

Leukemia detection using SegNet and faster region-based convolutional neural network

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ABSTRACT

Prevention of cancer is mostly attained by surveillance of the transformation zones. White blood cells (WBCs) are established in the bone marrow and intemperat growth of WBC leads to leukemia. Hematologists examine the microscopic images in manual method for predicting leukemia, but it is very complex process and without any guaranteed for accurate. In this proposed study, deep learning techniques involved to segment and classify the three types of leukemia like acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML) and chronic lymphocytic leukemia (CLL) using the BioGps dataset. The purpose of deep learning in medical science enhances the accuracy and precision of determining leukemia in early stages. In this study, introducing a sigmoid stretching (SS) in pixel enhancement for preprocessing; SegNet (St) is comfort to extract the structural features of the leukocytes and to segment the normal and blast cells for a clear classification; faster region-based convolutional neural network (faster R-CNN) carried under the process of classification and optimization done by dragon fly algorithm. The result of this work achieves best accuracy related to the existing techniques of convolutional neural network (CNN) such as support vector machine (SVM), k-nearest neighbors (kNN) and Bayesian model. This study achieves the accuracy rate of 97%, precision rate of 94% and sensitivity rate of 90% respectively with low complexity.

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1. INTRODUCTION

Leukemia is a classification of blood cancer in which abnormal white blood cells (WBC) form in the bone marrow [1]. According to Global Cancer Observatory (GLOBOCAN), an estimated 9,000 peoples are affected by leukemia in 2021. Figure 1 presents microscopic images of different types of leukemia. Acute lymphoblastic leukemia (ALL) is characterized by the presence of immature lymphoblasts in Figure 1(a). Acute myeloid leukemia (AML), which presents irregularly shaped nucleoli and myeloblasts is shown in Figure 1(b). Chronic lymphocytic leukemia (CLL) is characterized by mature, small lymphocytes with a distinctive, "smudged" appearance in Figure 1(c). An increased number of myeloid precursor cells in various stages of differentiation is shown in Figure 1(d). ALL arises in children age group between 2 to 8 years old, AML arises at any age, but most common in age group between 2 to 20 years old, CLL takes place the age group of above 70 years old and rarely affects the teenagers, chronic myeloid leukemia (CML) emanates at the age group of 60 to 65 years. Here, AML is rapidly spreading into the other blood cells. One of most