

Leukemia and Leukemoid Using VGG-16 Convolution Neural Network Architecture

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Abstract -Leukemia is a type of blood cancer that occurs when the body's bone marrow has too many white blood cells. This medical condition affects adults and is considered the most common type of cancer in children. Treatment for leukemia is determined by the type and extent of cancer in the body. Early diagnosis of leukemia is important to provide adequate treatment and cure the patient. Researchers are working on an advanced diagnostic system based on Machine Learning (ML) approach for early diagnosis of leukemia. In this study, we hybridized two different blocks of deep lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), and CNN-1. Multiple myeloma (MM). The proposed model detects malignant leukemia cells using microscopic blood staining images. We built a dataset of 4150 images from the public catalog. The main challenges are background reduction, removal of non-essential components of the blood supply, noise and blur reduction, and minimal methods for image segmentation. For preprocessing and segmentation, we change RGB color space to 8-bit grayscale mode, increase image contrast using image intensity adjustment method and adaptive histogram equalization (AHE) method. By multiplying the binary image and enhancing the image output, we improve the texture and sharpness of the image. In the next step, additional processing is done to remove the background of blood nuclei in the black and white nuclei. We then perform field operations and masking operations to remove background noise. Finally, we multiply the final output to the source image and transform the database image to [400,400] to recreate the image set in the RGB color space. After using all the methods and techniques, we were able to obtain a quiet, unblurred, sharp and segmented image of the lesion. In the next step, segmented images are given as input to CNNs.

Keyword Leukemia; Leukoid; Neutrophils; Eosinophils; Lymphocytes; Convolutional neural networks; Monocytes.

I. INTRODUCTION

Biomedical image processing plays an important part in the opinion of colorful conditions, allowing computers to replace mortal experts. Blood supplies the body's cells with oxygen and nutrients to survive. Blood is a admixture of white cells, red cells, tube, and platelets. Cancer is the rapid-fire conformation of aberrant cells that expand beyond their normal limits, so they infect near organs and spread to other organs. Blood cancer is also called leukemia. Entomology leukosis comes from the Greek word leukos, meaning "white", "purpose" and "blood". This type of cancer begins in the bone gist and causes an unbridled excess or morphological complaint of leukocytes in the blood. Cancer is the alternate most common cancer in the world, with 9.6 million deaths and 18.1 million new cases reported worldwide in 2018. One in six deaths worldwide is related to cancer. Cancer deaths are indeed worse in underdeveloped countries, counting for 70 percent of all deaths. According to the World Health Organization (WHO) report, Pakistan's death statistics in 2018 reported, 937 deaths due to cancer. Among other blood conditions, leukemia is considered the most dangerous. In Pakistan, leukemia was the fifth leading cause of cancer deaths in 2019, counting for nearly, 000 deaths and, 139 new cases of leukemia (World Health Organization, 2019). According to the American Cancer Society, leukemia caused, 690 deaths in the United States in 2016 alone, an estimated, 300(3.5) new cases of leukemia in 2018, and, 967 new leukemia

judgments since 2019. Table 1 shows the number of cases and deaths due to leukemia in 2019. Leukemia is a life- hanging complaint and can be fatal if not treated beforehand. Thus, there's a great need for rapid-fire discovery and treatment of leukemia. Bitsy images of blood are used to diagnose leukemia. Hematologists or laboratory specialists dissect these images. Hematologists or laboratory specialists use different styles to diagnose cancer, similar as luminescence achromatism, hybridization, etc.

TYPES	CASES	DEATHS
Acute lymphoblastic leukaemia	5930	1,500
Acute myeloid leukaemia	21,450	10,920
Chronic myeloid leukaemia	8990	1,140
Chronic lymphocytic	20,720	3,930

Immunophenotyping, cytogenetic analysis and cytochemistry. Previous methods of cancer screening are expensive and have certain limitations; this procedure is not widely available in the laboratory. In addition, this method requires manual monitoring and is not as time efficient as the manual method. Patient report results depend on factors such as the hematologist's experience, skill, and fatigue.

Microscopic images of blood are used to diagnose leukemia. Hematologists or laboratory technicians explore this image. Hematologists or laboratory technicians use different methods for detection cancer including fluorescence saturation, hybridization, and immunophenotyping, cytogenetic

Analysis and cytochemistry. Earlier methods were expensive and available for cancer screening certain limitations; this procedure is not widely available in the laboratory. In addition this method requires manual monitoring and is therefore not time-efficient is a manual method. The results of the medical report depend on the situation

Such as the hematologist's experience, expertise, and fatigue. Therefore, careful observation is necessary by pathology the result is a cheap, automated and reliable method

Needed to determine the type of leukemia. Pathologists can speed up and improve evaluated blood samples by automated microscopic examination the automation process overcomes the potential difficulties of manual diagnosis; this is it needed to facilitate diagnosis by creating an automatic classifier. Some computer-aided diagnostic methods are used to distinguish between the characteristics of healthy cells and blasts established in recent decades. In addition, examination of microscopic images

cheaper and does not require laboratory equipment for testing Machine learning-based networks have been widely used to extract valuable skills for prediction tasks in several fields , including medical diagnostics. System. If the disease is diagnosed and treated early, the death rate can be reduced

Meanwhile. It creates a hopeless situation and takes a lot of time to detect Program. Science. 26 of 2022, 12, 6317 3

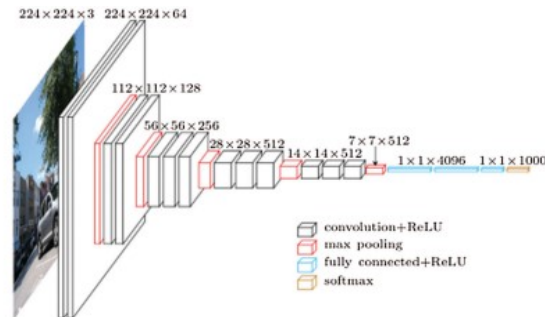
Disease manually by a hematologist. Computer-aided diagnosis of leukemia very efficient, time-saving and accurate method in solving this problem However, there are many challenges, obstacles and research gaps in computer aided systems, accuracy of leukemia and its type (acute myelogenous leukemia, acute lymphoblastic leukemia and multiple myeloma) and further segmentation, and classification. In this study, we focused on detecting and diagnosing leukemia.

II. RELATED WORKS

The method proposed here is aimed at detecting leukemic or leaked reactions from blood smear images. From the flowchart shown, the method used can be implemented without any pre-processing or segmentation in the image before providing input as a classification. This is an important finding between the proposed system and other methods presented as state-of-the-art. To classify and count WBC, VGG16 CNN is used to identify and detect WBC components as shown. A separate VGG16 CNN was used to train with the entire IDB2 database and blast classification to classify leukemia or leaked reactions. Typical cells from segmented images from the ALL IDB1 database.

III. GESTATION TRAINING AND VGG16

Convolutional Neural Networks(ConvNet or CNN), which principally apply complication drivers, are a class of Neural Systems that have been successful in areas similar as image bracket and recognition. It consists of 4 main way(see Figure 3)(20). ConvNet principally excerpts features from the image and preserves spatial associations between pixels by learning features from the input image in small areas. Moving the kernel or sludge in the input image that does the wrinkle subcaste, produce a compound chart with several different pollutants, while edge discovery, blurring, and stopping, produce a different raster chart over the same image. The drawn chart describes the spatial dependence of the image. After each convolutional subcaste, an activation function is applied. This function introduces non-linearity in remedied Linear(ReLu), digression or sigmoid ConvNet. The coming subcaste will reduce the number of features by taking the largest rudiments from the fixed point chart. The final consecution subcaste collects all point descriptors and maps each matrix to a vector.



Classification based on CNN

A convolutional neural network (CNN) is a type of artificial neural network widely used in all image processing applications. It is based on multi-layer neural network and supervised learning method. It is a food driven nervous system. It is used for classification and image recognition due to high accuracy and small error rate. Below are the steps in the CNN method to generate the hidden method.

Recommended system

Finally, the density layer is used for shape classification. To distinguish leukemic and leaked reactions from hemorrhagic forms using the VGG16 architecture. A logistic regression algorithm was used to model the collected features. At the same time, in this project, we use a deep learning model and work on the Tensor Flow platform, where image classification is done using image classification techniques. Mobile Net V3 architecture is a curve based study. The main theme of MobileNetV3 is to use Atom to find the best neural network architecture for a given problem. This is in contrast to the hand-crafted design of the previous version of the architecture. In particular, MobileNetV3 uses two Atom methods: Magnet and Net Adapt MobileNetV3 searches for architectures using Magnet, and then uses reinforcement learning to select the optimal configuration from discrete options. Next, the model optimizes the architecture using Net Adapt, an additional method that cuts unused activation channels in small increments.

HARDWARE & SOFTWARE REQUIREMENTS

Architecture: mobile net V3

Version: 3

Activation function: Sigmoid

Layer: Dense

Optimizer: root mean square prop

Loss function: sparse categorical cross entropy

Classes: 3

Epoch: 10

Accuracy: 0.56

Loss: 0.94.

VI.MOBILENET V3

Delivering the next generation of mobile networks based on a combination of advanced research methods and new architectural designs. MobileNetV3 adapts to the mobile phone CPU through a combination of hardware-aware network architecture optimization (NAS) enhanced with the Net Adaptation algorithm and further enhanced by new architecture developments. This paper sets out to explore how automated search algorithms and network design can be used together to leverage complementary approaches to improve the state of the art. Through this process, we created two new Net Net models, MobileNetV3-Large and MobileNetV3-Small, designed for high and low resource utilization. This model was then adapted and applied to object detection and semantic segmentation problems. We propose a new efficient segmentation decoder Lite Reduced Arous Spatial Pyramid Pool (LR-ASPP) for the problem of semantic segmentation (or dense pixel prediction). We achieved a new state of the art for cell classification, detection and segmentation. MobileNetV3-Large is 3.2% more accurate in Image Net classification and reduces latency by 15% compared to MobileNetV2. MobileNetV3-Small is 4.6% more accurate and 5% less latency compared to MobileNetV2. MobileNetV3-Large detection is 25% faster in accuracy than MobileNetV2 in detecting COCO. MobileNetV3-Large LR-ASPP is 30% faster than MobileNetV2 R-ASPP with similar accuracy for Cityscapes segmentation.

V.DOUBLE PROP (RMSProp)

Root Mean Square Propagation, or RMSProp for short, is an extension to the gradient descent optimization algorithm. This unpublished extension was originally designed to speed up the optimization process. RMSProp is described in lecture notes for Jeffrey Hinton's Courser course on neural networks, specifically in lecture 6R of the section on gradients of finite magnitude. To reduce the number of function evaluations required to reach an optimum or to increase the ability of an optimization algorithm. Gives a better finish. It is related to another extension for gradient generation called Adaptive Gradient or Adored. It is specially designed to explore the idea of automatically setting the step size (reading speed) for each parameter in the search field. This is achieved by first calculating the step size for a certain dimension, then acting on that dimension using the partial derivative of the calculated step size. This process is then repeated for each dimension in the search area. Ad grad calculates the step size for each parameter by first summing the partial derivatives for the parameters seen so far during the search, then dividing the initial step size hyper parameter by the square root of the number of squared partial derivatives.

The default step size calculation for one parameter is "cust_step_size = step size / (1e-8 + sort(s))". The step size is calculated for the input variable for a given point during the search, step_size is the size of the initial step, sort () square root operation, and s is the number of partial derivatives of the square for the observation variable; Research so far. It has the effect of smoothing out oscillations in the search for multi-curve optimization problems in the research domain. Adored cuts the training rate in the entire history of the quadratic gradient, and may have under-trained the training rate before arriving at such a convex structure.

The problem with Adored is that it can make the search very slow, resulting in a very low training speed for each parameter or dimension of the search. This has the effect of stopping the search for a while before the minimum is settled. RMSProp extends Ad grad to avoid the effect of monotonically decreasing training levels. RMSProp can be considered as an extension of Adored because it uses average decay or average partial derivatives instead of sums when calculating the learning rate for each parameter. This is achieved by adding a new hyper parameter, which we will call rho, which acts like a rate for partial derivatives. RMSProp holds the degenerate mean square gradient. Finding the moving average of the partially formed average allows you to ignore the initial values of the partially formed part of the search and focus on the last observed shape of the search area. RMSProp uses fast-deteriorating averaging to remove history from the past, which can quickly converge after finding a convex sum, such as the Adored algorithm example that starts at that sum.

VI.TENSORFLOW

Tensor Flow is an open source library developed by Google primarily for deep learning applications. It also supports traditional machine learning. Tensor Flow was originally developed for large-scale computing without deep learning in mind. However, deep learning has proven to be useful for development as well, which is why Google opened up. Stream Tensor receives data as a high-dimensional multidimensional array called a tensor. Multidimensional arrays are very useful for processing large amounts of data. Tensor Flow operates on a data flow graph with nodes and edges. Since the execution mechanism is graphical, it is easier to execute distributed Tensor Flow code on a computer when using a GPU. The next part of what is Tensor Flow tutorial covers why we should use Tensor Flow. `tf.layers.dense ()` is a built-in function in the Tensorflow.js library. This function is used to create a fully connected layer where every output depends on every input.

PYTHON IN OUTLOOK LEARN

Python is a general-purpose high-level programming language widely used for developing general-purpose and deep learning algorithms. Python and libraries like Jumpy, Spicy, Pandas, Matplotlib; Frameworks like Theano, Tensor Flow, Keras. The guide explains how various real-world libraries and frameworks can be used to solve complex real-world problems. Using artificial neural networks to build intelligent models and solve complex problems. We often use deep learning with unstructured data. Let us now understand the basics of neural networks in this deep learning and Python article. Advantages that make Python ideal for machine learning and AI-based projects include simplicity and consistency, extensive libraries and frameworks for AI and machine learning (ML), flexibility, platform independence, and a broad community. This increases the popularity of all languages. Python is often used for web and software development, task automation, data analysis, and data visualization. Because it is relatively easy to learn, Python has been adopted by many non-programmers such as accountants and scientists for everyday tasks such as managing finances.

LEUKEMIA Leukemia is a type of blood complaint or cancer white blood cells in the bone marrow. Bone marrow is the main point for the production of blood cells. When WBC production diminishes, cells produce blast cells or come leukemia cells. Can have symptoms of leukemia bleeding and bruising, fatigue, fever and swelling threat of infection. These symptoms are caused by insufficiency normal blood cells. This is best done after symptoms appear it's recommended that you visit your doctor.

Or doctor

To determine your threat early times. Clinically and pathologically, leukemia a diversity of the large group. The first division is between the sharp edges and habitual form acute leukemia is characterized by rapid-fire progression number of immature blood cells. Get treated right down demanded in acute leukemia because of its rapid-fire progression and the accumulation of nasty cells.

VII. LAYER SEPARATION

Here we talk about some manual changes without the help of search. This is mostly done in the first few layers and the last few layers. Below are the corrections made to the paper?

1. In the last block, the 1x1 extension layer is obtained from the MobileNetV2 inversion layer through the pool layer. This means that a 1x1 layer is used on a feature map of size 1x1 instead of 7x7 in terms of computation and latency.
2. We know that the expansion layer requires a lot of calculations. But now it has been moved beyond the pool layer, it is not necessary to do the same compression as it did with the projection layer from the previous block. So we can remove the projection layer and the filter layer from the previous interference layer (block). Both of these changes are shown in this picture. A test variation is to use 16 filters in the initial 3x3 layer, instead of 32, which is the initial compact model.

Segmentation

For semantic segmentation, the author proposed a new segmentation algorithm called R-ASSP [6] Lite R-ASSP or LR-ASSP. It is based on the idea of a pool that is used for compression and tension. The result of semantic segmentation in the set of cityscapes. Reduce the filter in the last block by a factor of 2. V2 0.5 and V2 0.35, respectively Mobile Net V2 with multiplier inside = 0.5 and 0.35. Segmentation Header (SH), where x uses R-ASSP, LR-ASSP proposal. The number of filters used at the beginning of the segmentation. CPU time is measured by full-frame input (i.e., 1024 x 2048) with one large pixel 3 (floating point) CPU time is measured by half-frame input (i.e., 512 x 1024). Lane 8 and lane 11 are our MobileNetV3 segmentation candidates. The authors report that LR-ASSP is faster than the proposed R-ASSP in combination with MobileNetV2. Also, MobileNetV3 backbones are slightly faster than their V2 counterparts.

Extraction feature

Feature extraction is an important part of the model. We provide special training

A hybrid model for feature extraction. The models used (CNN-1 and CNN-2) were developed in a sequence of convolutional layers involving 2-dimensional convolution.

Layer, batch regularization layer, Relax layer, and 2-dimensional up scaling layer.

By adding a filter, the data set is transferred to each layer layer. History

The last maximum, each layer of layers extracts relevant information. Finally a feature

The extraction is carried out in two sets of fully connected layers

VIII.LINEAR VS PERIOD?

We have a typical classification problem, where there is a set of points in space and each point is assigned a class label. If a straight line (or hyper plane in n-dimensional space) can separate two classes, then the problem can be separated linearly. On the other hand, if a straight line is not sufficient to separate two classes, then there is a problem of non-linear separation. The figure below shows the data in 2-dimensional space. Each node is assigned a red or blue class label. The left image shows a linear divisibility problem that requires a linear limit to distinguish two classes. The right figure represents a non-linear discrete problem where a non-linear decision boundary is required. Linearly separable problems. The linear decision boundary for three-dimensional space can be represented by the plane equation. A linear decision boundary for an N-dimensional space is described by the hyper plane equation.

IX.THE RESULT

Manual detection of blood clots is very important, so using an accurate detection model is essential for human safety. To apply the deep learning model using the shape classification method, we can detect whether the blood cells are healthy and Neutrophil, Eosinophil, Lymphocyte, Monocyte. Search based on V3 mobile network architecture. End of image classification where density layer is used. Classification and enumeration of leukocytes and classification of blast cells can be used to accurately determine the type of leukaemia and leaked reaction and support doctors in finding appropriate treatment for patients. In order to validate the accuracy and reliability of the proposed deep learning architecture, the implementation of the proposed method is mainly based on the replicated database. The results obtained from our paper is that the use of blood smeared images has many overlapped cells into which the image processing techniques are applied. During segmentation, the overlapping cells do not form an arbitrary shape of the blood cells and may result in improper segmentation due to the abnormal shape and structure of the WBC. The CNN classification method is a typically a complex one that requires only a trained set of input data and the samples required to train the data needed is more. While this database is powered only by acute lymphoblastic leukaemia (ALL), we intend to use the chronic lymphocytic leukaemia (CLL) database to carry out future work to distinguish CLL from leaked reactions. This project is related to the detection of blood cancer types such as Neutrophil, Eosinophil, Lymphocyte, and Monocyte. Deep learning algorithms are used to detect this type. A deep learning method based on VGG16 (Visual Geometric Group) CNN (Convolution Neural Network) architecture is introduced to classify and count WBCs from segmented images.

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