© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717891

AI Based Leukemia Detection Using Microscopic Blood Samples

N. CHINNA THAMBI[1], K. ARAVIND KUMAR[2], S. KALIDASS[3], DR.M. ILAYARAJA[4]
[1,2,3]*Department of Computer science and Information technology Kalasalingam Academy of Research and Education*
[4]*Associate Professor, Department of Computer science and Information technology Kalasalingam Academy of Research and Education Krishnankovil India*

Abstract- ***The Cancer Cell Detection System was designed to accurately and efficiently identify cancer cells in blood samples. It uses techniques like machine learning to achieve this. The device uses a microscope to see pictures of blood. It improves them by eliminating noise, boosting contrast, and fragmenting the images. The system examines the size, shape, and texture of the cells following picture enhancement. Then, it uses machine learning models such as Logistic Regression, Support Vector Machine, and Convolutional Neural Networks to predict if a cell is cancerous or not. When it comes to automatically identifying patterns in photos, Convolutional Neural Networks excel. If configured correctly, logistic regression can also be effective. The Cancer Cell Detection System is intended to effectively and precisely identify cancer cells from blood samples. It uses methods like machine learning to do this. The device uses a microscope to examine pictures of blood. It improves them by dividing the images, increasing contrast, and eliminating noise. Following image enhancement, the system examines the cells' size, shape, and texture. Then, it uses machine learning models like Logistic Regression, Support Vector Machine, and Convolutional Neural Networks to identify whether a cell is cancerous or not. Convolutional neural networks are especially a dept at this and have the ability to automatically identify patterns in pictures. When configured correctly, logistic regression can also be effective.***

Keywords: logistic regression, blood cell categorization, machine learning, convolutional neural networks, and cancer detection

I. INTRODUCTION

Cancer detection is made easier and more accurate by the Advanced AI-based Cancer Cell Detection System. It uses machine learning techniques like Support Vector Machine (SVM), Convolutional Neural Networks (CNN), and Logistic Regression in MATLAB to analyze blood samples and identify whether or not the cells are cancerous. To detect cancer, physicians and pathologists typically examine blood samples under a microscope. This can take a long time and occasionally result in errors. The goal is to make things easier by implementing an automated system that can aid in diagnosing. Faster, more dependable, and less biased results are produced by the technology. First, by eliminating noise, modifying contrast, and highlighting crucial edges, the technique improves the quality of blood pictures. The features of the cells, including their size, shape, texture, and color, are then extracted. These traits help identify cancerous cells from healthy ones. In the system, machine learning models are employed. CNN, SVM, and logistic regression. to combine cells. CNN is excellent at finding patterns in images. often offers excellent precision. Logistic regression is more efficient and user-friendly. It has to be tweaked in order to operate correctly. Principal Component Analysis (PCA) hyperparameter modification and ensemble learning are two techniques that improve its performance. The main goal of this project is to provide a diagnostic tool for labs and hospitals that is reliable, economical, and efficient. The system achieves performance while keeping processing demands reasonable. MATLAB simplifies the integration of machine learning models and image processing. In the future, this system may include cloud-based support and real-time photo analysis. This would make it accessible in remote areas with limited access to medical facilities. All things considered, this project makes use of the Advanced AI-based Cancer Cell Detection System to improve the speed and precision of cancer detection, which is crucial for early diagnosis and improved

patient care. Future improvements to this system might include cloud support and real-time image analysis. This would enable remote locations with limited medical facilities to access it. Lastly, the Advanced AI-based Cancer Cell Detection System is used in this research to improve the speed and precision of cancer detection, which is crucial for early diagnosis and better patient outcomes care.

II. LITERATURE SURVEY

[1] Automated Acute Leukemia Identification Through Microscopic Images (2018)
Convolutional neural networks are being used in this study to identify malignant diseases from blood cell pictures. The researchers used images of cleaned blood cells to train their Convolutional Neural Networks model to distinguish between healthy and sick cells. They were successful in doing so and demonstrated how deep learning can speed up and lower leukemia misdiagnosis.

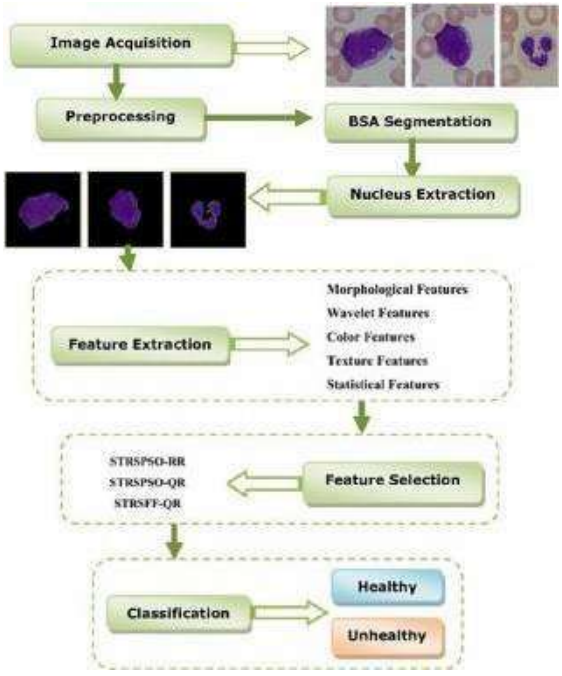
[2] Model for Acute Lymphoblastic Leukemia Identification Based on Deep Learning (2021)
The deep learning model for acute lymphoblastic leukemia is the subject of this work. Although we don't have much data, they were able to get excellent quality out of their model by adding data that absorbed the poor quality photographs. The result was superb. This can enable the early detection of leukemia and help clinicians make well-informed judgments.

[3] Leukemia Detection Using Color and Texture Features in Image Analysis (2014) This study's interpretation is more conventional image watching than learning. Blood was separated from the rest of the image, and color and texture analysis was conducted inside. The quality of these cells was determined using this information. It was easy, but it worked. showed that, when done correctly, traditional methods can also be beneficial.

[4] Survey for LEUKEMIA Detection Based on Microscopic Image Analysis (2020)
This essay contrasts several methods, such as the use of Convolutional Neural Networks and other machine learning techniques, with the conventional methods of item recognition and categorization. The paper claims that the use of intelligence in the medical industry is growing in significance. The research discusses a number of issues, such as the requirement for real-time applications and a dearth of practice photos.

[5] Hybrid Deep Learning Model for Classifying Leukemia(2022)
Both the conventional method of machine learning procedures and the deep learning process have been used in this model. Other machine learning methods are used to draw conclusions after Convolutional Neural Networks are utilized to identify things inside the image.

III. METHODOLOGY



Leukemia Detection from Color Segmentation

Image Acquisition Module
But it all begins with the Image Acquisition Module. This component of the system makes use of microscopes to capture high-quality images of blood

samples. These microscopes are ideal for capturing high-resolution images, which are essential for obtaining more trustworthy results. All photos are stored in a way that makes them easily accessible. Along with the photo, the patient's ID number, the date the sample was taken, and further medical data are saved. This will make it easier to monitor and manage all of the data. Every time an image is captured, similar procedures are performed to ensure that everything goes as planned. Every aspect of the photos, including lighting, zooming, and focusing, is set to the same level. If an image seems to be of low quality, a new one is taken. Furthermore, several gadgets are capable of taking pictures on their own with little assistance from a human. One of the benefits of the Image Acquisition Module is its ability to take images in real time. The fact makes it possible to analyze the samples and greatly aids in problem detection. The option to move images straight to a database is another capability.

Module of Preprocessing

The Preprocessing Module aids in raising the photos' visual quality. In order to make it easier to see the cell boundaries, special procedures like filtering and Gaussian smoothing are applied to hazy photos. Additionally, the module increases the variety of the photographs. The photographs' features become more noticeable. Certain strategies are employed to highlight the differences in the cells. Among the methods that aid in highlighting the differences are contrast stretching and histogram equalization. This is significant since little changes could indicate whether or not the cell is normal. In order to maintain a consistent visual quality, all of the photographs are also converted to grayscale. Other methods are used to improve the cell's appearance.

Module for Segmentation

The Segmentation Module separates the cells from the remainder of the picture. This stage is crucial since the algorithm only needs to examine specific areas of the image. Cells are separated from the remainder of the image using certain techniques. For instance, Otsu's thresholding is one of them. Even when multiple layers of cells are stacked on top of one another, more sophisticated cells. Convolutional Neural Networks (CNN) are used in addition to the conventional methods. This is carried out because CNN is able to thoroughly examine the photographs and spot any trends or anomalies. Reliable findings can be obtained by thoroughly analyzing the data using both manual and artificial intelligence methods.

Dimensionality Reduction Module and Feature Selection

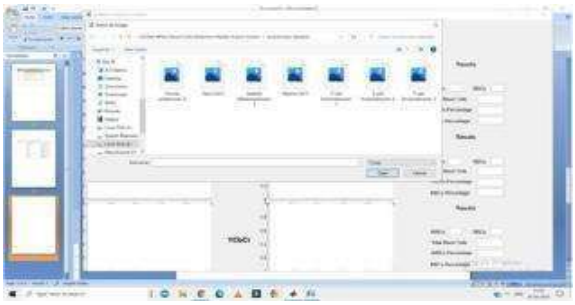
Since not every object found is equally beneficial, this module's topic is selecting the useful items. As a result, the system operates more accurately and quickly. PCA is one of the special techniques for reducing the number of objects found. RFE is an additional method in which only the best elements remain after the crucial ones are removed one by one. In order to eliminate superfluous information, the relationships between the things that have been found are also examined. As a result, system difficulties are avoided and performance is accelerated. It produces better outcomes. It also facilitates comprehension of the model.

Module for Augmenting Data

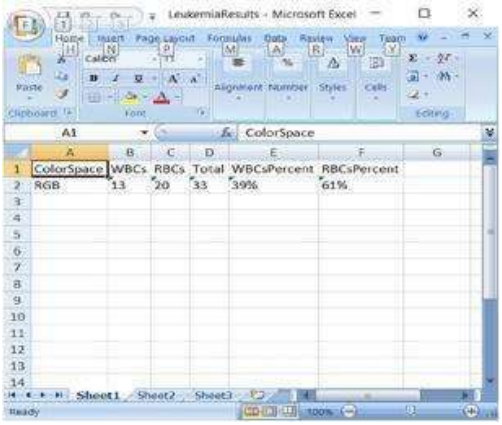
The Data Augmentation Module increases the quantity and variety of images, which enhances system performance. It creates several versions of the current images through rotations, flips, scale, and brightness/contrast adjustments. This will enable the model to function well when fresh or slightly altered data is provided. Additionally, it will be helpful in handling datasets that are unbalanced, meaning that there may be a lower number of malignant instances than normal cases. Adding noise to the dataset is one way to make it seem more realistic. This can be accomplished by creating artificial images utilizing sophisticated techniques like GANs and VAEs.

IV. RESULT

Upload Microscope Blood Cell Image



© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717891



V. CONCLUSION

The Advanced AI-based Cancer Cell Detection System allows doctors to find cancer cells more quickly and accurately. It analyzes microscopic images of blood samples using machine learning techniques such as Support Vector Machine, Convolutional Neural Network, and Logistic Regression. Instead of relying only on human inspection, this method uses complex algorithms to detect abnormalities in cells. The system follows a thorough process to ensure reliable results. The first step is to improve the photos' quality. It then divides the pictures into pertinent sections so that each cell may be examined in detail. It then collects vital information from each cell, such as its form and structure. Finally, it establishes whether or not the cells are cancerous. Each of these steps is essential to improving accuracy and reducing the possibility of a false diagnosis. Among all the techniques used, the Convolutional Neural Network is very important because it can recognize complex patterns in cells that may not be immediately obvious. This function helps generate more accurate results and boosts the system's efficiency.

REFERENCES

[1] "Automatic Detection of Leukemia Using Microscopic Images with CNN", A. Rehman, S. A. Khan, M. Abbas, T. Saba, Computers in Biology and Medicine, 2018.

[2] "Deep Learning for Identification of Acute Lymphoblastic Leukemia in Blood Smear Images", C. Mohapatra, R. Behera, M. P. Singh, IEEE Access, 2021.

[3] "Image Analysis-Based System for Leukemia Detection Using Color and Texture Features", D. Putzu , G. Caocci , G.D. Giacomo, Computers in Biology and Medicine, 2014.

[4] "A Survey on Microscopic Image Analysis for Leukemia Detection", A. K. Sahu, B. Bhowmick, Procedia Computer Science, 2020.

[5] X. Wang, Journal of Healthcare Engineering, 2020.

[6] "Leukemia Detection Using Image Processing and Machine Learning", K. V. Ramya, S. U. Rehman, International Journal of Computer Applications, 2019.

[7] "AI-Driven Blood Smear Analysis for Early Diagnosis of Leukemia", P. Sharma, N. Yadav, Biomedical Engineering Letters, 2021.

[8] X. Wang, Journal of Healthcare Engineering, 2020.

[9] "Leukemia Detection Using Image Processing and Machine Learning", K. V. Ramya, S. U. Rehman, International Journal of Computer Applications, 2019.

[10] "Transfer Learning Approach for Classification of Leukemia Types in Microscopic Images", R. Joshi, M.R. Paul, Expert Systems with Applications,2023.