test ratios (70:30, 80:20, and 90:10) demonstrated that the model's accuracy remained stable at 81%, even though the train-test ratio influenced the distribution of training and testing data. These findings indicate that the combination of GLCM and KNN methods can provide good performance in classifying microscopic blood images and has the potential to be implemented as a medical decision support system to assist in the early diagnosis of ALL.

Keywords: *Acute Lymphoblastic Leukemia (ALL), image classification, Gray Level Co-occurrence Matrix (GLCM), K-Nearest Neighbor (KNN), microscopic images.*