Prediction of Abnormalities in White Blood Cells Using Deep Learning Models

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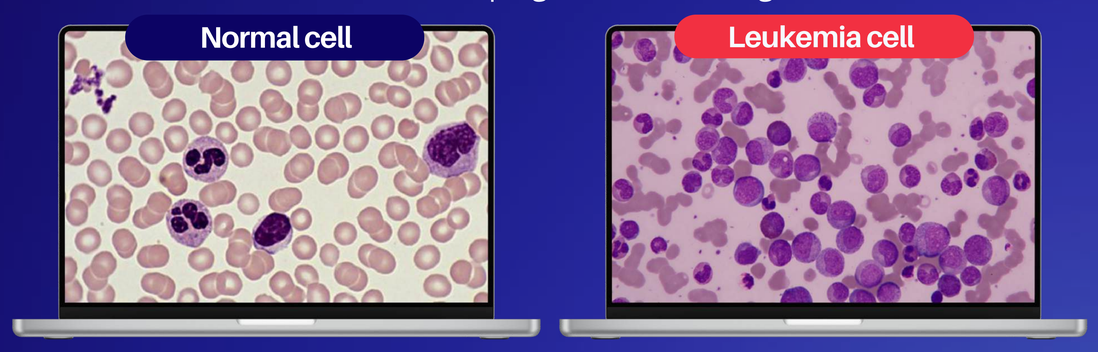
ABSTRACT

This study compares deep learning models for classifying abnormal white blood cells using four techniques: YOLOV8, EfficiencyNetB3, ResNet101V2, and DenseNet121. The dataset comprises 10,661 images of white blood cells, both normal and diseased, sourced from The Cancer Imaging Archive. The data is divided into training, and test sets for model development, parameter tuning, and performance evaluation. Model performance is assessed using a confusion matrix. YOLOV8 demonstrates the best performance, achieving an accuracy of 97%, precision of 98%, recall of 99%, and F_1-score of 98%. These findings support the development of a medical decision support system that integrates laboratory imaging to enhance diagnostic speed and reduce errors. This approach also lays a foundation for future advancements in medical image classification

INTRODUCTION

Leukemia is a group of hematologic malignancies caused by the abnormal proliferation of white blood cells, affecting the immune system and overall bodily functions. According to the National Cancer Institute (NCI) [1] , in 2021, leukemia accounted for 3.2% of all new cancer cases and was the 10th most common cancer in the United States, highlighting its significant health impact. Early detection of abnormal white blood cells is crucial for effective treatment, as it enables timely medical intervention, reduces complications, and improves patient outcomes. Therefore, analyzing white blood cell images at the cellular level is essential for developing effective strategies to combat this disease

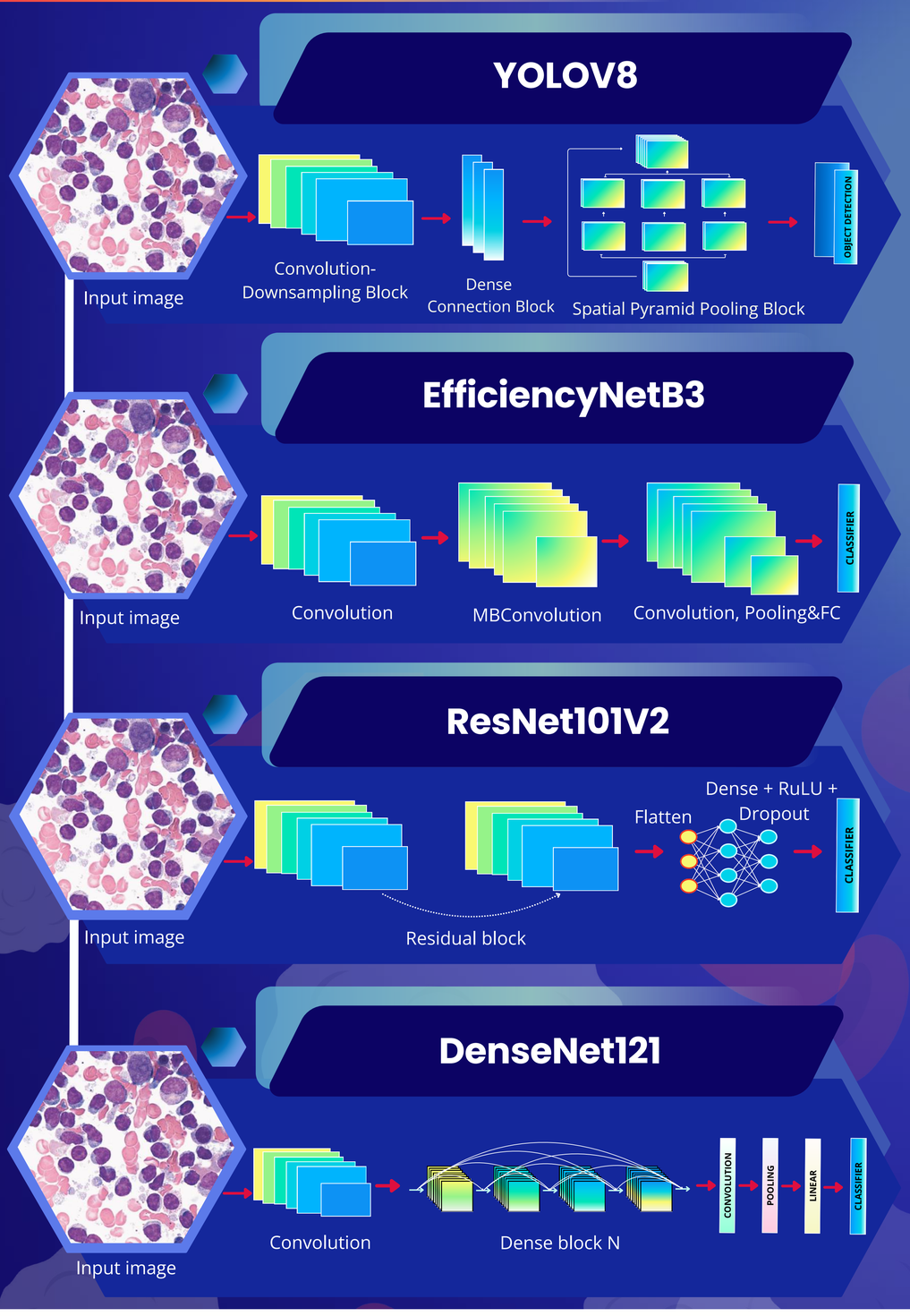


OBJECTIVES

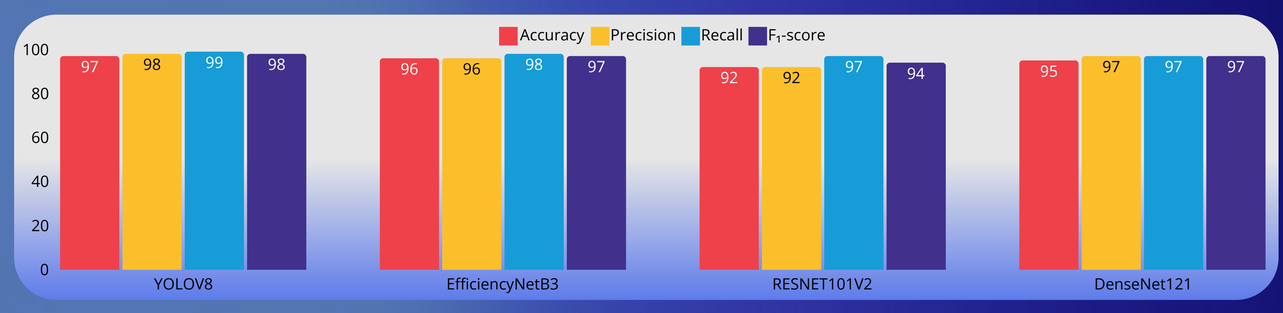
- To show the differences between normal white blood cells and leukemia cells
- To compare classification models for identifying abnormalities in white blood cell images

METHODOLOGY

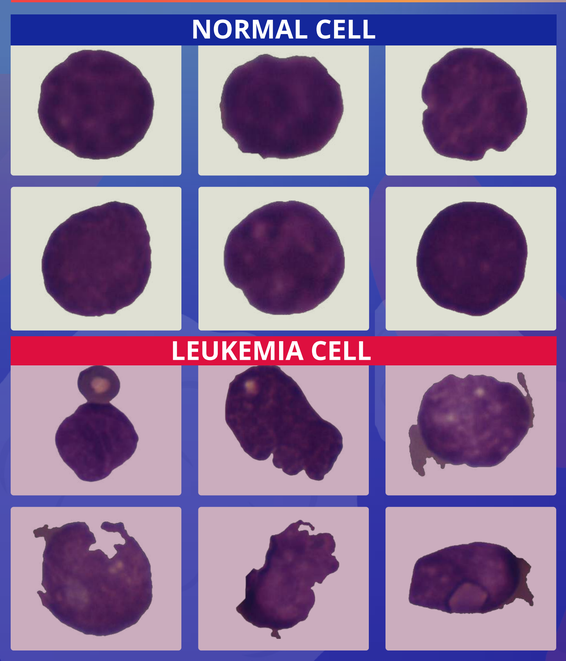
MODEL ARCHITECTURE

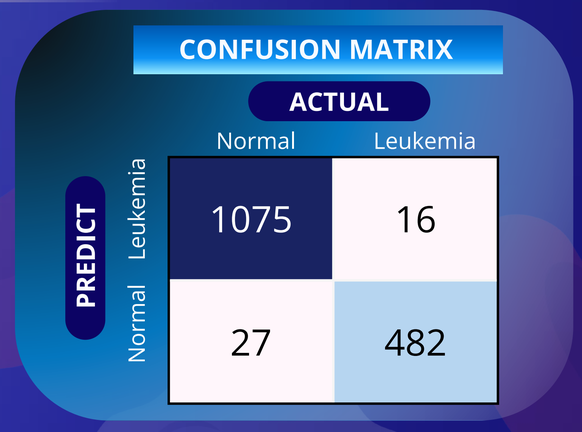


RESULT



CONCLUSION & DISCUSSION





In conclusion, YOLOv8 achieved the best results, with accuracy of 97%, Precision of 98%, Recall of 99%, F_1-Score of 98%, which enhances its performance for image classification and reduces errors. This aligns with findings in [3]. In contrast, EfficientNetB3 is not effective in classifying blood cell structures, and ResNet101V2 is not specifically designed for this tasks.

BENEFITS OF RESEARCH

The results can help reduce human error and improve the accuracy of medical diagnoses, the way to enchace model for future medical diagnosis support system that could be implemented in hospitals.

SCAN ME

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