

Application of machine learning in diagnosis of ALL

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Abstract

The morphologic diagnosis of ALL by pathologist depends on examining patient peripheral blood together with the bone marrow blood films, However, this manual aspect for diagnosis is susceptible to discrepancies, by now we have a newly introduced technology that allows to overcome individual variation in diagnosis of ALL so named Machine learning depending on a complex preprogrammed convolutional networks matrix.

Objective

challenging a Machine-aided systems which utilize microscopic blood film images to recognize and diagnose ALL based on a preprogrammed deep convolutional neural network (CNN) i.e. machine learning algorithms.

Materials & Methods

We collected a dataset of images composed of PB & BM smears' images of two classes; ALL and normal control blood.

We analyzed 192 samples of digital images: 96 images of patients with leukemia and 96 images of healthy normal controls.

For each smear sample, we collected the results of clinical data (clinical history and examination) and laboratory data (morphological, cytochemical, and immunophenotyping assessment).

We challenged seven types of CNN models: Alexnet, VGG16, VGG19, GoogLeNet, ResNet50, ResNet101, and Inception-v3 to diagnose ALL.

Result

comparing ability of 7 models to diagnose ALL revealed that :The Alexnet had the lowest Accuracy of 95.51% followed by VGG16 92.13 % and VGG19 93.83% whilst the Inception-v3 had a promising highest accuracy of 99.98%.and can detect almost al ALL cases.

Conclusion

The statistical measures of the Inception–v3 performance revealed promising results. The sensitivity, specificity, and accuracy of Inception-v3 reached 99.98% for detection of ALL.