An Image Processing Application for Diagnosing Acute Lymphoblastic Leukaemia (ALL)

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Acute Lymphoblastic Leukaemia is a fatal disease that affects white blood cells and bone marrow in the human body. Every year, considerably a large number of adolescents and children become victims of this type of leukaemia. The early detection of this disease directly affects the recovery rate of the patients. In the manual process, pathologists can identify Acute Lymphoblastic Leukaemia and the accuracy of the prediction may rely upon their experience. Hence this research has proposed an image processing approach for early detection of Acute Lymphoblastic Leukaemia cells to prevent the spreading of cancer, enabling the medical experts to initiate the treatment without any delay and increase the recovery rate of such patients. For that, microscopic blood sample images were analyzed considering the features such as color, shape, presence of nucleoli, and nucleon to a cytoplasmic ratio of the cells separately using three Conventional Neural Networks (CNNs). Based on that, the Acute Lymphoblastic Leukaemia cells were identified and classified as either Acute Lymphoblastic Leukaemia or healthy. Compared to the laboratory testing methods, this approach obviously leads to early detection of Acute Lymphoblastic Leukaemia with an accuracy of 94.57% that has been confirmed by the domain experts. The proposed approach is an effective and less expensive method that would assist doctors to get fast and accurate results. Hence the originality of this research was to identify the presence of Acute Lymphoblastic Leukaemia cells in the microscopic blood sample images and classify them as either Acute Lymphoblastic Leukaemia or healthy by identifying the features of the Acute Lymphoblastic Leukaemia cells separately. Moreover, this research has found that Conventional Neural Networks (CNN) is the most suitable Neural Network to identify Acute Lymphoblastic Leukaemia using image processing technique.

***Keywords*:** Acute Lymphoblastic Leukaemia; white blood cells; conventional neural networks; Image Processing; Machine Learning