ABSTRACT

The immune system's White Blood Cells (WBCs) attack pathogens. The most prevalent blood malignancy that can result in mortality is leukemia. It occurs when the bone marrow produces a significant number of immature WBCs, which destroy healthy cells. Pathologists must evaluate the properties of WBC while diagnosing blood-related disorders. The morphological qualities of the nucleus of WBC can be used to characterize WBC characteristics. In Western countries, the most frequent leukemia is chronic lymphocytic leukemia (CLL). CLL is the most common type of adult leukemia. CLL is a disease that mostly affects the elderly, who are more likely to have coexisting illnesses in addition to disease-related immunosuppression and myelosuppression, and has a highly varied clinical history. Specific genetic changes that impair clonal B-cell apoptosis trigger the leukemic transition. Blood counts, blood smears, and immunological phenotyping of circulating B-lymphocytes are used to determine the diagnosis, which identifies a clonal B-cell population containing the CD5 antigen and B-cell markers. The introduction of innovative biological drugs such as ibrutinib, idelalisib, and venetoclax, as well as increasingly strong anti-CD20 monoclonal antibodies, has resulted in a significant increase in the complexity of treating patients with chronic lymphocytic leukemia over the last several years. To lessen the impact of this disorder, it's critical to recognize immature cell formations early on, as this reduces the patients' modality rate. Several types of Deep-Learning (DL)-based segmentation and classification algorithms with improved accuracy have recently been published.

In the first work, a power-law transformation law is used in the preprocessing phase to enhance the contrast of the image. A deep learning-based framework named improved convolutional deep belief network is proposed to classify the images. Additionally, the EfficientNet is employed for segmentation with that stacked denoising autoencoder is extract the representative features to improve the accuracy. The classification result improved the overall performances and also increases the accuracy, precision and recall.

The T2FCS filter is used in the second paper as an effective approach for reducing adjacent noise from images. Then for an accurate detection result, a novel deep learning-based approach deep fuzzy clustering is used to segment the cells. The detection stage of the proposed detection mechanism is the final stage, in which the CLL process is recognized using an RMDL classifier trained using the established Jaya-CSO method. The proposed classifier improved the performances. The experimental outcomes show that the proposed method yields a superior classification than the current state-of-the-art method.

Keywords: Leukemia, Chronic lymphocytic leukemia (CLL), older persons, deep learning, segmentation, classification, T2FCS filter, deep fuzzy clustering